

Female students' participation (over the years) in esports and its implications on psychological conditions, communication, and virtual gaming risks

Participación de las estudiantes (a lo largo de los años) en los deportes electrónicos y sus implicaciones en las condiciones psicológicas, la comunicación y los riesgos del juego virtual

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Abstract. eSport is a sport of choice and is quite popular, especially among young people, including women. This virtual sport has been developed entirely with various ways to play. At the same time, there is a negative paradigm of eSport games for women in Indonesia, including damaging vision, causing numbness in the hands, forgetting to eat, being introverted, and using harsh language. From a cultural perspective, women who play eSport are considered to violate the nature of women because they reflect masculine characteristics. This study uses quantitative research with a causal-comparative design to examine the effect of female students' participation in playing eSports on psychological development, communication skills, and the risks of virtual games. The research data were analyzed descriptively and inferentially (Multivariate Analysis of Variance). The analysis results prove a simultaneous influence between eSport participation (duration of playing) and female students' psychological conditions, communication, and virtual game risks. In partial testing, eSport participation only significantly affected the communication skills variable of female students, while the other two variables did not. Future research needs to conduct qualitative investigations to explore the clinical experiences of female gamers that help them train their communication skills. Given the existence of various gender discriminatory behaviours in eSports, female gamers may have good communication to protect themselves from the threat of discrimination, or vice versa.

Keywords: Gender, psychology, communication, virtual gaming risks, eSport

Resumen. El eSport es un deporte preferido y bastante popular, especialmente entre los jóvenes, incluidas las mujeres. Este deporte virtual ha sido desarrollado íntegramente con varias formas de jugar. Al mismo tiempo, existe un paradigma negativo de los juegos de deportes electrónicos para las mujeres en Indonesia, que incluye daños en la visión, entumecimiento en las manos, olvido de comer, ser introvertida y usar lenguaje duro. Desde una perspectiva cultural, se considera que las mujeres que practican deportes electrónicos violan la naturaleza de las mujeres porque reflejan características masculinas. Este estudio utiliza una investigación cuantitativa con un diseño causal-comparativo para examinar el efecto de la participación de estudiantes femeninas en la práctica de deportes electrónicos sobre el desarrollo psicológico, las habilidades de comunicación y los riesgos de los juegos virtuales. Los datos de la investigación fueron analizados de manera descriptiva e inferencial (Análisis Multivariado de Varianza). Los resultados del análisis demuestran una influencia simultánea entre la participación en deportes electrónicos (duración del juego) y las condiciones psicológicas, la comunicación y los riesgos de los juegos virtuales de las estudiantes. En las pruebas parciales, la participación en deportes electrónicos solo afectó significativamente la variable de habilidades comunicativas de las estudiantes, mientras que las otras dos variables no. Las investigaciones futuras deben realizar investigaciones cualitativas para explorar las experiencias clínicas de las jugadoras que les ayuden a entrenar sus habilidades de comunicación. Dada la existencia de diversos comportamientos discriminatorios de género en los deportes electrónicos, las jugadoras pueden tener una buena comunicación para protegerse de la amenaza de discriminación, o viceversa.

Palabras clave: Género, psicología, comunicaciones, riesgos de juegos virtuales, deportes electrónicos

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Introduction

eSports has been recognized as a competitive sport, which began in the 1992 European Sports Charter and was later revised in 2001. eSports is a new media that has experienced tremendous growth in recent years (Huang et al., 2023; Palanichamy et al., 2020). At least we can capture two significant data developments, respectively: player development data in Asia totalling up to 1.48 billion and in Europe 715 million players (Hallmann & Giel, 2018), economic development data reaching up to \$906 million in 2018, and in 2020 increasing to \$24 billion (Howarth, 2024). The surge in players and economic development like this make eSports an exciting object to explore. It is a new choice for people to realize their competitive experience without having to "face-to-face" with their opponents or teams, which is a must in real sports. In eSports, athletes' physical attributes (masculinity) are not central to winning the match, but rather how they mobilize their various potential resources (including

