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BRIEF REPORT

Cognitive Differentiation in Adolescents with Different Levels of Video Game Activity: A Comparative Analysis

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Abstract: *Relevance*. Video games have become a pervasive part of adolescent life, yet their impact on the structural organisation of cognitive abilities, particularly cognitive differentiation, remains largely unexplored. Previous research has focused on attention and visuospatial skills, yielding contradictory results; the role of gaming frequency and genre preferences in shaping the refinement of cognitive schemas has not been systematically investigated. *Objective*. This pilot study examined differences in cognitive differentiation among adolescents with varying levels of video game activity and genre preferences. *Methods*. The sample comprised 44 adolescents (25 girls and 19 boys); M age = 15.11 ± 0.82 years). Participants completed a digital activity questionnaire and the Rapid Object Classification technique (Chuprikova & Ratanova, 1997), measuring sensory, perceptual, identity, semantic, and personal differentiation under simple and complex conditions. *Results*. High gaming frequency was associated with significantly lower accuracy in sensory (more errors: p = .023, H = 7.505) and perceptual differentiation (p = .001, H = 14.363). Low-frequency gamers showed a trend toward poorer semantic and personal categorisation. Genre-specific effects emerged: simulation fans were slower on complex identity/difference (p = .005) and semantic tasks (p = .016); action fans made more sensory errors (p = .049) but were more accurate on identity tasks (p = .049); role-playing and real-time strategy players excelled in personal differentiation (fewer errors, p = .032 and faster speed, p = .037); quest/adventure fans were slower on simple differentiations (p = .006–.011). *Conclusions*. Video game activity and genre preferences are linked to distinct patterns of cognitive differentiation. The findings underscore the need for multidimensional approaches and larger longitudinal studies to clarify causal mechanisms.
Keywords: Video Games, Cognitive Differentiation, Adolescents, Cognitive Development, Game Genres

1. Introduction

The impact of digitalization on human development has become a central concern in contemporary psychological research. The rapid proliferation of electronic devices has fundamentally altered the environments in which mental functions develop and are expressed, transforming both everyday cognitive demands and the requirements for social progress (Bediou et al., 2018; Hilgard et al., 2019). Despite extensive investigation, the relationship between digital activity and cognitive abilities remains contested, with meta-analyses frequently yielding contradictory findings (Bediou et al., 2018; Hilgard et al., 2019). Researchers have suggested that these inconsistencies may stem from differing initial theoretical positions (Hilgard et al., 2019; Smith &

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Basak, 2023; Soldatova & Teslavskaia, 2017).

The debate is particularly pronounced in the domain of video games, where polarized positions characterize the literature. Some scholars emphasize the detrimental effects of video games on cognitive functioning, while others highlight their potential for cognitive enhancement (Fabio et al., 2021). This polarization underscores the need for expanded investigation into the cognitive consequences of video game engagement, especially during adolescence, a period of heightened vulnerability and developmental plasticity.

Adolescents represent a significant portion of the gaming population. According to 2022 data from the Entertainment Software Association (ESA), approximately 65% of American children and adolescents play video games, with this proportion continuing to grow (ESA, 2022). Given that video game activity constitutes a substantial component of the developmental environment for intellectual abilities, rigorous evaluation of its cognitive impact is imperative.

Existing research on video games has predominantly focused on attention, visuospatial abilities, and executive functions (Azizi et al., 2018; Vedechkina & Borgonovi, 2021). However, no studies to date have systematically examined the relationship between video game engagement and cognitive differentiation, the process by which cognitive structures become increasingly refined and organized. Cognitive differentiation serves as a fundamental measure of intellectual development, reflecting both the current organization of cognitive structures and their potential for further elaboration (Chuprikova, 1997). Higher levels of cognitive differentiation are associated with superior cognitive development, enhanced cognitive abilities, and greater intellectual capacity, as indexed by the speed of differentiation reactions, an indicator of the brain's discriminative capacity (Ratanova, 2011).

