Education and Information Technologies
https://doi.org/10.1007/s10639-024-12632-z

I want to play a game: Examining sex differences in the effects of pathological gaming, academic self-efficacy, and academic initiative on academic performance in adolescence

Sara Madeleine Kristensen[1,2] · **Magnus Jørgensen**[1] · **Ellen Haug**[1]

Received: 2 November 2023 / Accepted: 11 March 2024

Abstract

Although research has investigated the association between pathological gaming and academic performance in adolescence, the complexity of the relationship has not been thoroughly examined. This short longitudinal study aimed to investigate the interactions between pathological gaming, academic self-efficacy, academic initiative, and academic performance in an adolescent sample, focusing on sex differences. The participants ($N=2853$; 50.1% boys) were students in the second and third years of upper secondary school. Their grade point average (GPA) at graduation the same year was obtained. The moderated mediation structural equation model results showed that academic self-efficacy, directly and indirectly through academic initiative, impacted later GPA. There was no direct effect of pathological gaming on academic initiative or GPA. However, academic self-efficacy moderated the impact of pathological gaming on GPA for boys. In other words, boys with increased pathological gaming tended to achieve poorer grades in school if they experienced a strong academic self-efficacy. This study contributes to the understanding of the complex interplay between sex, pathological gaming, academic self-efficacy, academic initiative, and academic performance. We suggest that future research examines confidence or other relevant factors as explanatory mechanisms in the relationships between pathological gaming, academic self-efficacy, and GPA, particularly in male samples.

Keywords Pathological gaming · Academic self-efficacy · Academic initiative · GPA · Sex differences

Sara Madeleine Kristensen and Magnus Jørgensen are joint first authors.

Extended author information available on the last page of the article

Published online: 27 March 2024

1 Introduction

During recent decades, playing games on computers, smartphones, and other devices has become increasingly popular during leisure time (Inchley et al., 2017). For most adolescents, regulating their gaming behaviors is not an issue in their educational endeavors (Dindar, 2018); however, for some, it can become problematic and even pathological, with ramifications for educational attainment and academic performance (Adelantado-Renau et al., 2019; Islam et al., 2020; Sahin et al., 2016; Skoric et al., 2009; Wang et al., 2014). The escalation of gaming is thus a concern as it may reflect diminished control (WHO, 2018). For example, in the 11th Revision of the International Classification of Diseases, gaming disorder was included and defined as a pattern of gaming behavior ("digital-gaming" or "video-gaming") characterized by "impaired control over gaming, increasing priority given to gaming over other activities to the extent that gaming takes precedence over other interests and daily activities, and continuation or escalation of gaming despite the occurrence of negative consequences" (WHO, 2018). It is estimated that more than three per cent of the general population suffers from a gaming disorder globally (Stevens et al., 2021), wherein young people (Kim et al., 2022), particularly boys (Wittek et al., 2016), are increasingly prone to becoming addicted to video games.

Why some young people develop a gaming disorder might not be entirely clear yet (Gentile et al., 2017; Paulus et al., 2018), but several indicators, such as stress, family dysfunction, bullying and being bullied, social issues, inattention, psychological distress, low self-esteem, and long average game time have been identified as potential risk factors (Gao et al., 2022). Although the research field on the causes, correlates, and consequences of pathological gaming in adolescence is nascent, longitudinal studies indicate that the development of a gaming disorder can be detrimental to young people's mental health (e.g., Kammerl et al., 2019) and social functioning and life satisfaction (Teng et al., 2020). In a similar vein, individuals with an increasing trajectory of pathological gaming symptoms throughout adolescence tend to experience higher depression levels, aggression, anxiety, shyness, and problematic cell phone use compared to youth with stable low or moderate trajectories of pathological gaming symptoms (Coyne et al., 2020).

The investigation of how pathological gaming and academic performance are related has gained traction due to the increasing importance of educational attainment in today's society (West & Sweeting, 2003). A central belief is that gaming likely distracts students' attention and motivation at the cost of personal interest in schoolwork, resulting in poorer academic achievements (Sahin et al., 2016). Although there is a growth of literature on the effect of pathological gaming on academic performance, research has yet to examine the complexity of this association. This study aims to fill that gap. We investigate sex differences in the interplay between pathological gaming and central motivational factors (i.e., academic self-efficacy and academic initiative) and how these interactions might affect academic performance in an upper secondary school sample.