cognitive and psychological) to win the virtual competition. In addition to fostering creativity, playing patterns, winning strategies, and teamwork, eSports participation also has an explosive growth impact from an economic perspective. The eSports industry generates more than USD 1 billion in funding and is projected to grow by more than 15.7% annually (Trotter et al., 2020). This condition presents significant potential, indicating that this sport could be a viable career path, particularly with comprehensive support from sponsors. This sport can be a career choice, especially if sponsors provide full support (Madden & Hartevelde, 2021), so it is not surprising that female eSports players have higher levels of valence and achievement motivation than men (Kordyaka et al., 2023).

Female gamers were initially relatively few but have recently grown quite rapidly. We can take a picture of the case from 2006 to 2021, where previously the number of men in eSports was around 62% while women were 38%, but there was an "overlap" of 10%, namely female eSports

players increased to 48% and male athletes decreased to 52% (Clement, 2023). This shift is an interesting note about the reasons and impacts of women's participation in eSports. The study by Lazarus and Folkman (1984) found that most female gamers play with a coping strategy, namely a game strategy that emphasizes cognitive and behavioural efforts in managing external and internal demands.

Observing eSports's various developments and benefits leaves some contradictions regarding societal and cultural perspectives. For example, society still maintains a patriarchal culture, so eSports is still associated with masculine activities. Hence, the "suitability" of sports for women is still a topic of discussion today (Happonen & Minashkina, 2019), and this also affects the discomfort of female gamers in participating in eSports. Previous studies by Rogstad (2022) have reported that the development of eSports still focuses on gender, namely the issue of masculinity construction, online harassment, and negotiation of gender issues. Some online harassment is verbal, being belittled, considered low-skilled, being labeled a "naughty woman," and being a burden on a team, so gender discrimination and inferiority are seen in the community (Devianti & Nurchayati, 2023; Moura et al., 2024; Ruvalcaba et al., 2018).

Another problem with the gender stereotype of women as eSports players is considered to violate the nature of women because eSports reflects the characteristics of masculinity (Taylor, 2015). Women are also considered uncompetitive and unsuitable for playing extreme, aggressive, and masculine types of online games (Yusoff & Yunus, 2021), unfit to compete because winning an event is considered less important for women (Hartmann & Klimmt, 2006). In addition, the funds provided for eSports are still dominated by male athletes compared to female athletes (Madden & Hartevelde, 2021). The negative paradigm above is more influenced by "narrow" cultural elements, which continue to be preserved and developed from generation to generation. On a broader scale, it can have implications for developing the mental health, social health, and careers of women who will enter the world of professional sports.

Based on previous research by Rogstad (2022), Ruvalcaba et al. (2018), Devianti and Nurchayati (2023), and Moura et al. (2024) (see Paragraph 4), it is necessary to explore eSport research that discusses how to manage the health of eSport athletes (Zwibel et al., 2019), health benefits and risks (Yin et al., 2020), and reducing the risk of injury (DiFrancisco-Donoghue et al., 2022). The study by Trotter et al. (2022) has shown that student involvement in eSports does not harm any health or psychological factors. Unlike the previous study by Trotter et al. (2022), the study by Luo et al. (2022) found that participating in more eSports not only led to increased mental fatigue immediately after playing but high and sustained levels of eSport participation were also associated with consistently high and prolonged levels of mental fatigue. The interesting question is, is the pessimistic view towards female students' eSport

participation also due to the tendency for their level of participation to affect their psychological condition, communication, and virtual game risks?

Many adverse effects and views arise when women play eSports. Also, eSports is a competitive sport with many tournaments held at the regional, national, and international levels, such as the 2022 Asian Games. For this reason, this investigation is vital to enrich previous studies by looking at the participation (year) of eSports of high school female students towards psychological conditions, communication, and virtual game risks. We will conduct an investigation based on several supporting gender theories, such as conflict theory, structural-functional theory, masculinity theory, family theory, and feminist theory (Berliana, 2020; Berliana et al., 2024) so that in the end it concretely produces another landscape by discussing women's participation in eSports from a psychological, communication, and virtual risk perspective, as well as offering educational solutions even in the career choices of future female athletes in their participation in eSports.