We hypothesized that adolescents' cognitive differentiation would vary as a function of both video game frequency and genre preferences. Specifically, we anticipated that the degree of immersion and the distinctive features of gameplay and content would differentially influence mental experience and the formation of cognitive structures.

The present pilot study aimed to: (a) identify differences in cognitive differentiation among adolescents with low, medium, and high levels of video game activity; (b) examine cognitive differentiation patterns among adolescents who prefer specific game genres (action games, simulations, real-time strategies, quests and adventures, role-playing games); and (c) determine study limitations and refine the survey protocol for future research.

2. Method

2.1. Participants

The study involved students from three secondary schools in Kazan and students from Moscow schools, assessed at the Research Institute of Pediatrics and Children's Health, National Medical Research Center of Surgery named after Academician B.V. Petrovsky. The final sample comprised 44 participants (25 girls and 19 boys), with a mean age of 15.11 years (SD = 0.82). Absence of psychiatric pathology (including Internet addiction) was confirmed by a psychiatrist and validated using standardized questionnaires (Beck Depression Inventory, adolescent version; Beck Anxiety Inventory; Kimberly-Young Questionnaire). The presence of psychopathology constituted an exclusion criterion.

2.1. Procedure and Instruments

Data collection occurred between May and July 2022. Each participant independently completed a digital activity assessment questionnaire hosted on the Google Forms platform (https://docs.google.com/forms) using a provided tablet or personal smartphone. The questionnaire included items assessing video game experience and preferences.

Prior to questionnaire administration, participants engaged in a brief (approximately 5 minutes) individual interview with a psychologist regarding the structure and duration of digital device use. During questionnaire completion, participants could consult the psychologist with questions. Following questionnaire completion, the psychologist compared information obtained during the preliminary interview with questionnaire responses, posing clarifying questions when discrepancies were identified. There was no time limit for questionnaire completion.

Of the 18 questionnaire items, three assessed video game frequency across three time periods: weekdays, weekends, and holidays. Participants selected one of the following response options: "never," "up to 1 hour," "1-3 hours," "3-5 hours," or "more than 5 hours." Response category definitions were based on previous research (Soldatova & Vishneva, 2019). Based on responses, participants were categorized into three groups: "low" (gaming experience predominantly less than 1 hour per day), "medium" (gaming experience predominantly 1-3 hours per day), and "high" (gaming experience predominantly more than 3 hours per day).

The questionnaire included an open-ended question: "Indicate the names of the computer games you prefer to play (up to 5 games)." Participants who did not have favorite games could indicate "I don't play." Based on responses, preferred game genres were assessed by categorizing specified games according to developer-designated genres on the Steam online platform (https://store.steampowered.com) or official developer websites. A single game could be assigned multiple genre values if specified by the platform. While 11 game genres were identified, only five were selected by sufficient participants for comparative analysis:

Action Games: Gameplay focused on fast and intense player activity, emphasizing physical interaction with the environment, real-time reactions, and goal achievement often involving combat. Examples from participant responses: CS:Go, PUBG, GTA.

Simulation Games: Games simulating aspects of real life or specific processes, providing realistic experiences through control and simulation of scenarios, situations, and systems. Examples: Sims 4, Fortnite, FIFA, Trains Sim World.

Real-Time Strategy (RTS): Games involving real-time management and development of virtual armies, bases, and resources, with continuous action without pauses or turns. Examples: Dota2, Starcraft 2, League of Legends.

Quests and Adventures: Story-driven games where players follow plots and solve puzzles to progress, focusing on world exploration, character interaction, and puzzle-solving. Examples: Legend of Zelda, Detroit: Become Human, Life is Strange.

Role-Playing Games (RPGs): Games where players control characters, developing skills, progressing through narratives, and making decisions affecting gameplay, with emphasis on role dependency and character development. Examples: The Witcher, Dark Souls, World of Warcraft, Cyberpunk.

