IIAI Open Conference Publication Series
IIAI Letters on Informatics and Interdisciplinary Research
Vol.007, LIIR478
DOI: https://doi.org/10.52731/liir.v007.478

Internet Fatigue as a Protective Signal in Visibility-Intensive SNS

Chie Kato *

Abstract

We examined "*Internet Fatigue*" as a "*Protective Signal*" in visibility-intensive social media. We analyzed 871 free-text responses from young Social Networking Sites (SNS) users in Japan (mean age = 21.9) using an embedding-assisted content analysis. Sentences were encoded with Multilingual E5 (Wang et al., 2022; 2023; 2024) and clustered with k-means. We inspected the elbow curve (k = 2–30) to delimit a candidate range, then selected k by the average silhouette within that range. Overall, 747/871 (85.8%) reported at least one fatigue experience. Seventeen interpretable clusters emerged—e.g., Alt-Account Exposure and Conformity Pressure; Problematic Use and Time Displacement; Relational Maintenance Pressure—many tied to heightened visibility and inflow. We argue that internet fatigue could function as a protective signal, prompting boundary-setting and other self-regulatory actions.

Keywords: Internet Fatigue, Adolescents, Digital Literacy Education, Protective Signal

1 Introduction

In this study, we used an embedding-assisted content analysis to explore the latent structure of "*Internet Fatigue*" among 871 young SNS users in Japan (mean age = 21.9). Each free-text response was converted into contextual sentence embeddings, enabling data-driven theme discovery without predefined dictionaries or labels. We chose this approach because manual qualitative methods (e.g., the KJ method; Kawakita, 1970; grounded theory; Kinoshita, 1999) become difficult to scale and to maintain objectivity as sample size grows. Embedding-assisted analysis better captures semantic nuance and supports more unbiased grouping of short texts, compared with dictionary-based approaches.

2 Previous Study

2.1 Reasons for Targeting Young People

The widespread adoption of smartphones and the COVID-19 pandemic reduced opportunities for face-to-face interaction and increased online communication among young people in Japan. According to the Ministry of Internal Affairs and Communications (MIC), Institute for Information and Communications Policy (IICP) Fiscal Year 2022 survey (N = 1,500; ages 13–69), usage of the instant messenger (IM) LINE was 92.2% among teenagers and 98.1% among people in their twenties. Social networking sites show a similar pattern: usage of X (formerly Twitter) and Instagram was highest among those in their twenties (78.6% for both),

* Fukui University of Technology, Fukui, Japan

followed by teenagers (67.4% for X; 72.3% for Instagram). We focus on adolescents and young adults (ages 15–25), given their near-universal adoption and daily use of social networking services (SNS) and instant messenger (IM). While daily internet use can enrich social life, public data also note risks such as online trouble and incidents. Accordingly, this study examines internet fatigue associated with the use of SNS and IM among young people in their late teens and early twenties.

2.2 Internet Fatigue in Japan

The spread of SNS and IM has made it possible to easily communicate with friends and acquaintances regardless of location or age. At the same time, these services have also brought about challenges that were unthinkable before their widespread use. One such challenge is internet fatigue.

2.2.1 Receiver Fatigue

People may experience internet fatigue from mere browsing due to information overload, ambiguity, and cumulative vigilance demands. For example, Hosotsuji (1991) examined the impact of information overload on relationships and communication in a society where information over-load is rampant. Hosotsuji (1991) considered Simmel's "Attitude of Boredom" (Simmel, 1950) as a characteristic of urban dwellers, viewing it as an adaptation to overstimulation. People at-tempt to protect themselves from the noise by using boredom as a barrier, when they perceive excessive information as inappropriate, meaningless, or inconsequential. In a sense, this defensive behavior can be seen as a sign of "fatigue."

2.2.2 Quantitative Aspects of Internet Fatigue

One example of a study that quantitatively assessed SNS fatigue is Mori and Natori's (2018) study. Since no quantitative scale for measuring SNS fatigue had been developed at the time, Mori and Natori (2018) created a scale that incorporated stressful events related to SNS use. Factor analysis revealed two factors in the "Passive Stress Event Scale": "Concerns about Trends," such as feeling jealous when reading articles or comments about other people's daily lives, and "Negative Emotions," such as feeling depressed when reading slanderous or libelous articles or comments. Three factors were extracted from the "Active Stress Events Scale": "Avoiding Dislike," such as worrying that others will dislike you if you post your true feelings; "Attention-seeking," such as posting articles and comments that make it seem like your daily life is fulfilling; and "Fiction-Construction," such as not being able to express oneself naturally (e.g., feeling compelled to post casually and sometimes even to embellish or mix in falsehoods).

Inazuka and Maekawa (2023) also examined the negative impact of SNS use on mental health in 193 female students, examining the relationship between SNS Fatigue and feelings of lethargy. The results showed that the longer the SNS usage time (high group), the stronger the relationship between SNS fatigue and feelings of lethargy. Furthermore, even in the group with short SNS usage time (low group), SNS use became "emotionally unstable," resulting in feelings of "exhaustion."