Methods

Design

This study is a quantitative descriptive study with a causal-comparative design, where the researcher attempts to determine the consequences of pre-existing differences between groups of individuals. This study, along with correlational research, is sometimes viewed as a form of associational research because both capture pre-existing conditions that describe relationships between variables (Fraenkel et al., 2011). Operationally, the researcher used this design to study female eSports participants on psychological conditions, communication, and virtual risks from a gender perspective. Student participation in eSports games has been grouped into four levels, namely <1 year, 2-3 years, 3-4 years, and >4 years, which will be tested for their implications on psychological conditions, communication, and virtual game risks, as shown in Table 1.

Table 1.
Causal comparative design

Group	Independent variable	Dependent variable
I	C_1 (<1 year play eSport)	O_1 (Psychology)
II	C_2 (1-2 year play eSport)	O_2 (Communication)
III	C_3 (3-4 year play eSport)	O_3 (Virtual gaming risks)
IV	C_4 (>4 year play eSport)	

Sample

The research sample consisted of 425 female students consisting of 218 Junior High School (JHS) students and 207 Senior High School (SHS) students. All students from the JHS school level and students from the SHS school level came from 6 cities/regencies in West Java Province. Where from Indramayu Regency, there were 131 students; from Karawang Regency, there were 57 students; from

Pangandaran Regency, there were 62 students; from Purwakarta Regency, there were 52 students; from Cirebon City, there were 50 students; from Tasikmalaya, City there were 73 students.

Instrument

The psychological condition instrument was developed using two indicators. First, self-image includes self-image before and after knowing eSports (4 items) and self-image in the surrounding environment (2 items). Second, self-control, including the ability to think when playing games (2 items), and attitude control in eSports (3 items). Six of the 17 items constructed did not meet the validity value (<0.553) with a Cronbach alpha reliability value of 0.787. Respondents responded on a 4-point Likert scale (strongly agree-strongly disagree).

The communication instrument was developed using two indicators. First, the way of communication, including the way of communicating in eSports (2 items) and the way of behaving in eSports (3 items). Second, communication includes verbal communication (2 items) and non-verbal communication (2 items). Six of the 15 items constructed did not meet the validity value (<0.553) with a Cronbach alpha reliability value of 0.753. Respondents responded on a 4-point Likert scale (strongly agree-strongly disagree).

The virtual game risk instrument was developed using four indicators. First, financial risk, including purchases (4 items) and transaction amounts (2 items). Second, performance risk includes the impact on performance and other activities (2 items). Third, psychological risk, including personal satisfaction (1 item) and emotions (2 items). Fourth, physiological risk, including Health (5 items). Of the 26 items constructed, 12 did not meet the validity value (<0.553) with a Cronbach alpha reliability value of 0.865. Respondents responded on a 4-point Likert scale (strongly agree-strongly disagree).

Data Analysis

This study used descriptive and inferential data analysis tools like Microsoft Excel and IBM SPSS version 29. For descriptive analysis, the mean and standard deviation values are sought. Before proceeding to inferential analysis, the researcher conducted an analysis requirement test (classical assumption test) with normality and homogeneity tests. The inferential analysis ended with a Multivariate Analysis of Variance to test the effect of eSport participation on psychological conditions, communication, and virtual game risks in Junior High School and Senior High School students.