1.1 Self-efficacy, initiative, and gaming in education

The motivational construct referred to as self-efficacy (Bandura, 1977, 1997) has been established as an important element in educational performance (e.g., Loo & Choy, 2013; Multon et al., 1991; Schunk & DiBenedetto, 2016; Zimmerman & Martinez-Pons, 1990). Bandura (1997) argued that people are increasingly likely to perform actions or function effectively in a particular context if they believe they have the appropriate capabilities demanded to handle specific situations. In an educational setting, self-efficacy facilitates academic initiative (Pintrich & de Groot, 1990), characterized by agency, autonomy, and positive emotions (i.e., comparable to autonomous self-regulation: Danielsen et al., 2010). Initiative behaviors might constitute planning future actions, goal setting, pursuing challenges appropriate to one's own level, persisting when failing, using effective coping strategies, and performing better and more creatively (Hansen et al., 2003; Reeve, 2002). Because such behaviors are instigated by agency, the academic initiative can be considered an explanatory factor in the relationship between academic self-efficacy and academic performance (Bandura, 1997).

Lack of self-control, which might indicate weak self-efficacy, has been put forth as an essential element in the negative association between pathological gaming and academic performance (Haghbin et al., 2013). That is, an increase in pathological gaming might pose a risk to students' abilities to self-regulate their schoolwork due to impaired control in organizing, structuring, and planning their learning. In other words, their academic initiative may become thwarted, resulting in poorer academic performance. In support of this assumption, Sun et al. (2023) established that online game addiction negatively impacted students' behavioral, emotional, and cognitive engagement, reducing academic achievement motivation. In a similar vein, studies on smartphone addiction have shown that students in higher education are more likely to mind-wander during learning (Sumuer & Kaşıkcı, 2022). However, research has not examined whether these associations vary according to levels of self-efficacy. It is possible that students with a strong academic self-efficacy (including high self-control) are better able to self-regulate their learning (e.g., plan future actions, set goals, and use effective coping strategies), attenuating the impact of pathological gaming on academic performance.

Because adolescent boys are particularly likely to suffer from addictive or problematic gaming (e.g., Marraudino et al., 2022; Mihara & Higuchi, 2017; Wittek et al., 2016), research is needed to understand better how sex might play a role in the association between pathological gaming and academic performance (Brunborg et al., 2013; Ferguson et al., 2011; Mentzoni et al., 2011; Wittek et al., 2016). A recent Norwegian study interviewed adolescent boys who spent almost all their leisure time on gaming and found that they, unconcernedly, never did homework and were simultaneously very confident in their academic abilities (Moberg & Vogt, 2022). Boys tend to report stronger academic self-efficacy (Huang, 2013) and have a greater vulnerability to developing a gaming disorder (Dong et al., 2018) than girls, while girls report higher academic initiative (Danielsen et al., 2011) than boys and outperform them academically (Reilly et al., 2019; Voyer & Voyer, 2014). These findings give rise to the question of whether there are sex differences in the interaction effects of pathological gaming and academic self-efficacy on academic performance and if academic initiative can function as an explanatory factor in this relationship.

1.2 Study aims

In this short longitudinal study, we use a large Norwegian upper secondary school sample (N=2853) to investigate the relationships between pathological gaming, academic self-efficacy, academic initiative, and final grade point average (GPA). Further, we examine potential sex differences in these associations. Please see Fig. 1 for the hypothesized model. We formulated the following research questions:

RQ1 Does pathological gaming have a negative impact on academic initiative and later GPA?

RQ2 Does academic self-efficacy, directly, and indirectly through academic initiative, impact later GPA?

RQ3 Is there an interaction effect of pathological gaming and academic self-efficacy on academic initiative and later GPA?

RQ4 Does academic initiative mediate the potential interaction effect of pathological gaming and academic self-efficacy on later GPA?

RQ5 Are there sex differences in the examined relationships?