2.3 Internet Fatigue Overseas

Internet fatigue is not a Japan-specific issue. Overseas, research related to internet fatigue has focused on SNS fatigue and Facebook fatigue. For example, Bright et al. (2015) conducted an exploratory study on social media fatigue and pointed to the rapid increase in social media use as a factor behind it. They also speculated that the fear of missing out is behind this surge in social media use. Dhir et al. (2018) focused on fatigue and psychological well-being associated with social media use and reviewed prior research related to these topics. Their findings revealed that most research on social media fatigue has focused on Asian countries, including China, South Korea, Taiwan, and Japan.

2.4 Definition of Internet Fatigue in This Study

Previous research has characterized social media fatigue as a state of mental exhaustion resulting from the overload (technical, informational, and communicative) associated with participation and interaction on social media (Dhir et al., 2018). Lee et al. (2022) also consider social media fatigue as a negative psychological state that leads to withdrawal intentions. These definitions primarily focus on the psychological and mental strain associated with social media use. This study broadly encompasses the use of instant messengers (IM) in addition to social media, and furthermore, encompasses physical strain (e.g., Eye Strain and Posture-Related Discomfort).

Therefore, this paper adopts the comprehensive concept of internet fatigue and defines it as follows: Internet fatigue is a state that includes negative emotions (e.g., anxiety, irritability, depression), cognitive exhaustion (attentional and judgment strain), and physical strain experienced by users while using online services and applications (e.g., social media, IM) on smartphones, computers, etc. We collected free-form responses from respondents, asking, "please tell us about any difficult or painful experiences you've had while using the internet (especially social media and instant messenger) on your smartphone or computer", based on this definition.

We treated "difficulty" in the free-form responses as a self-reported indicator of negative emotions. The types of burden included in the above definition were also treated as proxy indicators of internet fatigue. The analysis was based on Kato's (2013) classification framework, with a codebook expanded to include contemporary domains (e.g., Boasting/Comparison Burden, Non-Consensual Posting/Privacy Violation, Panic over Mis-Operation, Algorithm Opacity, Anxiety about Missing Out on Content, Misinformation Burden, Physical Fatigue). We conducted an exploratory mixed-methods study that combines machine learning subclassification (clustering) with manual labeling.

2.5 Internet Fatigue as a Protective Signal Study

Following stress-and-coping research in cognitive psychology (e.g., Lazarus and Folkman, 1984), we conceptualize negative emotions and fatigue as signals that an individual's coping resources are being exhausted and that some form of adjustment is needed. From this perspective, fatigue is not merely a maladaptive symptom, but can function as an early warning cue that prompts individuals to change strategies, reallocate attention, or temporarily withdraw from stressful environments. Applied to visibility-intensive SNS, internet fatigue can be understood as a subjective indication that the current level of inflow, exposure, or relational demands has become un-sustainable. In this sense, we treat internet fatigue not only

as a risk indicator but also as a potentially adaptive signal that supports boundary setting and self-regulation in digital life and digital well-being (Burr et al., 2020).

3 Methods

This study is an exploratory mixed-methods design that combines machine learning subclassification (clustering) with manual semantic labeling. First, we quantified free descriptions and automatically created clusters. Second, we assigned human-interpretable names to clusters in accordance with qualitative research procedures.

3.1 Participants

An online survey was conducted between July and early October 2024. Participants were 871 young people aged 15 to 25 years (407 men, 459 women, 5 unspecified; mean age = 21.9 years). All participants had regular internet access and completed the full questionnaire online. Given the typical limitations of online, convenience-based sampling, the results should be interpreted with caution when generalizing beyond this population. All participants provided informed consent for the publication of anonymized results.

The sample also reflects specific cultural characteristics. In Japan, the use of "sub-accounts" or "alternate accounts" for more candid self-expression on social media and instant messaging services is widespread. Many of the internet fatigue experiences recorded in this study (e.g., feelings of obligation created by read receipts, or the shock of discovering derogatory posts on a friend's private account) are therefore likely shaped by platform norms among Japanese adolescents and young adults. This cultural and platform-specific context should be kept in mind when interpreting the findings.

The primary aim of this study was to organize participants' free-text descriptions into interpretable patterns. Rather than training a predictive model, we treated the free-form responses as data to be quantified. Specifically, for each response we obtained a fixed-length sentence embedding using the publicly available Multilingual E5 model (Wang et al., 2022, 2023, 2024). No additional training or fine-tuning was performed; embeddings were mean-pooled and L2-normalized before clustering.

3.2 Analysis

3.2.1 Analysis Environment

This study was conducted using Python. The main libraries used were scikit-learn (clustering and metric calculation), NumPy and pandas (preprocessing), and sentence-transformers (sentence embedding using the E5 model for Japanese). Figures were created using matplotlib.

