

## The Influence of Gender and Academic Level on Brain Rot in Adolescents

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### ABSTRACT

This study aimed to explore the main and interaction effects of gender (boys and girls) and academic level (school and junior college) on brain rot among adolescents. A total of 172 students aged 13 to 18 years from various schools and junior colleges in Kolhapur city were selected through simple random sampling. The sample was evenly distributed across a 2×2 factorial design (gender × academic level), with 43 participants in each group. Brain rot was assessed using a self-developed Brain Rot Scale, which measured cognitive, emotional, and behavioural deterioration associated with maladaptive digital media use. The tool demonstrated acceptable reliability (Cronbach's  $\alpha > .70$ ). A two-way ANOVA was used to analyse the data. The findings revealed a significant main effect of gender, with boys reporting higher brain rot scores than girls. No significant main effect of academic level was observed. However, a significant interaction effect between gender and academic level was found. Specifically, school boys exhibited the highest brain rot scores, while school girls showed the lowest, indicating that the influence of gender on brain rot is moderated by academic level. The results underscore the need for gender and age sensitive interventions to address brain rot in adolescent populations. School boys may benefit from targeted strategies that promote healthier digital habits and cognitive engagement.

**Keywords:** *Brain Rot, Gender Differences, Academic Level, Adolescents, Digital Behavior, Factorial Design*

Language does not merely describe our reality; it actively reflects the evolving fabric of human experience. Every year, major dictionaries select "Words of the Year," spotlighting linguistic expressions that capture the cultural zeitgeist and social transitions of the time. In 2024, the selections unveiled by various dictionaries included terms like brain rot, demure, manifest, polarisation, and brat. Each a linguistic reflection of our societal anxieties, values, aspirations, and the accelerating influence of technology.

Among these, the Oxford University Press announced "brain rot" as its 2024 Word of the Year, following a two-week public vote involving over 37,000 participants (Oxford University Press, 2024). Other words on the Oxford shortlist included demure, dynamic pricing, lore, romantasy, and slop, each representing diverse facets of popular discourse. Yet

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it was brain rot—a term emerging from online culture and youth slang that resonated most deeply, symbolizing a shared unease about the psychological costs of the digital age.

### *Defining "Brain Rot": A Cultural Diagnosis*

Though informal and colloquial, brain rot has come to denote the cognitive, emotional, and behavioural decline believed to result from overexposure to unengaging, repetitive, or maladaptive content; particularly through digital media. The phrase has gained traction on platforms like TikTok, where young users often refer to the numbing effects of binge-watching short videos or endlessly scrolling social media feeds.

While not a clinical term, brain rot captures a constellation of concerns increasingly backed by psychological research. These include deteriorating attention spans, emotional dysregulation, diminished physical activity, and weakened interpersonal skills; all of which are seen as side effects of prolonged digital media consumption (Twenge & Campbell, 2018; Przybylski & Weinstein, 2019).

### *The Adolescent Brain in the Digital Era*

The relevance of this term is particularly striking in the context of adolescent development. Adolescence is a period of profound neurological and psychological change, characterized by heightened neuroplasticity and increased sensitivity to environmental input (Blakemore & Mills, 2014). During this stage, the brain is especially malleable, rendering young individuals both adaptable and vulnerable to external stimuli, including digital media.

The rise in screen time, especially among adolescents, has been associated with:

- Reduced cognitive stimulation
- Poor sleep hygiene
- Heightened anxiety and depression
- Lower academic performance (Rideout, 2015; American Academy of Pediatrics, 2016)

These outcomes align closely with what brain rot implies a slow erosion of mental and emotional acuity driven by passive, excessive digital engagement.

### *Features and Consequences of Brain Rot*

Psychologically, the phenomenon encapsulated by brain rot can be broken down into several interrelated domains:

#### 1. Cognitive Effects:

- Reduced attention span, continuous exposure to short-form, rapidly shifting content can impair sustained attention.
- Memory issues, limited cognitive engagement hampers the brain's ability to encode and retrieve information effectively.
- Slower information processing, Over-reliance on visual stimuli and reduced problem-solving practice can affect cognitive speed and agility.