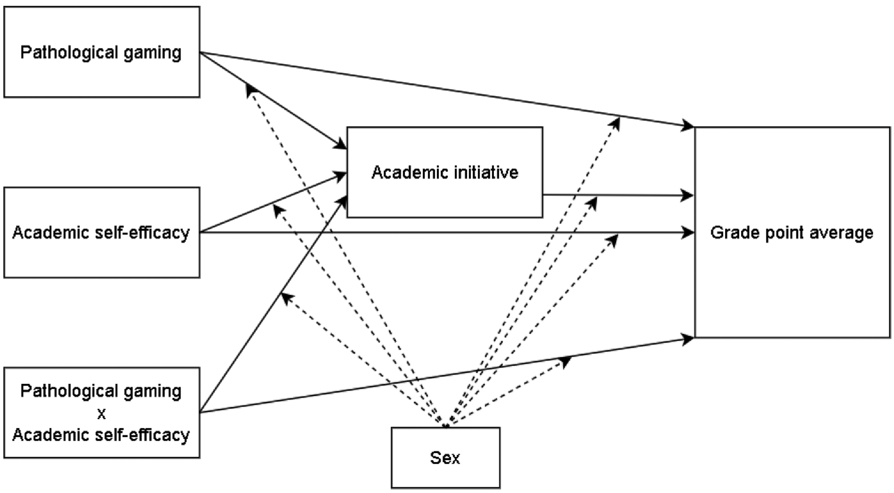

Fig. 1 The hypothesized model of pathological gaming, academic self-efficacy, and academic initiative on grade point average moderated by sex. *Note* The dotted lines are moderating effects.

2 Methods

2.1 Procedure and participants

This study uses data collected in the COMPLETE project (Larsen et al., 2018), a randomized controlled trial aimed to improve the psychosocial learning environment in upper secondary school, a three-year-long education, in Norway. The project implemented two interventions in six schools each, and five schools served as the control group. The schools in all groups are in Western and Northern Norway. The data in this study is from the final measurement occasion in the COMPLETE project, which took place in late March 2019, when measures on pathological gaming were included in the survey. The GPA was obtained from registry data at the end of the academic year in July 2019. Researchers physically collected data during school time, and students who were absent during the data collection were asked to participate via SMS. The Norwegian Centre for Research Data (NSD) approved the study, and all participants were above the age of 16 when data was collected. The students were given written and oral information about the study prior to participation.

The participants ($N=2853$) were in two cohorts enrolled in the second and third (last) year of upper secondary school. There were 1127 third-year students in the first cohort and 1726 second-year students in the second cohort. The ages of the students ranged from 16 to 31 years. Most students were 19 years old or younger during the data collection ($n=2639$, 92.5%). There was an almost equal distribution of boys ($n=1429$, 50.1%) and girls ($n=1424$, 49.9%) in our sample. Regarding geographic locations, 1615 students (56.6%) lived in Western Norway, and 1238 (43.4%) lived in Northern Norway.

2.2 Instruments

2.2.1 Pathological gaming

To measure pathological gaming, we used the 7-item short version of the Game Addiction Scale for Adolescents (GASA: Lemmens et al., 2009). There are seven criteria of pathological gaming (i.e., addiction to games), wherein one item represents one criterion, as opposed to three, on the short scale. Thus, the items measure *salience* ('Did you think about playing a game all day long?'), *tolerance* ('Did you spend increasing amounts of time on games?'), *mood modification* ('Did you play games to forget about real life?'), *relapse* ('Have others unsuccessfully tried to reduce your game use?'), *withdrawal* ('Have you felt bad when you were unable to play?'), *conflict* ('Did you have fights with others (e.g., family, friends) over your time spent on games?'), and *problems* ('Have you neglected other important activities (e.g., school, work, sports) to play games?'). The participants answered the questions on a scale ranging from 1 (never) to 5 (very often). The instrument has produced acceptable reliability ($\omega=0.96$) and achieved weak invariance across different demographic factors (e.g., Liu et al., 2020). In line with previous literature (Krossbakken et al., 2018), we measure gaming pathology on a continuum ranging from low to high severity.

2.2.2 Academic self-efficacy

The students' beliefs in their capability to master and learn their school- and classwork were measured using the 5-item academic efficacy scale in Patterns of Adapted Learning Scale (PALS: Midgley et al., 2000). The instrument is a context-specific assessment of how capable people perceive themselves to perform and master schoolwork, including work in class and at home. The indicators are as follows: 'I'm certain I can master the skills taught in class this year', 'I'm certain I can figure out how to do the most difficult schoolwork', 'I can do almost all the schoolwork if I don't give up', 'Even if the schoolwork is hard, I can learn it', and 'I can do even the hardest schoolwork if I try'. The scale shows acceptable reliability in previous studies (α = 0.78: Midgley et al., 2000).