Following questionnaire completion, cognitive differentiation was assessed using a computerized version of the Rapid Object Classification technique (Chuprikova & Ratanova, 1997) administered via laptop. Participants were required to differentiate objects appearing on screen as quickly and accurately as possible by pressing either the "l" or "p" key. In each series, 32 stimuli were presented, with stimuli changing following participant responses. Execution time and error count were automatically recorded.

Five types of classification tasks of varying complexity were administered, with two samples per type (simple and complex differentiations):

Sensory Differentiation: (a) Lines: horizontal-vertical (simple) and vertical-oblique (complex); (b) Colors: red-green squares (simple) and red-orange (complex).

Perceptual Differentiation: Right triangle with sides vs. rectangle (simple); square vs. rectangle (complex).

Identity/Difference Establishment: (a) Two geometric figures, identical size and color (simple), figures of different colors and sizes (complex); (b) Written letters, identical or different (simple), capital and lowercase letter pairs semantically identical or different (e.g., Aa; BA, BB; ba, aB; AB; complex).

Semantic-Subject Differentiation: Words semantically distant (plants vs. non-plants; simple) and words semantically close (tableware vs. situationally related words; complex).

Semantic-Personal Differentiation: Classification of appearance descriptors vs. character traits/internal psychological characteristics (simple); words denoting moral vs. mental properties (complex).

All tasks were performed 3-4 times. Because participants in later trials frequently performed the task superficially (2-5 seconds with errors exceeding 10), results from the first trial were analyzed. Error count indicated the formation of cognitive structures responsible for differentiation (errors exceeding four), while speed indexed the level of brain discriminative ability.

2.3. Statistical Procedures

Statistical analysis included descriptive statistics (means, standard deviations); ANOVA with Bonferroni correction for multiple comparisons for groups with dependent quantitative variables (Levine's test > .05), otherwise Mann-Whitney U test (2-group comparisons) or Kruskal-Wallis test (3-group comparisons). Chi-square tests compared groups with dependent qualitative variables. Data processing employed IBM SPSS Statistics version 26.

3. Results

The sample demonstrated generally low discriminative ability, with adolescents making numerous errors, particularly on complex differentiations (with the exception of sensory tasks). Only 13.6% of participants successfully completed the complex personal differentiation task (mean errors = 8.46 ± 4.2), and 40.9% completed the complex identity/difference differentiation task (mean errors = 3.6 ± 3.1). These results, combined with low average academic performance (algebra: M = 3.6; geometry: M = 3.7; Russian language: M = 3.8; literature: M = 3.9), suggest a low overall level of intellectual abilities in the sample (Ratanova, 2011). The proportion of students achieving the highest grade was low across core subjects (algebra: 4%; Russian language: 12%). No statistically significant differences in academic performance emerged between adolescents with varying video game experience.

Tables 1–6 present the descriptive statistics and group comparisons. Table 1 shows performance across activity levels; Tables 2–6 present genre-specific effects.

Table 1. Cognitive Differentiation Performance by Video Game Activity Level (M and SD)

Metric	Low Activity (N= 19)	Medium Activity (N= 15)	High Activity (N= 9)
Sensory Simple (t1)	18.0 (2.5)	19.0 (3.6)	18.4 (4.6)
Sensory Simple (n1)	0.5 (1.1)	0.4 (1.3)	2.7 (5.0)
Sensory Complex (t1)	18.0 (2.3)	17.7 (5.5)	15.9 (2.9)