Results

Descriptive analysis

Descriptive analysis will obtain the mean value, overall standard deviation and good category for the category of eSport participation less than 1 year, the category of eSport participation 1-2 years, the category of eSport participation 3-4 years, the category of eSport participation more than 4

years. Then, an inferential test is carried out at the school level to determine the effect of the length of eSport participation (playing games) on students' psychological condition, communication, and virtual game risk.

eSports participation on psychological conditions

Based on the descriptive analysis diagram (see Figure 1), eSport participation (playing duration) based on school level confirms that both Junior High School (JHS) and Senior High School (SHS) students have relatively the same mean and standard deviation. However, SHS students' eSport participation towards psychological conditions places that participation for <1 year has the highest value ($M \pm SD = 47.00 \pm 4.05$) of the other three participation categories. Meanwhile, for JHS students, eSport participation for 1-2 years has the highest value ($M \pm SD = 47.48 \pm 3.61$) of the other three categories.

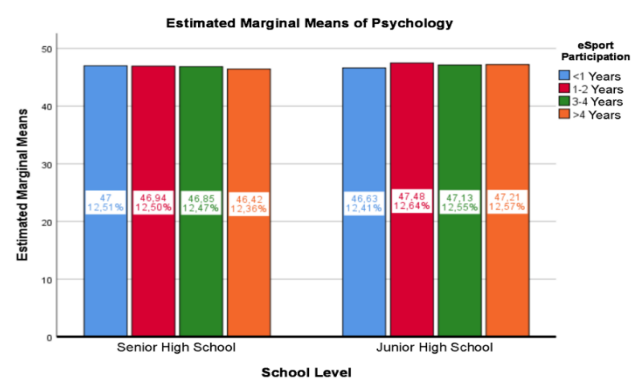


Figure 1. Average student participation in relation to psychology based on school level

eSports participation on communication

The descriptive analysis diagram data of eSport participation (playing duration) towards student communication based on school level confirms that both JHS and SHS students have relatively the same mean and standard deviation (see Figure 2). However, SHS students' eSport participation towards communication places that participation for >4 years has the highest value ($M \pm SD = 52.33 \pm 5.77$) of the other three participation categories. Meanwhile, for JHS students, eSport participation for 1-2 years still consistently has the highest value ($M \pm SD = 52.10 \pm 5.42$) of the other three categories.

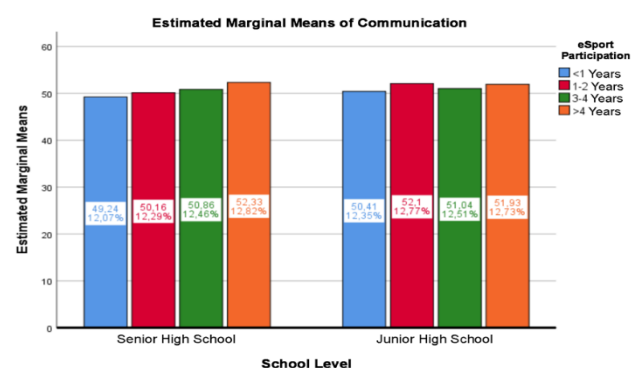


Figure 2. Average student participation in communication based on school level

eSport participation on virtual game risks

Still has the same conclusion as the two previous reports, where the descriptive analysis diagram of eSport participation (playing duration) against students' virtual game risks based on school level confirms that both JHS and SHS students have relatively the same mean and standard deviation (see Figure 3). However, SHS students' eSport participation against virtual game risks places that participation for >4 years has the highest value ($M \pm SD = 80.85 \pm 8.24$) of the other three participation categories. Meanwhile, for JHS students, eSport participation for 1-2 years still consistently has the highest value ($M \pm SD = 80.42 \pm 8.02$) of the other three categories.