2.2.3 Academic Initiative

We measured academic initiative (i.e., autonomous self-regulation: Danielsen et al., 2011) using a 5-item Norwegian version of the Youth Experience Survey (YES 2.0) (Hansen & Larson, 2005; Hansen et al., 2003) adapted to an educational setting. The items are as follows: 'I find out how I can reach my goals in schoolwork', 'I plan how I shall do homework', I challenge myself when I am doing schoolwork', 'I concentrate when I am doing schoolwork', and 'I set goals for myself when I am doing schoolwork'. The students ranged their academic initiative on a scale from 1 (never) to 4 (almost always). Previous studies have found acceptable reliability values (α > 0.84) of the instrument in adolescent samples (Danielsen et al., 2010, 2011).

2.2.4 Grade Point Average

The students' grades were collected from registry data at the end of the academic year in July. A mean score was calculated based on the academic performance in each subject the students were enrolled in that school year. The grade point average (GPA) score ranges from 1, a failing grade, to 6.

2.2.5 Sex

Sex (i.e., biological sex assigned at birth) was obtained from registry data. Boys were coded as 0, and girls were coded as 1.

2.2.6 Control variables

Because the students were in one of two intervention groups or the control group, we adjusted for the two intervention conditions in the model. We created two dummy variables based on intervention conditions, wherein the students were either in an intervention (coded as 1) or not (coded as 0). Socioeconomic position was based on a single item, assessing how well off the students perceived their family economically (Iversen & Holsen, 2008). The participants rated their responses on a scale ranging from 1 (very well off) to 5 (not well off at all). We also adjusted for the possible effect of belonging to one or the other cohort and living in Western (coded as 0) or Northern Norway (coded as 1).

2.3 Analyses

Preliminary analyses included confirmatory factor analyses (CFA), omega reliability tests, measurement invariance across relevant factors, and correlation analysis. The analyses were performed in SPSS version 28 (IBM, 2021) and Mplus version 8 (Muthén & Muthén, 1998–2017) with maximum likelihood estimation. The measurement invariance analyses followed the effects-coding approach described by Little et al. (2006). The measurement invariance tests consist of a stepwise approach of increasingly stricter constraints in latent variables across groups. The configural models are freely estimated across groups. In contrast, metric models have equality constraints on corresponding factor loadings across groups, scalar models have equality constraints on the corresponding indicator's intercept, and strict models have equality constraints on the corresponding item's error variance. We followed the recommendations by Chen (2007) when evaluating the fit between nested and comparison models. Acceptable changes between models were ΔCFI < 0.010, ΔRMSEA < 0.015, and ΔSRMR < 0.030. Measurement invariance was tested across sex, cohorts, and geographic regions.

Prior to the main analysis, we created variables based on the sum of the factors' indicators to ease the computational burden of the complex model. In the main analyses, academic self-efficacy, pathological gaming, academic initiative, and GPA were standardized using the 'define' option in Mplus. The main model was specified using structural equation modelling (SEM), wherein pathological gaming, academic self-efficacy, and their interaction term functioned as predictors of GPA, directly and indirectly through academic initiative. To examine sex differences in the mentioned effects, we used the 'knownclass' command with sex as a latent class grouping variable. We compared estimates across groups using the model constraint function. The model was adjusted for intervention conditions, socioeconomic position, cohort belonging, and geographic location.

3 Results

3.1 Confirmatory factor analyses

The pathological gaming scale did not achieve acceptable fit: X2 = 1710.253, df = 14, RMSEA = 0.226, CFI = 0.883, and SRMR = 0.048. Based on modification indices, we stepwise added six error covariances to achieve good model fit: X2 = 37.529, df = 8, RMSEA = 0.039, CFI = 0.998, and SRMR = 0.007. The residual of question 3 ('did you play games to forget about real life?') was correlated with the error term of questions 1 ('did you think about playing a game all day long?'), 2 ('did you spend increasing amounts of time on games?'), and 7 ('have you neglected other important activities (e.g., school, work, sports) to play games?'). Error covariances were added between indicators 1 and 2, 5 ('have you felt bad when you were unable to play?')

and 6 (‘did you have fights with others (e.g., family, friends) over your time spent on games?’), and 4 (‘have others unsuccessfully tried to reduce your game use?’) and 7. A chi-square difference test indicated that the model fit significantly improved after the error covariances were added ($\Delta X2 = 1672.724$, $\Delta df = 6$, $p < .001$).