3.2.2 Procedure

(1) In the open-ended question, participants were asked, "Please describe a difficult or painful experience you have had while using the Internet (especially social media and instant messaging) on your smartphone or computer." Responses were generally short, ranging from three to six sentences.

(2) Brief responses such as "none," "nothing," "I don't know," or leaving the box blank were classified as "no fatigue." Symbols such as emojis and exclamation marks were normalized,

and obvious typos were minimally corrected if they interfered with semantic interpretation. No further linguistic preprocessing (e.g., stopword removal) was performed.
(3) The open-ended text was converted into sentence embeddings using Multilingual E5 (Wang et al., 2022; 2023; 2024). The embeddings were average-pooled into 768-dimensional vectors and L2-normalized. k-means was applied using Euclidean distance, which is approximately equivalent to cosine distance in L2-normalization.
(4) For visualization purposes only, we projected the embeddings into two dimensions using PCA.
(5) Similar sentences were grouped using unsupervised k-means.
(6) We examined the elbow curve (k = 2–30) to narrow the candidate range (Thorndike, 1953) and selected the final k based on the average silhouette within that range (Rousseeuw, 1987). We then ran k-means with the selected k (random_state = 42, n_init = "auto").
(7) The overall cluster typology remained qualitatively unchanged after random initialization and shuffling the input order, suggesting that this structure is unlikely to be the result of chance. To select the optimal solution from multiple initializations, we used scikit-learn with n_init = "auto" (the average silhouette peaked at k = 17).

3.2.3 Transparency of Procedure

We increased transparency by publishing clear labeling criteria and examples near the centroid, allowing other researchers to evaluate whether they could arrive at equivalent cluster names, because all qualitative interpretations were performed by a single researcher.
(1) Groups were created automatically using machine learning (E5 + k-means) without using predefined dictionaries or categories.
(2) Twenty representative examples (near the centroid) were automatically extracted from each cluster and summarized in a table along with their definitions.
(3) The label naming criteria were displayed in the table to provide a guide for third parties to arrive at equivalent interpretations.
This approach ensured transparency by allowing users to check the text supporting each label.

3.2.4 Stability Checks

The cluster typology remained qualitatively unchanged across random initializations and input shuffling. Therefore, we determined that the cluster structure reported in this study was not the product of chance and is qualitatively stable. We used scikit-learn and n_init = "auto" to select the best solution from multiple initializations in practice. The average silhouette peaked at k = 17. We then ran k-means with k = 17.

3.3 Ethics and Data Availability

All procedures were approved by the Fukui University of Technology Institutional Review Board, Protocol Hito-2024-08. For participants under 18, we obtained guardian consent in addition to minor assent. Participants provided written informed consent for anonymized publication, including permission to publish anonymized excerpts; no personally identifying information was collected in free-text fields.

4 Findings

4.1 Existence or Absence of Experiences Leading to "Internet Fatigue"

We surveyed 871 young people aged 15–25 (407 men, 459 women, 5 unspecified), between July and early October 2024. In response to "please tell us about any difficult or painful experiences you've had while using the internet (especially social media and instant messenger) on your smartphone or computer": 747 participants answered Yes (85.8%) and 124 answered No (14.2%) (Figure 1). We then analyzed the free-text descriptions by converting them into numerical embeddings using machine learning (E5 + k-means) without using a predefined dictionary or categories. We present representative examples from each cluster below together with human-assigned labels.

4.2 Occurrence Rate by Cluster

We mapped free-text responses to E5 embeddings (mean-pooled, L2-normalized) and applied k-means (Thorndike, 1953; Lloyd, 1982). We determined k by first inspecting the elbow over k = 2–30 (within-cluster sum of squared errors, SSE; Figure 2), then selecting the final value by the average silhouette (Rousseeuw, 1987) within that range (Figure 3), which yielded k = 17. Using this k, we extracted 20 near-centroid exemplars per cluster and assigned hu-man-readable labels (Figure 4). Figure 5 reports the percentage of responses in each cluster. The largest clusters were "Alt-Account Exposure and Conformity Pressure," "Problematic Use and Time Displacement," and "Relational Maintenance Pressure." By contrast, clusters such as "Read-Receipt Pressure and Silence" were relatively small (Table 1).