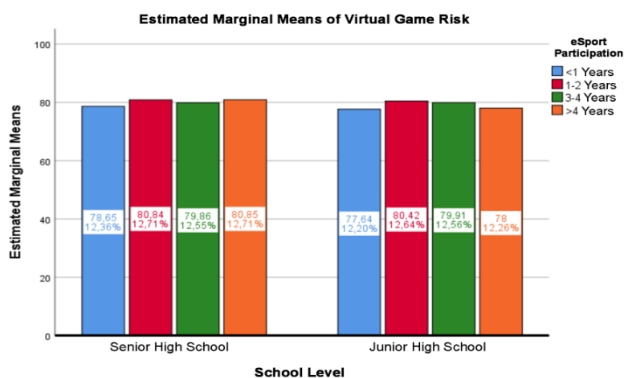


Figure 3. Average student participation in virtual game risks based on school level

Multivariate Analysis of Variance (MANOVA)

Test of normality

Before testing the influence of eSport participation on psychological conditions, communication, and virtual game risks, the normality and homogeneity of the data were first tested. The normality test results with the one-sample Shapiro-Wilk test show that the 12 groups of data in each independent variable of psychological conditions, communication, and virtual game risks are typically distributed (Sig. >0.050), as in Table 2 below.

Table 2. Tests of normality (Shapiro-Wilk)

	eSport participation	Statistic	df	Sig.
Psychology	<1 Year	0.984	112	0.213
	1-2 Year	0.982	118	0.124
	3-4 Year	0.988	111	0.424
	>4 Year	0.971	84	0.052
Communication	<1 Year	0.971	112	0.054
	1-2 Year	0.984	118	0.163
	3-4 Year	0.968	111	0.050
	>4 Year	0.972	84	0.066
Virtual game risk	<1 Year	0.982	112	0.147
	1-2 Year	0.993	118	0.820
	3-4 Year	0.991	111	0.639
	>4 Year	0.985	84	0.416

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Tests of homogeneity

Furthermore, the researcher also conducted a homogeneity test of variance on the participation or playing eSports data for each overall category using Levene's test. The homogeneity test results prove that the variance of eSports

participation data has a Sig. value >0.05 (see Table 3), so it can be interpreted as homogeneous data.

Table 3. Tests of homogeneity (Levene's test)

	Statistic	df1	df2	Sig.
Psychology	Based on mean	1.731	3	0.160
	Based on median	1.709	3	0.164
Communication	Based on mean	0.954	3	0.414
	Based on median	0.752	3	0.521
Virtual game risk	Based on mean	0.747	3	0.525
	Based on median	0.678	3	0.566

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Design: Intercept + x1

Multivariate tests

Referring to the assumptions of normality and homogeneity that have been met, the researcher conducted a relationship and regression test using MANOVA. The influence test in Table 4 concludes the results of the Sig. values of each dependent variable are as follows. First, the influence between eSport participation and psychological conditions has a significance of 0.699 (>0.05), so it is concluded that there is no influence of eSport participation on students' psychological conditions. Second, the influence between eSport participation and communication has a significance of 0.032 (<0.05), so it is concluded that eSport participation influences female students' communication. Third, the influence between eSport participation and virtual game risks has a significance of 0.051 (>0.05), so it is concluded that there is no influence of the length of playing eSports on students' virtual game risks.

Table 4. Tests of between-subjects effects (partial test)

Source	Dependent variable	Sum of squares	df	Mean square	F	Sig.
e-Sport participation	Psychology	20.974	3	6.991	0.477	0.699
	Communication	235.101	3	78.367	2.969	0.032
	Virtual game risk	427.484	3	142.495	2.609	0.051

a. R Squared = .003 (Adjusted R Squared = -.004)

b. R Squared = .021 (Adjusted R Squared = .014)

c. R Squared = .018 (Adjusted R Squared = .011)

In addition to conducting partial analysis, researchers also conducted a simultaneous (joint) influence test between eSport participation (playing duration) on female students' psychological condition, communication, and virtual game risk. The multivariate test table proves that the significance value is <0.05 (see Table 5), so it can be concluded that there is a simultaneous influence between eSport participation on the psychological condition, communication, and virtual game risk of students.