The latent factor of academic self-efficacy produced unacceptable model fit: $X2 = 579.718$, $df = 5$, $RMSEA = 0.216$, $CFI = 0.923$, and $SRMR = 0.043$. Based on modification indices, we added two error covariances. The residual covariances were between items 1 (‘I’m certain I can master the skills taught in class this year’) and 2 (‘I’m certain I can figure out how to do the most difficult schoolwork’) and between items 3 (‘I can do almost all the work in class if I don’t give up’) and 5 (‘I can do even the hardest work in this class if I try’). The chi-square significantly improved after the residual covariances were added ($\Delta X2 = 560.386$, $\Delta df = 2$, $p < .001$).

Lastly, the latent variable of academic initiative achieved acceptable model fit: $X2 = 69.224$, $df = 5$, $RMSEA = 0.072$, $CFI = 0.989$, and $SRMR = 0.017$.

3.2 Measurement invariance

Table 1 shows details on the measurement invariance results. The academic self-efficacy scale achieved strict invariance across sex and cohorts, and partial strict invariance across geographic regions. The pathological gaming variable achieved partial scalar invariance across sex, strict invariance across cohorts, and partial strict invariance across geographic regions. Lastly, the academic initiative factor achieved strict invariance across sex, cohorts, and geographic regions.

3.3 Descriptive statistics

Table 2 shows the descriptive statistics of the study variables and the correlations between them. The omega reliability test results indicate that the pathological gaming, academic self-efficacy, and academic initiative scales have acceptable reliability ($\omega > 0.89$). Pathological gaming was negatively related to academic initiative and GPA for boys and girls. The negative relationship between pathological gaming and academic self-efficacy was only significant for boys. There were positive associations between academic self-efficacy, academic initiative, and GPA in both sexes.

3.4 The associations between pathological gaming, academic self-efficacy, academic initiative, sex, and GPA

The model results are presented in Fig. 2. The results indicate that pathological gaming did not directly predict academic initiative or later GPA in either sex. Academic self-efficacy positively impacted GPA for boys ($\beta = 0.26$, $p < .001$) and girls ($\beta = 0.18$, $p < .01$). Further, academic self-efficacy had a positive effect on academic initiative for boys ($\beta = 0.31$, $p < .001$) and girls ($\beta = 0.26$, $p < .001$). The effect of academic initiative on GPA was positive for both boys ($\beta = 0.13$, $p < .001$) and girls ($\beta = 0.26$, $p < .001$). The moderation effect of academic self-efficacy on the association between pathological gaming and GPA was significant and negative for boys ($\beta = -0.18$, $p < .001$) and non-significant and negative for girls. That is, the negative effect

Table 1 Measurement invariance of academic self-efficacy, pathological gaming, and academic initiative across sex, cohorts, and geographic regions