#### 2. Emotional Impact

- Increased irritability and anxiety: Overstimulation and sleep deprivation contribute to heightened emotional reactivity.
- Emotional numbness: Repetitive, emotionally flat content may desensitize individuals over time.

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### 3. Social Consequences

- Reduced face-to-face interaction: Online communication often replaces richer, in-person exchanges.
- Underdeveloped interpersonal skills: Limited real-world social practice can hinder empathy, listening, and conflict resolution abilities.

### 4. Physical Health Correlates

- Sleep disturbances: Blue light exposure and constant digital stimulation interfere with circadian rhythms.
- Decreased physical activity: Sedentary behavior contributes to obesity and other long-term health issues.

These challenges are particularly concerning when they affect adolescents, as the patterns developed during this sensitive period can persist into adulthood, shaping lifelong habits, relationships, and mental well-being.

### *A Sociocultural Call to Action*

By selecting brain rot as the Word of the Year, Oxford University Press has unintentionally issued a cultural diagnosis and a call to reflection. The popularity of the term indicates that many; especially younger generations, are becoming increasingly aware of the psychological toll of unchecked digital immersion. As researchers, educators, and parents grapple with the realities of growing up in an online world, brain rot encapsulates the pressing need for balanced digital habits, enriched cognitive environments, and deliberate mental engagement. The term may be slang, but the issues it surfaces are real, serious, and increasingly urgent.

## REVIEW OF RELATED LITERATURE

### **A. Understanding “Brain Rot” and Cognitive Fatigue**

"Brain rot," although a colloquial term, aligns closely with the psychological concept of cognitive fatigue; a state characterized by reduced attention, memory, and executive functioning following prolonged mental activity (Boksem & Tops, 2008). Cognitive fatigue has been shown to impair information processing, decrease motivation, and increase error rates, particularly among adolescents exposed to extended academic stress (Tanaka et al., 2014). Fatigue-related declines in executive functioning are particularly detrimental during the adolescent years, a period of ongoing neurological development, especially in the prefrontal cortex (Luna et al., 2010).

### **B. Gender Differences in Mental Fatigue and Cognitive Performance**

Gender has been widely studied as a variable in cognitive performance and fatigue susceptibility. Some research suggests that male students may experience more noticeable cognitive fatigue due to less consistent study habits and higher impulsivity (Gur et al., 2012). On the other hand, females often outperform males in tasks involving sustained attention and verbal memory (Lejuez et al., 2003). A study by Majer et al. (2008) also showed that females report higher subjective fatigue yet maintain performance better than males, suggesting that while both genders experience fatigue, the manifestation and coping mechanisms may differ.

### **C. Academic Level and Exposure to Cognitive Load**

Academic demands increase significantly from middle school (grades 8–10) to junior college (grades 11–12), often leading to greater cognitive load and mental fatigue among older students (Putwain, 2007). Studies have shown that cognitive fatigue correlates with academic level, especially during transitional phases like moving from high school to

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college (Bursztyrn & Jensen, 2015). Junior college students often face additional stressors such as competitive exams, career pressures, and identity formation, which further exacerbate cognitive strain (Eccles et al., 1993).

### ***Rationale of the Study***

The phenomenon often colloquially referred to as "brain rot" reflects a growing concern among educators, parents, and psychologists about the cognitive, emotional, and social effects of excessive media consumption and mental under-stimulation, especially among adolescents. This term, though informal, broadly encompasses the deterioration in attention span, motivation, critical thinking, and emotional regulation; traits vital for academic success and healthy social development (Twenge & Campbell, 2018).

In recent years, adolescents have become increasingly exposed to digital devices and online platforms, leading to reduced physical activity, irregular sleep patterns, and decreased real-life social engagement (Domoff et al., 2019). These factors contribute to what researchers describe as cognitive overload or, conversely, cognitive stagnation, both of which impair executive functioning and learning outcomes (Kuss & Griffiths, 2017).