Table 5. Multivariate tests^a (simultant test)

Effect	Value	F	Hyp. df	Error df	Sig.	
eSport participation	Pillai's Trace	0.042	2.015	9.000	1263.000	0.035
	Wilks' Lambda	0.958	2.021	9.000	1019.887	0.034
	Hotelling's Trace	0.044	2.023	9.000	1253.000	0.034
	Roy's Largest Root	0.032	4.530 ^b	3.000	421.000	0.004

a. Design: Intercept + x1

b. Exact statistic

c. The statistic is an upper bound on F that yields a lower bound on the significance level.

Discussion

We would like to discuss the results of this study in three main sections (according to the dependent variables) to make it easier for readers to diagnose, examine, and even debate the findings and discussions of this study in the future.

The Influence of eSport Participation on Psychological Conditions

This study has confirmed that female students' participation in eSports affects their psychological condition; at least they always think about playing strategies to win, remain "cool-minded" even though their eSports team is in chaos, or keep smiling despite losing. It means that this study has confirmed other investigations that have previously reported the longitudinal impact of students' involvement in high school eSports, showing that participation in eSports does not have a negative impact on psychological factors (Trotter et al., 2022). At least some female gamers portray their participation in eSports from a different perspective. This positive perspective is manifested through female gamers using their eSports experience to channel their pleasure and increase their self-confidence and ability to overcome challenges. It means that eSports can also develop positive self-perception (Harisah & Masiming, 2008), namely the development of self-identity, self-efficacy, self-esteem, ideal self-concept, and real self-concept.

This study provides a different report from previous studies that excessive gaming can cause various psychological problems, including depression, anxiety, tension, sleep disorders, addiction, and aggressive behaviour and influence (Chan et al., 2022; Choi et al., 2018; Palanichamy et al., 2020; Tang et al., 2023). eSports is a field of sports activities that uses information and communication technology to develop and train its participants' mental or physical abilities (Tang et al., 2023; Wagner, 2006). People involved in eSports are likely to develop specific mental health problems if their playing patterns are problematic (Thakur et al., 2021). Although using virtual aids, the spirit of sports competition (such as defeating opponents, winning matches, or being obsessed with becoming tournament champions) also plays a role in shaping the psychological condition of its players. Therefore, a person's perspective on being involved in eSports greatly determines how they maximize their participation in particular interests.

The results of this study provide positive support for the psychological development of female gamers to reduce gender stigma in digital games. As a topic for further discussion, female gamers often experience verbal harassment, which shows that female gamers are viewed as targets of sexual games from the most vital perspective (Devianti & Nurchayati, 2023; Kim & Lim, 2021; Moura et al., 2024; Ruvalcaba et al., 2018). This stigma continues because when they want to avoid the stigma, they reduce their chances of becoming female gamers. This condition has been experienced by female gamers who have been involved as players since adolescence but still face

problems that stem from stigmatized internal gender self-image. Stigmatization of female gamers can result in sexism, gender violence, harassment, and objectification, which gradually and continuously push female gamers out of the gaming world (Kuss et al., 2022; Rogstad, 2022). Therefore, on a broader and more planned scale, a deeper understanding of gender perceptions among eSports players must be prioritized and elaborated to change gender perceptions (Kim & Lim, 2021) while promoting an equal digital space for female gamers.

One way to protect the psychological safety and comfort of female gamers in eSports is to strengthen the perspective of gender equality. If this is not considered, the scenario of eSports to the patriarchal system will be strengthened (Moura et al., 2024), and the space for women's participation will be more hampered and consistently and continuously cause psychological inequality for female gamers. Along with female gamers' growing interest and motivation in eSports, it must be seen as an opportunity for their career development (Kordyaka et al., 2023). For this reason, mitigating psychological attacks by strengthening the gender perspective so that they can see their role and participation in eSports as a medium for expressing and developing their potential that is not limited to self-confidence to finish the match, constructing new strategies when under pressure or defeat, being able to control themselves when winning or losing, and being open to various problems. Developing these psychological skills increases the opportunity for them to be transferred into their academic life (as high school or university students) as well as their non-academic life (in the family and community environment).