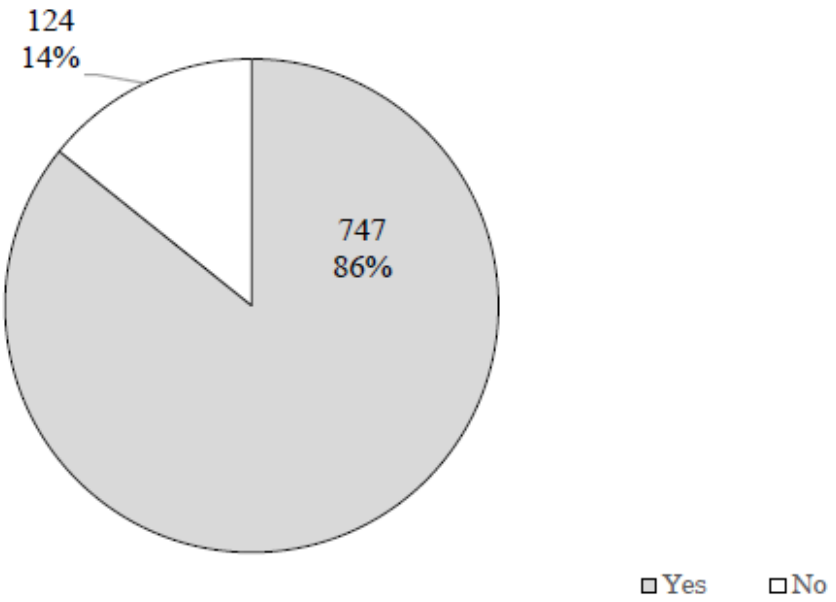

Figure 1: Experience of internet fatigue (Any issue: Yes/No).

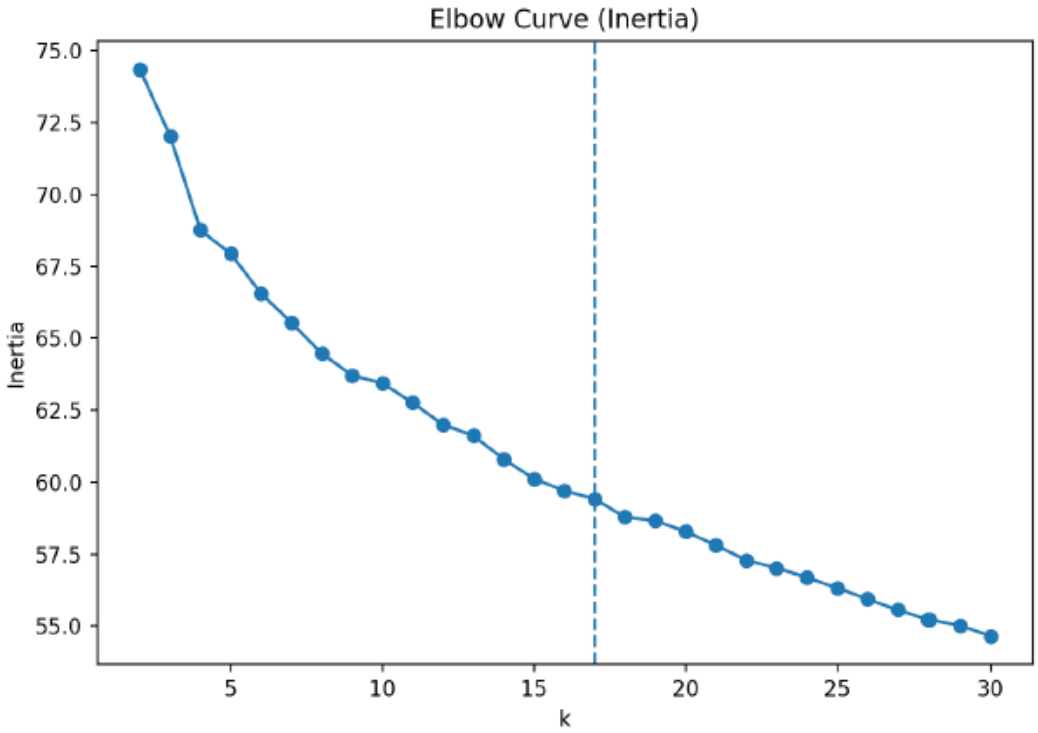

Figure 2: Elbow curve (SSE) for k = 2–30; knee around k = 15–19.
E5 embeddings (mean-pooled, L2-normalized); k-means (Euclidean; cosine-equivalent).