Students in grades 8 to 10 and junior college (11th and 12th) are at a crucial stage of development. According to Piaget's theory of cognitive development, this age group is transitioning into the formal operational stage, where abstract thinking and reasoning are maturing (Piaget, 1972). However, excessive digital media exposure may delay or impair these abilities by replacing meaningful mental engagement with passive consumption (Sigman, 2014). Moreover, academic expectations increase significantly during this period, often leading to stress and reliance on maladaptive coping mechanisms, including escapism via digital platforms (Abi-Jaoude et al., 2020).

Gender differences in both media usage and academic coping styles are well-documented. Studies have shown that female students often report higher levels of academic stress, whereas male students tend to exhibit higher levels of digital gaming and media use, which can differentially impact their academic performance and mental health (Rideout & Robb, 2019; Lien et al., 2015).

Given these concerns, there is a pressing need to systematically investigate how the so-called "brain rot" manifests in adolescents and how it influences academic performance and gender-specific developmental trajectories. Understanding these associations will aid in designing targeted interventions for healthier media habits, academic engagement, and mental well-being.

### ***Aim of the Study:***

To study the main and interaction effects of gender (male and female) and academic level (school and junior college) on brain rot using.

### ***Objectives of the Study:***

1. To investigate the main effect of gender (Girls vs. Boys) on brain rot.
2. To examine the main effect of academic level (school vs. junior college) on brain rot.
3. To assess the interaction effect between gender and academic level on brain rot.

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### *Hypotheses of the Study:*

1. There will be a significant difference in brain rot scores between Girls and Boys students.
2. There will be a significant difference in brain rot scores between school and junior college students.
3. There will be a significant interaction effect between gender and academic level on brain rot scores.

## **METHODOLOGY**

### *Sample and Recruitment*

A total of 289 students were considered for the study, comprising 106 high school students (Grades 8–10) and 183 junior college students (Grades 11–12) from various schools and junior colleges in Kolhapur city.

From this pool, 172 participants were selected using the lottery method of simple random sampling, with 43 participants in each of the four cells formed by the 2×2 factorial design (Gender × Academic Level). The selected participants' ages ranged from 13 to 18 years.

### **A. Inclusion Criteria:**

- Students aged 13 to 18 years.
- Enrolled in Grades 8 to 12 (High School or Junior College) in Kolhapur city.
- Provided informed consent (and parental consent for minors).
- Willing to participate and complete the full questionnaire.

### **B. Exclusion Criteria:**

- Students with diagnosed neurological, psychiatric, or learning disorders.
- Those who failed to complete the full questionnaire or provided inconsistent responses.
- Participants currently under medication that affects cognition or behavior.

### *Variables*

#### **A. Independent Variables:**

1. Gender (Girls and Boys)
2. Academic Level (Grades 8–10 and Junior College)

#### **B. Dependent Variable:** Brain Rot Score

### *Operational Definition*

1. **Gender:** The participant's self-identified gender, recorded during demographic data collection, limited to binary options (Girls and Boys) for the purposes of this study.
2. **Academic Level:** The participant's current educational level, categorized as, High School Students studying in Grades 8 to 10 and Junior College Students studying in Grades 11 or 12.
3. **Brain Rot Score:** A composite measure derived from self-reported questionnaire scores assessing screen time (hours/day), frequency of gaming or social media use, physical activity levels, and sleep patterns. High Brain Rot- Scores in the top quartile of the Brain Rot Scale. Low Brain Rot- Scores in the bottom quartile.

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### Psychological Tool: Brain Rot Scale

This is a self-reported questionnaire developed by the researcher to assess the impact of "brain rot" across cognitive, emotional, and behavioural domains. The scale uses a 5-point Likert response format ranging from 1 (Strongly Disagree) to 5 (Strongly Agree), where higher scores reflect greater levels of "brain rot." The reliability of the scale was established through a pilot study conducted on a sample of 30 students, yielding a Cronbach's alpha value greater than 0.70, indicating acceptable internal consistency. Content validity was ensured through expert review.

### Research Design

The study adopts a 2×2 factorial design with two independent variables, Gender divided in Girls and Boys also Academic Level divided into High School (Grades 8–10) and Junior College. This design allows for the examination of both main effects and interaction effects between gender and academic level on the dependent variable (i.e., brain rot scores).