The Influence of eSport Participation on Communication

This study has confirmed that female students' participation in eSports impacts communication. Where eSports participation strengthens collaboration and communication skills while increasing the possibility of transferring acquired skills, such as leadership and communication skills, to real-world contexts (Zhong et al., 2022), social interaction, teamwork, and critical thinking skills (Delello et al., 2021). Again, we do not deny that eSports can also have an opposite (negative) impact on the social skills of female gamers. For this reason, using gender theory, such as conflict theory, structural-functional theory, masculinity theory, family theory, and feminist theory (Berliana, 2020; Berliana et al., 2024) is very important in determining how female gamers can neutralize various significant threats to their social development. If this perspective is not strengthened, then in various social spaces (digital and traditional), gender discrimination issues will continue to monopolize the space for female gamers' expression.

eSport is a form of sport in which the main aspects of the sport are facilitated by electronic systems (Hamari & Sjöblom, 2017; Tang et al., 2023), including fostering

communication between gamers. Call it (broadly) the commentator's strategy in communicating, such as in broadcasting, so that it can attract public interest, namely by mentioning profiles, tournaments, rules, techniques, and strategies that are transmitted through energy, emotion, strength, and rhythm (Torres-Toukoumidis et al., 2022). Publications of articles about eSport have paid very high attention to gamers' collaboration and communication skills. Unfortunately, other facts also find that eSport participation focuses less on other life and career skills related to creativity and innovation, information literacy, and citizenship (Zhong et al., 2022). The current study successfully reported the determination of eSport participation on the communication skills of female gamers. The perception of communication is well established between and among eSport players, including communication about the strategy to be used.

In many cases of marginalization of women in the gaming community, female gamers use voice chat for fear of harassment. In addition, the phenomenon of smurfing exacerbates the problem within the community, contributing to increased frustration and hostility, especially towards minority players (Maharani et al., 2024). Gender stereotypes of women as uncompetitive in eSports, sexually explicit comments from male opponents, communication problems, especially with male players, and the perception that women are not suitable for playing extreme, aggressive, and masculine types of online games. Game features are more significant for men than women, often associated with femininity. Indirectly, these impressions hinder the opportunity for women to be more active and progressive in eSports (Yusoff & Yunus, 2021). Whereas in eSports, the physiological size of gamers does not contribute to the success of winning matches, which can be simplified in that female and male gamers will be tested on their ability to develop their thinking and psycho-social skills while participating in eSports. Participating in eSports develops social networks, and people with professional eSports skills and resilience tend to be models of eSports participation (Chung et al., 2022). Gamers can interact anywhere and anytime in difficult eSports situations; they also often ask for help from others, respect fellow players when playing to train cooperation and help gamers become brave in communicating in teams. eSports participation can also help young people to engage in sports and fitness. According to the study by Ningning and Wenguang (2023), significant factors influencing young people's intention to participate in sports and fitness include the e-gaming scene, virtual sports experience, and social presence. Creating a safe and comfortable eSports experience is vital in ensuring and attracting young people to engage in eSports. If eSport gamers do not guarantee safety and comfort in competitive eSports, it can lead to decreased involvement in games and communication (Nguyen & Park, 2023).

The Influence of eSport Participation on Virtual Game Risks

This study has confirmed that female students' participation in eSports affects their virtual gaming risk. Virtual

risk refers to how individuals interpret risks to their health or safety. One of the most severe risks is Internet Gaming Disorder (IGD), which is being considered as a future medical diagnosis by the American Psychiatric Association (King et al., 2020). Continuous involvement in esports (for years) has an impact on various physical health problems of female gamers, such as stiff neck and muscles, disturbed sleep quality, and addiction to playing eSports. More specifically, a systematic review study conducted by Palanichamy et al. (2020) showed that excessive eSports play and its competitive nature cause physical problems, including eye fatigue, blurred vision, lower back pain, tension headaches, wrist pain, hand pain, and poor posture while playing games. In addition, Palanichamy et al. (2020) and Tang et al. (2023) also reported that excessive gaming causes several physical problems, such as eye fatigue, blurred vision, lower back pain, and tension headaches.