Metric	Low Activity (N= 19)	Medium Activity (N= 15)	High Activity (N= 9)
Sensory Complex (n1)	0.4 (0.6)	0.2 (0.3)	0.8 (1.6)
Perceptual Simple (t1)	16.6 (2.7)	17.4 (4.0)	13.5 (1.8)
Perceptual Simple (n1)	0.6 (1.9)	1.9 (6.2)	1.8 (1.7)
Perceptual Complex (t1)	21.6 (5.2)	21.5 (5.3)	18.9 (4.7)
Perceptual Complex (n1)	2.2 (2.8)	3.3 (7.6)	2.7 (3.2)
Identity Simple (t1)	21.0 (6.0)	23.1 (5.5)	19.6 (7.7)
Identity Simple (n1)	2.5 (3.0)	1.4 (1.0)	2.0 (1.5)
Identity Complex (t1)	24.1 (7.8)	21.0 (5.6)	26.4 (11.7)
Identity Complex (n1)	4.1 (3.2)	2.8 (2.8)	3.8 (3.6)
Semantic Simple (t1)	29.8 (6.2)	33.0 (7.7)	29.4 (2.9)
Semantic Simple (n1)	3.9 (4.7)	3.4 (2.7)	2.9 (3.3)
Semantic Complex (t1)	26.1 (4.8)	27.1 (6.9)	28.5 (7.5)
Semantic Complex (n1)	2.1 (3.7)	2.1 (2.5)	1.9 (3.1)
Personal Simple (t1)	37.8 (10.1)	39.8 (12.4)	33.3 (11.2)
Personal Simple (n1)	5.2 (4.7)	2.5 (2.7)	1.7 (1.7)
Personal Complex (t1)	37.0 (–)	49.0 (14.0)	39.0 (12.7)
Personal Complex (n1)	9.6 (4.4)	7.0 (3.8)	8.2 (4.0)

Note. t1 = mean completion time (seconds); n1 = mean error count.

Adolescents with high video game experience performed sensory differentiations worse, committing more errors (p = .023; H = 7.505) with no speed advantage over less active players. They also made more errors in perceptual classification (p = .001; H = 14.363) but demonstrated better execution time (p = .023; F = 4.173).

Adolescents with low video game experience did not exhibit statistically significant negative differences compared to other groups; however, a trend toward greater difficulty in personal differentiation emerged, with reduced accuracy in categorising simple personal stimulus objects and in complex differentiations (differences not statistically significant).

Males were significantly more likely to report high video game experience (χ^2 = 8.486, df = 2; p = .014), consistent with previous research (Rathakrishnan et al., 2023). Intergender comparisons revealed that males tended to demonstrate better speed on average (p = .084; F = 1.135), though these advantages primarily pertained to simpler information analysis.

Conversely, females performed complex semantic and personal differentiations faster and identified simple perceptual stimulus objects more accurately (p = .001; U = 116).

Table 2. Cognitive Differentiation by Action Game Preference

Metric	Not Prefer	Prefer	F	p
Sensory Simple (t1)	18.1	18.7	1.75	.532
Sensory Simple (n1)	0.1	1.5	9.63	**.049**
Sensory Complex (t1)	17.6	17.4	0.27	.909
Sensory Complex (n1)	0.3	0.5	0.35	.587
Perceptual Simple (t1)	15.9	16.5	2.41	.570
Perceptual Simple (n1)	0.4	1.9	3.69	.209
Perceptual Complex (t1)	21.1	20.8	0.60	.870
Perceptual Complex (n1)	2.1	3.0	1.47	.475
Identity Simple (t1)	20.7	22.0	0.88	.353
Identity Simple (n1)	2.8	1.5	6.81	**.049**
Identity Complex (t1)	26.7	21.4	0.28	.196
Identity Complex (n1)	3.6	3.6	0.01	.993
Semantic Simple (t1)	28.5	32.9	0.44	†.054
Semantic Simple (n1)	3.4	3.6	0.09	.910
Semantic Complex (t1)	25.2	28.1	0.36	.177
Semantic Complex (n1)	1.8	2.2	0.04	.712
Personal Simple (t1)	33.3	39.8	1.18	†.097
Personal Simple (n1)	4.4	3.0	0.78	.298
Personal Complex (t1)	37.0	45.0	–	.604
Personal Complex (n1)	8.7	8.3	0.48	.803

Note. † indicates trend-level significance (p < .10).