### Statistical Analysis

Descriptive statistics, including means and standard deviations, were calculated to summarize the data. To assess the main and interaction effects of gender and academic level on brain rot scores, a two-way Analysis of Variance (ANOVA) was performed.

### Data Analysis and Interpretations:

*Table No. 1 shows the descriptive statistics for brain rot among school students*

Academic Level	Gender	Mean	Std. Deviation	Sample
School	Girls	51.70	8.49	43
	Boys	68.56	14.91	43
	Total	60.13	14.74	86
Jr College	Girls	60.32	15.64	43
	Boys	67.21	12.66	43
	Total	63.77	14.56	86
Total	Girls	59.45	13.25	86
	Boys	64.44	15.75	86
	Total	61.95	14.72	172

The descriptive statistics in Table No. 1 provide an overview of brain rot levels among students across different academic levels and genders. Among school students, the average brain rot score for girls was 51.70 with a standard deviation of 8.49, whereas boys recorded a significantly higher Mean score of 68.56 with a standard deviation of 14.91. This indicates that school boys exhibited markedly higher levels of brain rot compared to their female counterparts.

For junior college students, the Mean score for girls was 60.32 (SD = 15.64), and for boys, it was 67.21 (SD = 12.66). Although boys still exhibited higher levels of brain rot than girls, the gender gap in this group was not as wide as it was among school students.

When looking at the data across all academic levels, girls had a lower overall mean brain rot score of 59.45 compared to 64.44 for boys. Junior college students had a slightly higher overall mean brain rot score (63.77) than school students (60.13), although the difference between the two groups was not substantial. These findings suggest that both gender and

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academic level influence brain rot, with boys consistently showing higher levels across educational stages.

To confirm the significance of these differences, we conducted a two-way ANOVA to assess the main effects of gender and academic level, as well as their interaction effect on "brain rot" scores, as shown in Table No. 2.

*Table No. 2 shows the Two-way analysis of variance for brain rot*

Sources of variance	Sum of Squares	df	Mean Square	F	Sig.
Academic Level	569.587	1	569.587	3.257	0.073
Gender	1070.006	1	1070.006	6.119	0.014
AL * Gender	6060.703	1	6060.703	34.661	0.000
Error	29376.233	168	174.859		
Total	37076.529	171			

a. R Squared = .208 (Adjusted R Squared = .194)

The table No. 2 presents the results of a Two-Way Analysis of Variance (ANOVA) to evaluate the effects of academic level (AL), gender, and their interaction on "brain rot" scores.

The main effect of academic level was not statistically significant ( $F = 3.257$ ,  $p = 0.073$ ). This suggests that the academic level alone (school vs. junior college) does not significantly affect brain rot. While junior college students had slightly higher brain rot scores than school students, the difference did not reach statistical significance and could be due to chance.

The main effect of gender was found to be statistically significant ( $F = 6.119$ ,  $p = 0.014$ ). This indicates that gender has a significant influence on brain rot, with male students experiencing higher levels of cognitive fatigue or brain rot than female students, regardless of academic level.