The adverse effects of playing eSports include the tendency toward addiction, where players can spend excessive time playing to the point of risking other essential aspects of their lives, such as their education, work, and social relationships. In eSports, when these stimuli are presented in eSports (visual information displayed on the monitor and auditory information through headphones), gamers need to control their body movements by interpreting sensory input such as visual, auditory, and tactile information appropriately (Kim et al., 2023) so that they can more easily train their eye-hand coordination. However, prolonged involvement (hours and years) can cause hand function problems (Çil et al., 2023). Excessive virtual gaming also adversely affects players' physical health. Problems such as sleep disorders, eye fatigue, poor posture, and several other physical health risks are often faced by eSports players. Moreover, due to the highly competitive environment of eSports, players often feel pressured to constantly improve their performance, which can divert all their concentration to virtual rather than physical performance. Female gamers need to balance their eSports gaming time with other physical activities to minimise the risk.

Another systematic review report by Chan et al. (2022) of 36 studies confirmed a link between online video gaming (including eSports participation and consumption) and poor lifestyle outcomes. These include physical activity issues (such as reduced physical activity levels, increased body mass index and sedentary behaviour), nutrition (poorer dietary habits, consumption of sugary drinks), and sleep-related outcomes (decreased quality/duration, increased sleepiness/sleep deprivation). Among the 36 studies, one investigated physical lifestyle outcomes (eye strain, wrist pain, neck pain). Participation in eSports must be controlled to avoid negatively impacting female students' health, especially at school age. They need good health by controlling the intensity and dependence on eSports. The short-term impact can affect their stability and stamina to study and concentrate in class because of their unstable physique and contaminated spirit. The long-term impact is that female students may neglect themselves in light and heavy

physical activities, gradually increasing obesity. We have seen various opportunities for self-development and career development for eSports players. However, at the same time, many activities in eSports are monotonous and passive. Gamers do not have much time to move due to passive behaviour (not moving much) for a long time and unhealthy diets, making gamers and eSports players potentially susceptible to various chronic diseases and death from various causes (Ketelhut et al., 2021). eSports players are susceptible to chronic injuries due to excessive use or participation. Competitive-level games require eSports players to play for hours a day. They sit in the same position for long periods, with unphysiological postures and repetitive movements of small muscle groups (DiFrancisco-Donoghue et al., 2022; Ketelhut et al., 2021). These conditions can cause eSports players to suffer career-ending injuries (Emara et al., 2020; Ketelhut et al., 2021). The issue of virtual game risks needs to be addressed to eSport users because we do not want them to invest their potential and career in eSports well but must ignore the issue of their physical health. For this reason, Kurniawan et al. (2024) recommend identifying the physical needs of esports athletes, such as strength, endurance, balance, and flexibility.

Conclusion

We conclude that participation (years) in eSports significantly affects female students' psychological, communication, and virtual game risks. Psychologically, participation in eSports affects stress and anxiety levels and provides a sense of achievement and satisfaction that can increase female gamers' self-confidence. However, another important note is that excessive participation can also lead to mental health disorders such as addiction and social isolation. In terms of communication, eSports can encourage collaboration and teamwork skills, considering that many games require group strategy and effective communication. In addition, interactions in the electronic world also have the potential to cause conflicts or negative behaviour, such as bullying or online harassment among women.

Participation in eSports also affects the risks associated with virtual games, these risks include exposure to inappropriate or harmful content, as well as the potential for dependence on virtual games that can interfere with their academic and social activities. Other physical health risks include poor posture and lack of physical activity due to spending too much time in front of the screen. Therefore, it is crucial for female students involved in eSports to receive proper guidance and supervision to mitigate the negative impacts while maximizing the positive benefits of their participation for their potential and career development. Future studies can explore how female gamers manage their psychological health and communication despite the increasing cross-gender interactions in digital spaces.

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Conflict of Interest

There is no conflict of interest.

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