Table 3. Cognitive Differentiation by Simulation Game Preference

Metric	Not Prefer	Prefer	F	p
Sensory Simple (t1)	18.2	19.0	0.03	.516
Sensory Simple (n1)	0.8	1.3	2.29	.552
Sensory Complex (t1)	16.0	19.8	0.80	**.012**
Sensory Complex (n1)	0.4	0.6	1.31	.433
Perceptual Simple (t1)	16.0	16.8	0.01	.456
Perceptual Simple (n1)	1.5	0.7	0.98	.524
Perceptual Complex (t1)	21.7	19.5	4.67	.233
Perceptual Complex (n1)	3.0	1.9	1.21	.514
Identity Simple (t1)	21.6	21.2	0.74	.845
Identity Simple (n1)	1.9	2.2	1.05	.711
Identity Complex (t1)	21.7	35.7	1.26	**.005**
Identity Complex (n1)	3.3	4.1	2.67	.463
Semantic Simple (t1)	30.5	32.1	0.65	.550
Semantic Simple (n1)	3.5	3.6	0.00	.917
Semantic Complex (t1)	25.3	30.5	6.52	**.016**
Semantic Complex (n1)	2.4	1.3	1.77	.315
Personal Simple (t1)	34.2	43.5	0.76	**.036**
Personal Simple (n1)	4.4	1.6	8.24	**.037**
Personal Complex (t1)	35.3	52.0	3.31	.081
Personal Complex (n1)	7.9	9.7	3.82	.234

Table 4. Cognitive Differentiation by Real-Time Strategy Preference

Metric	Not Prefer	Prefer	F	p
Sensory Simple (t1)	18.3	19.3	0.01	.458
Sensory Simple (n1)	1.1	0.1	2.24	.400
Sensory Complex (t1)	17.4	17.7	0.06	.860

Metric	Not Prefer	Prefer	F	p
Sensory Complex (n1)	0.5	0.1	1.80	.247
Perceptual Simple (t1)	16.2	16.6	1.01	.766
Perceptual Simple (n1)	1.4	0.6	1.08	.607
Perceptual Complex (t1)	20.6	22.4	1.86	.403
Perceptual Complex (n1)	3.0	1.0	2.75	.327
Identity Simple (t1)	21.2	23.1	1.06	.463
Identity Simple (n1)	2.2	0.8	3.70	.111
Identity Complex (t1)	24.9	21.0	0.77	.426
Identity Complex (n1)	3.9	1.9	6.03	.107
Semantic Simple (t1)	31.0	30.8	0.02	.946
Semantic Simple (n1)	3.9	1.4	5.08	.107
Semantic Complex (t1)	27.3	24.8	1.20	.361
Semantic Complex (n1)	2.1	1.6	2.96	.666
Personal Simple (t1)	39.7	30.7	0.06	†.085
Personal Simple (n1)	3.9	2.0	3.92	.236
Personal Complex (t1)	46.4	30.0	–	.253
Personal Complex (n1)	9.1	5.2	5.55	**.032**

Table 5. Cognitive Differentiation by Quest/Adventure Preference

Metric	Not Prefer	Prefer	F	p
Sensory Simple (t1)	17.5	20.4	0.07	**.006**
Sensory Simple (n1)	1.1	0.5	1.99	.440
Sensory Complex (t1)	16.2	20.1	1.45	**.001**
Sensory Complex (n1)	0.6	0.1	3.78	†.099
Perceptual Simple (t1)	15.3	18.0	0.57	**.011**
Perceptual Simple (n1)	1.8	0.3	3.32	†.250