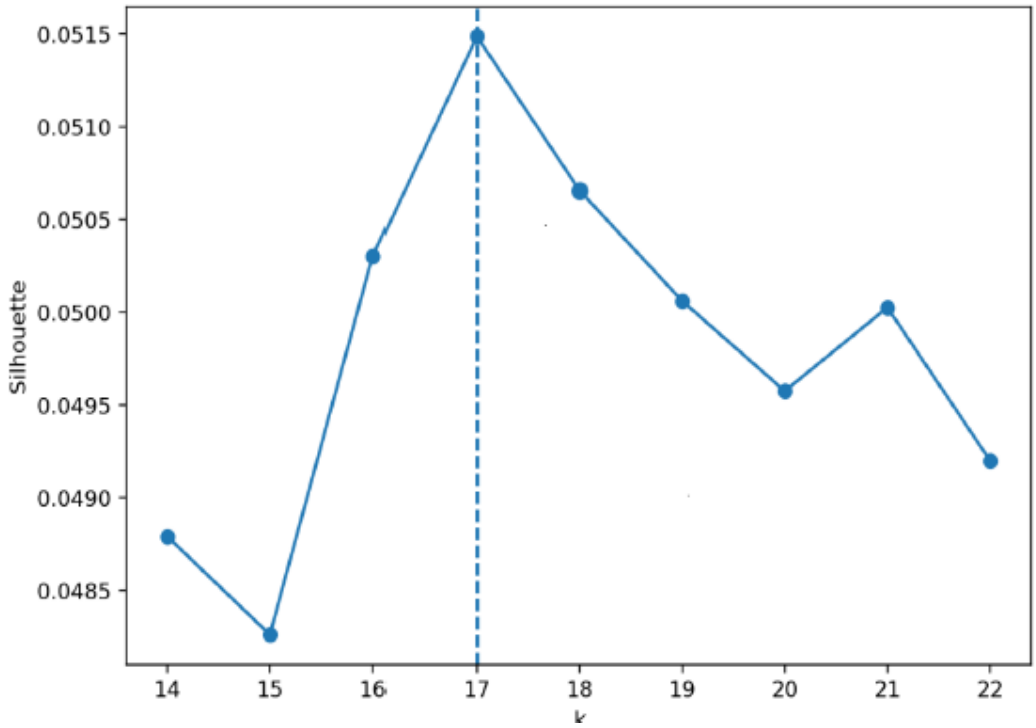

Figure 3: Average silhouette vs. k (k = 15–22); peak at k = 17.
Computed within the elbow candidate range

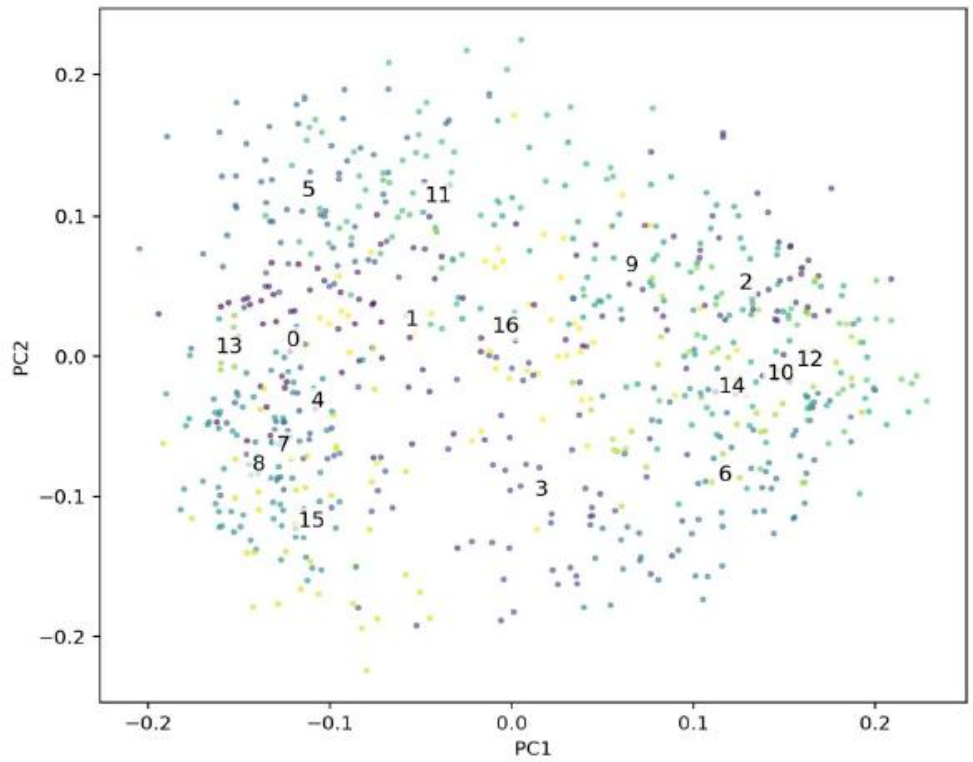

Figure 4: k-means clusters (k = 17) on E5 embeddings visualized by 2D PCA (N = 747). Clustering was performed in the original 768-dimensional embedding space; PCA is shown solely for visualization and may distort distances and angles.