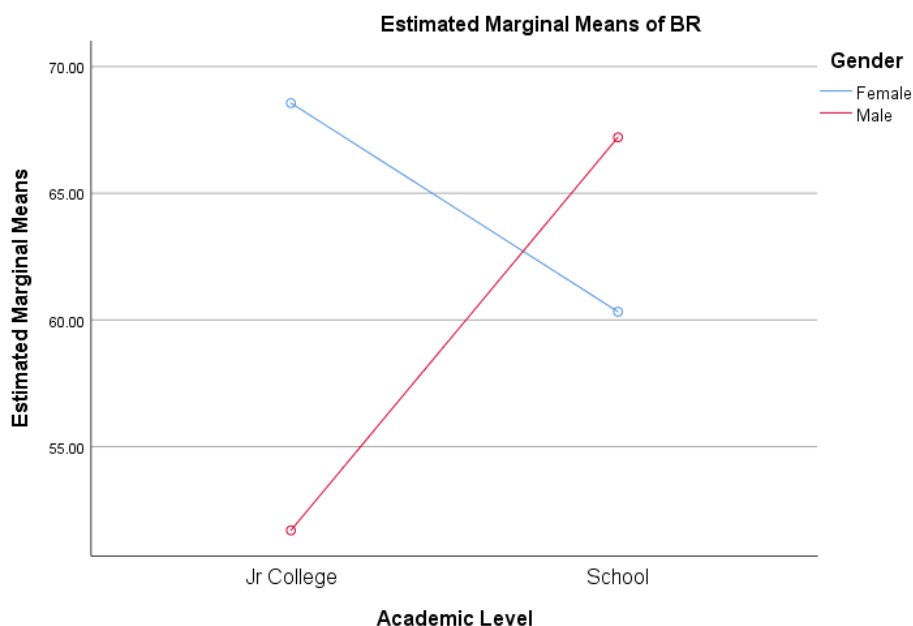
The interaction between academic level and gender was highly significant ( $F = 34.661$ ,  $p = 0.000$ ). This indicates that the effect of gender on brain rot differs depending on the academic level. In other words, the relationship between gender and brain rot is not consistent across school and junior college levels. This interaction effect highlights the importance of considering how different variables interact rather than examining them in isolation.

The model's  $R^2$  value of 0.208 indicates that approximately 20.8% of the total variance in brain rot scores can be explained by the combination of gender, academic level, and their interaction. The adjusted  $R^2$  value of 0.194 confirms that this is a moderate effect size, suggesting that the model has meaningful explanatory power.

The interaction effect between gender and academic level is visually represented in Figure No. 1. The graph clearly shows a crossover interaction, where the lines representing males and females intersect. Among junior college students, girls exhibited lower levels of brain rot than boys, which aligns with the trend seen in school students. However, among school students, the gender difference is more pronounced, with boys showing much higher brain rot scores and girls showing the lowest scores overall. This crossover pattern illustrates how

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the impact of gender on brain rot reverses across academic levels, providing a strong visual representation of the significant interaction found in the ANOVA.



**Figure No. 1 Shows the interactional effect of gender and academic level on brain rot**

### CONCLUSIONS

1. Boy students showed higher levels of brain rot compared to Girl students.
2. Academic level alone did not significantly affect brain rot.
3. A significant interaction was found between gender and academic level.
4. School boys had the highest brain rot, while school girls had the lowest.
5. The effect of gender on brain rot varies depending on the academic level.

### Practical Implications

The growing recognition of brain rot as a socio-psychological concern carries important practical implications, particularly for educational institutions, mental health professionals, and policymakers. One of the key observations is that boys exhibit higher levels of brain rot compared to girls, with school-going boys being the most affected subgroup. This highlights a pressing need for gender-sensitive interventions aimed at managing screen time, promoting healthy digital habits, and encouraging more cognitively enriching activities, particularly among male students at the school level.

Although the academic level alone did not show a significant impact on brain rot, the interaction between gender and academic level emerged as a crucial factor. This suggests that the influence of gender on brain rot is not uniform across all educational stages. School girls were found to have the lowest levels of brain rot, indicating potentially more balanced or mindful digital usage habits at that level among female students. In contrast, the highest levels of brain rot among school boys point to a particularly vulnerable group that requires targeted mental health support, awareness campaigns, and structured academic engagement.

Educational institutions should consider customized awareness programs and digital literacy campaigns that are responsive to both gender and academic stage. For instance, school-level interventions for boys might focus more on self-regulation strategies, outdoor activities, and responsible media consumption. At the same time, any digital wellness initiative must

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recognize that the relationship between gender and brain rot shifts depending on the academic level, thus requiring a dynamic and developmentally appropriate approach rather than a one-size-fits-all solution. In a nutshell, these findings stress the importance of context-specific and intersectional strategies in addressing brain rot among students. Tailoring interventions based on gender and academic level can foster healthier cognitive and emotional development, especially in an era where digital influences are becoming increasingly pervasive.

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### ***Conflict of Interest***

The author(s) declared no conflict of interest.

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