Metric	Not Prefer	Prefer	F	p
Perceptual Complex (t1)	20.3	21.9	0.25	†.400
Perceptual Complex (n1)	3.6	0.7	5.70	†.065
Identity Simple (t1)	20.7	23.3	0.53	.196
Identity Simple (n1)	2.2	1.6	0.04	.423
Identity Complex (t1)	24.1	24.0	0.32	.985
Identity Complex (n1)	3.6	3.5	0.06	.863
Semantic Simple (t1)	29.7	32.8	3.60	.198
Semantic Simple (n1)	3.9	2.7	1.99	.333
Semantic Complex (t1)	25.7	28.9	1.24	.132
Semantic Complex (n1)	2.3	1.6	2.01	.497
Personal Simple (t1)	37.1	38.7	0.21	.723
Personal Simple (n1)	4.2	2.3	5.52	.147
Personal Complex (t1)	40.0	51.0	7.27	.346
Personal Complex (n1)	9.4	6.8	2.93	†.069

Table 6. Cognitive Differentiation by Role-Playing Game Preference

Metric	Not Prefer	Prefer	F	p
Sensory Simple (t1)	17.9	19.5	0.01	.130
Sensory Simple (n1)	1.1	0.5	2.50	.420
Sensory Complex (t1)	16.9	18.5	0.03	.190
Sensory Complex (n1)	0.6	0.1	3.86	.112
Perceptual Simple (t1)	15.6	17.3	1.24	.103
Perceptual Simple (n1)	1.8	0.4	3.46	.286
Perceptual Complex (t1)	20.6	21.4	0.70	.660
Perceptual Complex (n1)	3.7	0.9	6.55	†.074
Identity Simple (t1)	20.7	22.9	1.16	.276
Identity Simple (n1)	2.2	1.6	0.01	.431

Metric	Not Prefer	Prefer	F	p
Identity Complex (t1)	24.1	24.0	1.48	.983
Identity Complex (n1)	3.7	3.5	0.46	.858
Semantic Simple (t1)	31.0	31.0	0.07	1.000
Semantic Simple (n1)	4.1	2.4	1.80	.154
Semantic Complex (t1)	26.6	27.5	0.14	.686
Semantic Complex (n1)	2.3	1.6	2.78	.502
Personal Simple (t1)	41.4	32.3	0.41	**.037**
Personal Simple (n1)	4.3	2.3	7.24	.117
Personal Complex (t1)	48.8	33.5	0.89	.160
Personal Complex (n1)	9.4	6.8	2.93	†.069

4. Discussion

This study provides preliminary evidence that both the frequency of video game engagement and the preferred genre are associated with distinct patterns of cognitive differentiation in adolescents. These findings extend the existing literature by moving beyond broad cognitive domains, such as attention or visuospatial skills, to examine the structural organisation of cognitive schemas.

Contrary to expectations based on research demonstrating superior visuospatial perception and hand-eye coordination in active gamers (Bediou et al., 2018; Yao et al., 2020; Valls-Serrano et al., 2022), adolescents with high video game experience did not exhibit enhanced discriminative abilities in processing visual-figurative information (sensory, perceptual, or identity/equality differentiation). Instead, they showed lower accuracy coupled with higher speed, which may indicate greater impulsivity rather than superior discrimination. This interpretation aligns with studies showing bidirectional links between attention deficits, impulsivity, and time spent playing video games (Gentile et al., 2012). It appears that habitual gaming may promote a speed-accuracy trade-off, where rapid responding is prioritised over precision, especially in simple perceptual tasks.

The genre-specific findings offer more nuanced insights. The advantage of role-playing game and real-time strategy players in personal differentiation is particularly noteworthy. These genres require players to track and manage complex character traits, make moral decisions, and plan long-term strategies, which may provide extensive practice in differentiating nuanced personal and psychological attributes. This supports the hypothesis that game content directly shapes corresponding cognitive structures (Rathakrishnan et al., 2023). The fact that RPG fans also showed trends toward better complex perceptual differentiation suggests that the cognitive benefits of such games may generalise beyond the specific content area.