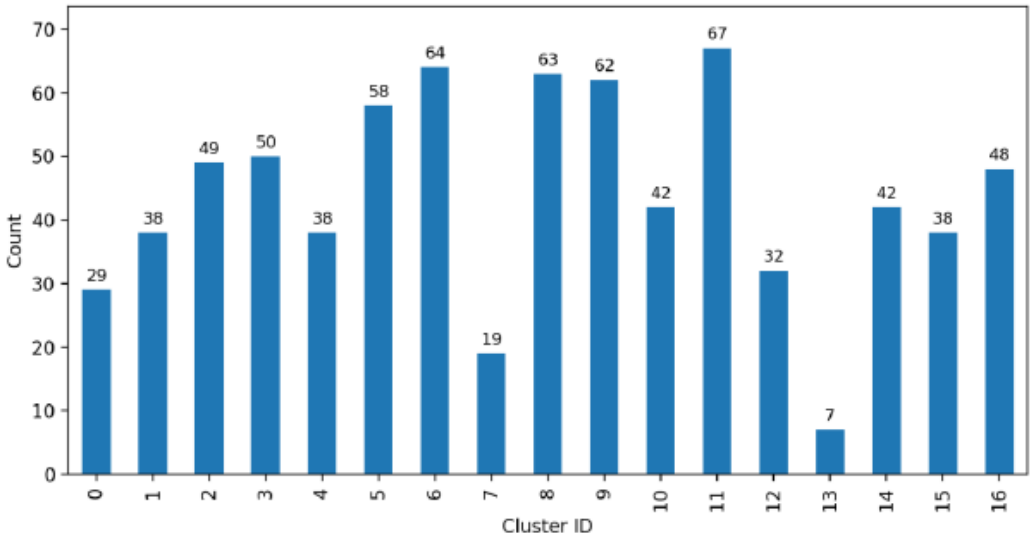

Figure 5: Cluster sizes by k-means (k = 17) on E5 embeddings, “Yes” subset (N = 747).

Table 1: Cluster Overview

Cluster	Label	Sample Text	Label of Chie Kato (2013)
0	Boundary Violation	People who repeatedly send me short messages like, "Did you watch the drama yesterday? I'm going to do some morning activities now! Do you want to go to a cafe today?" and other follow-up messages on LINE before I've even re-plied are annoying.	Receiver: Approach from a stranger/advertising/solicitation from a business
1	Online Harassment	It's tough when the opinions I post get critical comments or very few comments. When I look at the comments section of "influencers" I follow on social media, I see some pretty nasty things being written, and it's tough for me to look at.	Receiver: Defamatory Messages Receiver/Sender: Argument
2	Unwanted and Low-quality Exposure	You end up seeing unnecessary stressful information. You end up seeing only negative information.	Receiver: Excessive messages/Pessimistic messages/Flaunting messages/Advertising and solicitations from businesses
3	Technostress in SNS Use	Notifications are annoying. Everyone says too much because they can't see! There is an atmosphere that you have to reply immediately.	Receiver: Excessive messages Sender: Consideration of the content of messages
4	Paternalistic and Controlling Messages	"I don't mind if you reply slowly, but I wish you would understand that I'm worried about you." "You're free to think that, and I don't deny it, but...I'm not the same." Annoying.	Receiver: Excessive messages Sender: Consideration of the content of messages
5	Social Comparison	Among social media platforms, Insta-gram in particular, when I was busy with work or not having a fulfilling personal life, I would	Receiver: Ostentatious messages Receiver/Sender:

		feel sad when I saw other people's shiny posts.	Correspondence with friends and acquaintances
6	Problematic Use and Time Displacement	I keep putting off things that I need to do, and before I know it, time has passed.	General: Time wasting
7	Appearance and Lifestyle Shaming	"Don't you think your dark circles are weird? It might have been because it was dark during dinner today, but I was surprised at how dark they were. It's something I've been self-conscious about and I've always worried about it, and I'm sure he knew I was worried about it, but he said it with a mocking laugh, and it made me really sad."	Receiver: Defamatory messages
8	Relational Maintenance Pressure	"I'm saying this because I'm worried about you, and I'd be happy if you could just understand a little. I know you want me to be more careful and understand you." But somehow, I feel like a bad person and it makes me feel uneasy.	Receiver/Sender: Communication with friends and acquaintances/link requests
9	Cyber Aggression and Ostracism	I was relentlessly harassed by strangers while using X. I was insulted after un-following them.	Receiver: Defamatory messages Receiver/Sender: Arguments
10	Sleep Loss and Quality De-cline	I go to bed later. I sleep less. My sleep quality has worsened.	(N/A)
11	Alt-Account Exposure and Conformity Pressure	I happened to come across a friend's secret account and saw that they were posting bad things about me and the people around them, and I was disappointed to realize that this is what they really thought. As I became friends with all kinds of strangers online, I gradually felt like I had to join in on their conversations, and I felt like I was being pigeon-	Receiver: Ostentatious messages

		holed, so I started to prioritize the internet over reality.	
12	Operational Burden and Digital Literacy	When I waste time. When I can't keep up with new features.	(N/A)
13	Read-Receipt Pressure and Silence	It never caused any problems, but my mother-in-law did get worried and panicked when I forgot to reply. Also, there is a group for my parents-in-law, my husband, and me. I meant to send a LINE message to my husband, but it ended up posting to the group, revealing my vulgar language. I immediately canceled the message and apologized, but there was no response. It left me feeling conflicted.	(N/A)
14	Ambiguity in CMC (computer-mediated communication)	I couldn't express myself the way I wanted to, and I found it a little difficult to communicate.	Sender/Receiver: Misunderstanding with friends/acquaintances
15	Power Dynamics in Semi-work Exchanges	"The advice you gave me the other day didn't really resonate with me so I didn't really use it haha. In the end I managed to come up with something I thought up myself haha. Thank you," he said, which made me feel a little annoyed that I'd put so much effort into thinking up some-thing and yet it just didn't work.	(N/A)
16	Notification Overload and Scam Risk	I receive LINE messages and emails too frequently. Even if I want to block them, I can't because they'll know I've blocked them. It's fine to buy things online, but I almost fell victim to a scam.	Sender: Personal Information Leak Receiver: Advertising/Solicitation from a Business

5 Discussion

5.1 Internet fatigue as an Adaptive Signal

We found that 747 of 871 (85.8%) young people described experiences consistent with internet fatigue among the valid responses (Figure 1). Prior studies have tended to conceptualize internet fatigue primarily as a problem to be eliminated (Kato, 2013). By contrast, we interpret internet fatigue as a self-protective signal in information-dense environments—an internal signal prompting users to mute, block, or withdraw from excessive, inappropriate, or trivial inputs. We argue that it functions adaptively by supporting boundary-setting, rather than treating fatigue as uniformly negative.

5.2 k-means Clusters (k = 17) on E5 embeddings

The two PCA dimensions help contextualize the clustering results. The horizontal axis (PCA1) can be understood as a continuum from interpersonal strains (micro) to broader information-environmental burdens (macro). “Read-Receipt Pressure and Silence” and “Relational Maintenance Pressure” represent micro-level fatigue, while “Sleep Loss and Quality Decline” and “Operational Burden and Digital Literacy” represent macro-level fatigue.

The vertical axis (PCA2) represents openness of interaction (private vs. public). “Social Comparison” and “Alt-Account Exposure and Conformity Pressure” reflect fatigue in private exchanges, whereas “Power Dynamics in Semi-work Exchanges” reflects fatigue in more public contexts. “Social Comparison fatigue” is not necessarily triggered by problematic communication. For instance, when peers of equal or lower perceived status post attractive content, users may feel unexpectedly fatigued because it challenges perceived hierarchies. By contrast, content from higher-status individuals or strangers may not elicit the same fatigue. Taken together, these two axes provide a novel typology of Internet fatigue, extending beyond Kato’s (2013) framework.

5.3 Interpreting “No-Fatigue” Responses

Brief responses such as "none," "nothing," "I don't know," or leaving the box blank were classified as "no fatigue." It's important to note that a high rate of "no fatigue" responses doesn't necessarily guarantee that these participants aren't encountering risks online. Furthermore, long-term familiarity with highly visible platforms can dull risk perception through habituation and desensitization, making potentially problematic situations seem "normal" and even the apparent absence of fatigue itself a warning sign.

From this perspective, the apparent absence of fatigue may reflect habituation or a dulled risk perception rather than true safety. The possibility of "habituation numbness" may also need to be considered. While this interpretation is tentative because we did not directly measure risk perception or desensitization, it suggests that educators should pay attention not only to those who report strong fatigue but also to those who report no fatigue at all.

5.4 Fatigue from Uncontrollable Information

A common pattern across the Internet fatigue clusters is the constant, unintentional influx of information (from acquaintances, recommendation systems, notifications, etc.). Because this influx

is only partially self-regulating, simply "posting less" cannot address this issue. Promising solutions include environmental friction, such as stricter follower selection and active suppression of notifications and recommendations. Platforms that emphasize these design features may be perceived as more sustainable and less exhausting, but few platforms currently adopt this approach.

5.5 Fatigue from Amplifying Visibility

Platforms such as social media and instant messaging permanently make fleeting thoughts and emotions visible. While visibility amplifies jealousy, comparison, slander, and unintended dissemination, it may also encourage self-reflection and improvement. Analysis of the cluster cases highlights the "visibility amplifier" as a central mechanism behind Internet fatigue. Therefore, fatigue should not be viewed as a reaction to be completely suppressed, but rather as an adaptive signal that supports self-regulation (e.g., distancing, pausing, adjusting settings).

5.6 Implications for Digital Literacy Education

Our findings suggest specific directions for internet literacy and digital well-being education. First, rather than viewing fatigue as something to be simply eliminated, educators can help adolescents recognize early signs of internet fatigue (e.g., irritation from frequent notifications, difficulty disengaging from endless scrolling) as legitimate signals indicating the need for boundaries.

Second, curricula can explicitly teach "fatigue coping strategies," such as muting or hiding specific chats, curating followers, limiting push notifications, and scheduling device-free time before bed.

Third, given the salience of visibility-related strain, it may be beneficial to discuss how platform designs (e.g., read receipts) can amplify both positive and negative experiences and encourage adolescents to experiment with settings that make their environments less straining. Such an approach could shift the focus of internet literacy from simply moral warnings about “excessive use” to sustainable and self-protective practices in everyday digital life.