The slower performance of simulation game fans across multiple task types was unexpected. Simulation games ostensibly model real-world systems and should therefore foster rich mental models. However, the specific simulations preferred by our sample, such as *The Sims 4* and *Fortnite*, are relatively lightweight in terms of conceptual complexity. This may reflect a selection effect: adolescents with lower baseline cognitive differentiation may gravitate toward simpler, more repetitive gaming experiences, which then do little to enhance their discriminative abilities. Alternatively, the repetitive nature of such games might lead to cognitive “tunnelling,” where players become less flexible in their categorisation strategies.

Quest and adventure game enthusiasts were slower on simple sensory and perceptual differentiations. These games emphasise narrative immersion and puzzle-solving, which may shift cognitive resources away from fast perceptual processing toward verbal and logical reasoning. However, we did not find corresponding advantages in semantic differentiation, which challenges the assumption that such games enhance semantic processing. It is possible that the puzzle-solving in these games relies more on episodic memory and heuristic search than on the systematic differentiation of semantic categories.

The observed gender differences, with males reporting higher gaming frequency and showing faster but less accurate performance, are consistent with broader literature (Rathakrishnan et al., 2023). However, the finding that females outperformed males on complex semantic and personal differentiations suggests that gender differences in gaming do not simply mirror general cognitive differences. Rather, differential gaming experiences and preferences may interact with gender to shape specific cognitive profiles.

From a developmental perspective, these findings have important implications. Adolescence is a period of active cognitive restructuring, and the activities that occupy adolescents’ time can significantly influence the trajectory of this development. Our results suggest that heavy gaming, particularly of certain genres, might contribute to a less differentiated cognitive style, which could affect academic performance and problem-solving flexibility. However, the cross-sectional design precludes causal inferences. It is equally plausible that adolescents with pre-existing differences in cognitive differentiation select into specific gaming habits.

Theoretical mechanisms underlying these effects may involve neuroplasticity. Repeated exposure to specific task demands in games could strengthen neural pathways associated with those demands while underutilising others. For example, the rapid, reactive nature of action games might reinforce fast, automatic processing at the expense of deliberate, analytical differentiation. Conversely, the strategic and character-focused elements of RPGs might promote the formation of finely grained cognitive schemas for personal and social information.

This pilot study has several limitations that must be acknowledged. The small sample size (N= 44) limits statistical power and generalisability. The reliance on self-reported gaming frequency and genre preferences introduces potential biases, including socially desirable responding and inaccurate recall. We did not assess baseline intellectual ability or temperament, which may confound the observed relationships. The cross-sectional design does not allow for causal interpretations. Future research should address these limitations as well as explore the role of game complexity, narrative depth, and social interaction within games as moderators of cognitive outcomes.

Despite these limitations, our findings have practical relevance. Educators and parents should be aware that not all video games are cognitively neutral. While some genres, such as RPGs and RTS, may offer opportunities for developing nuanced differentiation of personal and strategic concepts, others, particularly action and simple simulation games, may not provide the same benefits and could even promote impulsive cognitive styles. This suggests that a “one-size-fits-all” approach to gaming recommendations is inadequate. Instead, the specific content and demands of the game should be considered when evaluating its potential developmental impact.

5. Conclusions

This study demonstrates that video game activity and genre preferences are associated with distinct patterns of cognitive differentiation in adolescents. High-frequency gaming was linked to reduced accuracy in sensory and perceptual differentiation, while low-frequency gamers showed a trend toward poorer semantic and personal categorisation. Genre-specific effects were pronounced: role-playing and real-time strategy games were associated with superior personal differentiation, whereas action and simulation games showed less favourable patterns. These findings underscore the need for a multidimensional approach that considers not only the quantity of gaming but also the quality and content of the gaming experience.