6 Conclusion

Currently, schools tend to treat internet fatigue as a negative reaction that should be eliminated. However, this study demonstrates that fatigue may function as an adaptive signal against excessive visibility, notification, comparison, and relational strain, encouraging self-regulatory behaviors such as boundary setting and temporary withdrawal. Furthermore, we confirmed that fatigue can occur even without aggressive messages, such as slander, simply by viewing friends’ and acquaintances’ “Visualizations of Fulfillment.” We also confirmed that there exists a certain group of students who report “No Fatigue.” The latter is not necessarily an indicator of safety, but may reflect a decrease in risk perception due to desensitization. Accordingly, rather than ‘suppressing fatigue,’ internet-literacy education should emphasize early recognition of fatigue and teach concrete self-regulatory repertoires (e.g., notification throttling, follower curation, scheduled breaks).

7 Limitations

This study has limitations. Participants are not necessarily representative of all young people in Japan, and free-text descriptions limit the depth of context. Future research should incorporate population-based sampling, mixed methods, and replication studies with independent samples. Furthermore, platform-level experiments manipulating recommendation and notification friction could help clarify whether reduced visibility and traffic causally alleviate internet fatigue. While the raw text cannot be made public, anonymized case studies and analysis codes are available upon reasonable request, as responses contain sensitive experiences.

Future studies should involve two or more independent human coders and systematically check how consistently they apply the labels (inter-coder reliability), in order to further strengthen the trustworthiness of the qualitative interpretations, because cluster labels were assigned by a single author.

Acknowledgments

I would like to express my sincere gratitude to Professor Koichi Tanigaki for his guidance in writing this paper.

References

[1] L. Wang et al., "Text Embeddings by Weakly-Supervised Contrastive Pre-training," arXiv:2212.03533, 22 Feb. 2022; https://arxiv.org/abs/2212.03533.

[2] L. Wang et al., "intfloat/multilingual-e5-base," Hugging Face model card, 19 May. 2023; https://huggingface.co/intfloat/multilingual-e5-base.

[3] L. Wang et al., "Multilingual E5 Text Embeddings: A Technical Report," arXiv:2402.05672, 8 Feb. 2024; https://arxiv.org/abs/2402.05672.

[4] J. Kawakita, The KJ Method: Development and Applications. Tokyo: Chuo Koron-shinsha, 1970.

[5] Y. Kinoshita, Grounded Theory Approach: Qualitative Empirical Research. Tokyo: Koubundo, 1999.

[6] Ministry of Internal Affairs and Communications (MIC), Institute for Information and Communications Policy (IICP), "Time Spent on Information and Communications Media and Information Behavior: Fiscal Year 2022 Survey Report" (in Japanese), 23 Jun. 2023; https://www.soumu.go.jp.

[7] K. Hosotsuji, "Human relations in the age of information overload," Social Science, vol. 47, 1991, pp. 337–350.

[8] G. Simmel, "The Metropolis and Mental Life," in *The Sociology of Georg Simmel*, K. H. Wolff, Ed. New York, NY, USA: Free Press, 1950, pp. 409–424.

[9] T. Mori and H. Natori, "Developing active/passive SNS-fatigue scales for university students," Journal of Japanese Clinical Psychology, vol. 36, no. 4, 2018, pp. 409–418.

[10] Y. Inazuka and C. Maekawa, "The Relationship Between the Proactive and Passive SNS Fatigue and the Features of Apathy: Focusing on SNS Usage Time," Kyoto Women's University Academic Information Repository Bulletin Paper, vol. 19, 2023, pp. 273–284.

[11] L. F. Bright, S. B. Kleiser, and S. L. Grau, "Too much Facebook? An exploratory examination of social media fatigue," Computers in Human Behavior, vol. 44, 2015, pp. 148–155.

[12] A. Dhir, Y. Yossatorn, P. Kaur, and S. Chen, "Online social media fatigue and psychological wellbeing," International Journal of Information Management, vol. 40, 2018, pp. 141–152.

[13] O. K. D. Lee, S. Lee, W. Suh, and Y. Chang, "Alleviating the Impact of SNS Fatigue on User Discontinuance," Industrial Management & Data Systems, vol. 122, no. 1, 2022, pp. 292–321.

[14] C. Kato, "The reality of negative experiences leading to social media fatigue: Based on interviews with 15 high school students," Journal of Socio-Informatics, vol. 2, no. 1, 2013, pp. 31–43.

[15] Lazarus, R. S., & Folkman, S., Stress, appraisal, and coping, New York: Springer Publishing Company, 1984.

[16] Burr, C., Taddeo, M., & Floridi, L., "The ethics of digital well-being: A thematic review," Science and Engineering Ethics, vol. 26, no. 4, 2020, pp. 2313–2343.

[17] R. L. Thorndike, "Who Belongs in the Family?," Psychometrika, 18(4), 1953, pp. 267–276.

[18] P. J. Rousseeuw, "Silhouettes: A Graphical Aid to the Interpretation and Validation of Cluster Analysis," Journal of Computational and Applied Mathematics, 20, 1987, pp. 53–65.

[19] S. P. Lloyd, "Least squares quantization in PCM," IEEE Trans. Inf. Theory, vol. 28, no. 2, 1982, pp. 129–137.