Future research with larger, longitudinal samples and objective measures is needed to establish causality and to elucidate the mechanisms by which specific game features influence cognitive structures. Such work will be essential for developing evidence-based guidelines for healthy gaming during adolescence.

Ethics Statement: The study was conducted in accordance with the Declaration of Helsinki and approved by the Institutional Ethics Committee of the Research Institute of Pediatrics and Children's Health (protocol No. 12/2022, dated 15 April 2022). Written informed consent was obtained from all participants and their legal guardians after a full explanation of the study procedures. Participants were informed of their right to withdraw at any time without consequences. All data were anonymised and stored securely.

Author’s Responsibility: The author confirms that the manuscript has been read and approved for submission. The author is fully responsible for the content, accuracy, and integrity of the data presented. Any errors or omissions are the sole responsibility of the author.

Competing Interests: The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Highlights:

- High video game frequency was associated with lower accuracy in sensory and perceptual differentiation, suggesting a speed-accuracy trade-off.
- Low-frequency gamers showed a trend toward poorer semantic and personal categorisation.
- Role-playing and real-time strategy players demonstrated superior personal differentiation, likely due to the emphasis on character traits and strategic decision-making.
- Simulation and action game fans exhibited slower performance and more errors on several cognitive differentiation tasks, indicating genre-specific cognitive profiles.
- The findings highlight the need to consider both the quantity and the content of gaming when evaluating its developmental impact.

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Когнитивная дифференцированность у подростков с разным уровнем активности в видеоиграх: сравнительный анализ

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Резюме. *Актуальность.* Видеоигры прочно вошли в повседневную жизнь подростков, однако их влияние на структурную организацию познавательных процессов, в частности на когнитивную дифференцированность, остаётся практически не изученным. Предшествующие исследования преимущественно касались внимания и зрительно-пространственных навыков и давали противоречивые результаты. При этом роль частоты игр и жанровых предпочтений в формировании тонкости ментальных схем систематически не анализировалась. *Цель.* Пилотное исследование направлено на выявление различий в когнитивной дифференциации у подростков с разным уровнем игровой активности и разными жанровыми предпочтениями. *Методы.* В выборку вошли 44 подростка (25 девушек и 19 юношей); средний возраст = 15,11 ± 0,82 года). Участники заполнили опросник цифровой активности и выполнили компьютеризированную методику «Скоростная классификация стимул-объектов» (Чуприкова и Ратанова, 1997), которая оценивает сенсорную, перцептивную, идентификационную, семантическую и личностную дифференцированность. *Результаты.* Высокая частота игр была связана с достоверно более низкой точностью сенсорных (больше ошибок: p = .023, H = 7.505) и перцептивных дифференцировок (p = .001, H = 14.363). У подростков с низкой частотой игр отмечена тенденция к менее точной семантической и личностной категоризации. Обнаружены жанрово-специфические эффекты: любители симуляторов медленнее справлялись со сложными задачами на тождество/различие стимул-объектов (p = .005) и семантическими дифференцировками (p = .016); поклонники экшенов допускали больше ошибок в сенсорных дифференцировок стимул-объектов (p = .049), но были точнее в задачах на дифференциацию тождества/различия (p = .049); игроки в ролевые игры и стратегии в реальном времени показали лучшие результаты в личностной дифференциации (меньше ошибок, p = .032, и выше скорость, p = .037); фанаты квестов и приключений выполняли простые дифференцировки стимул-объектов медленнее (p = .006–.011). *Заключение.* Игровая активность и жанровые предпочтения сопряжены с различными профилями когнитивной дифференцированности. Полученные данные подчёркивают необходимость многомерного подхода и проведения масштабных лонгитюдных исследований для выяснения причинно-следственных связей между цифровой активностью подростка и своеобразием когнитивного развития.

Ключевые слова: видеоигры, когнитивная дифференциация, подростки, когнитивное развитие, игровые жанры.

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