	χ^2	df	RMSEA [90%CI]	CFI	SRMR	ΔRMSEA	ΔCFI	ΔSRMR
ACADEMIC SELF-EFFICACY								
Sex (boys vs. girls)								
Configural	36.442	6	0.064 [0.045, 0.085]	0.996	0.008			
Metric	46.387	10	0.054 [0.039, 0.070]	0.995	0.023	0.010	0.001	0.015
Scalar	61.609	14	0.052 [0.039, 0.066]	0.994	0.030	0.002	0.001	0.007
Strict	**113.507**	**19**	**0.063 [0.052, 0.075]**	**0.987**	**0.036**	**0.011**	**0.007**	**0.006**
Cohorts (second vs. third year)								
Configural	22.689	6	0.047 [0.028, 0.069]	0.998	0.007			
Metric	25.802	10	0.036 [0.019, 0.053]	0.998	0.014	0.011	0.000	0.007
Scalar	29.654	14	0.030 [0.015, 0.045]	0.998	0.012	0.006	0.000	0.002
Strict	**47.369**	**19**	**0.035 [0.022, 0.047]**	**0.996**	**0.021**	**0.005**	**0.002**	**0.009**
Geographic regions (West vs. North)								
Configural	20.589	6	0.044 [0.024, 0.066]	0.998	0.008			
Metric	25.132	10	0.035 [0.018, 0.052]	0.998	0.014	0.011	0.000	0.006
Scalar	30.632	14	0.031 [0.016, 0.046]	0.998	0.019	0.004	0.000	0.005
Strict	216.711	19	0.092 [0.081, 0.103]	0.974	0.071	0.061	0.024	0.052
Partial strict[a]	**64.013**	**16**	**0.049 [0.037, 0.062]**	**0.994**	**0.034**	**0.043**	**0.020**	**0.027**
PATHOLOGICAL GAMING								
Sex (boys vs. girls)								
Configural	72.061	16	0.054 [0.042, 0.067]	0.996	0.010			
Metric	130.148	22	0.064 [0.054, 0.075]	0.992	0.038	0.010	0.004	0.028
Scalar	260.223	28	0.084 [0.074, 0.093]	0.983	0.071	0.020	0.009	0.033
Partial scalar[b]	**222.673**	**27**	**0.078 [0.069, 0.088]**	**0.986**	**0.062**	**0.006**	**0.003**	**0.009**
Strict	1902.543	34	0.215 [0.207, 0.223]	0.862	0.192	0.137	0.124	0.131
Cohorts (second vs. third year)								
Configural	81.638	16	0.059 [0.046, 0.072]	0.995	0.010			
Metric	108.491	22	0.058 [0.047, 0.069]	0.994	0.027	0.001	0.001	0.017
Scalar	132.385	28	0.056 [0.047, 0.066]	0.993	0.027	0.002	0.001	0.000
Strict	**178.725**	**35**	**0.059 [0.050, 0.067]**	**0.990**	**0.034**	**0.003**	**0.003**	**0.007**
Geographic regions (West vs. North)								
Configural	71.062	16	0.054 [0.041, 0.067]	0.996	0.008			
Metric	81.458	22	0.048 [0.037, 0.059]	0.996	0.020	0.006	0.000	0.012
Scalar	97.006	28	0.046 [0.036, 0.056]	0.995	0.026	0.002	0.001	0.006
Strict	192.539	35	0.062 [0.053, 0.070]	0.989	0.036	0.016	0.006	0.010
Partial strict[c]	**150.451**	**34**	**0.054 [0.045, 0.063]**	**0.992**	**0.033**	**0.008**	**0.003**	**0.003**
ACADEMIC INITIATIVE								
Sex (boys vs. girls)								
Configural	94.187	10	0.083 [0.068, 0.098]	0.986	0.021			
Metric	106.988	14	0.073 [0.061, 0.087]	0.985	0.034	0.010	0.001	0.013
Scalar	144.736	18	0.075 [0.064, 0.087]	0.979	0.040	0.002	0.006	0.006
Strict	**177.212**	**23**	**0.074 [0.064, 0.084]**	**0.975**	**0.032**	**0.001**	**0.004**	**0.008**
Cohorts (second vs. third year)								
Configural	33.620	10	0.093 [0.059, 0.128]	0.988	0.020			
Metric	36.162	14	0.076 [0.046, 0.107]	0.989	0.028	0.017	0.001	0.008
Scalar	42.206	18	0.070 [0.043, 0.098]	0.988	0.031	0.006	0.001	0.003
Strict	**43.543**	**23**	**0.057 [0.030, 0.083]**	**0.990**	**0.029**	**0.013**	**0.002**	**0.002**

Table 1 (continued)

	χ^2	df	RMSEA [90%CI]	CFI	SRMR	ΔRMSEA	ΔCFI	ΔSRMR
Geographic regions (West vs. North)								
Configural	81.122	10	0.076 [0.061, 0.092]	0.988	0.019			
Metric	94.241	14	0.068 [0.055, 0.081]	0.987	0.034	0.008	0.001	0.015
Scalar	145.261	18	0.076 [0.064, 0.087]	0.979	0.048	0.008	0.008	0.014
Strict	**164.461**	**23**	**0.071 [0.061, 0.081]**	**0.977**	**0.067**	**0.005**	**0.002**	**0.019**

Note[a] = three item residual variances were freely estimated across groups for model fit, [b] = one item intercept was freely estimated across groups for model fit, [c] = one item residual variance was freely estimated across groups for model fit. The highest level of achieved invariance is enhanced in bold

Table 2 Descriptive statistics and correlation coefficients

	n	ω	Min-max	Boys M (SD)	Girls M (SD)	1	2	3	4
1. Pathological gaming	2318	0.94	1–5	2.11 (0.97)	1.30 (0.64)	–	−0.05	−0.09**	−0.19**
2. Academic self-efficacy	2433	0.89	1–5	3.81 (1.04)	3.57 (0.98)	−0.17**	–	0.30**	0.26**
3. Academic initiative	2469	0.91	1–4	2.54 (0.76)	2.65 (0.76)	−0.15**	0.30**	–	0.36**
4. Grade point average	2560	–	1–6	4.06 (0.87)	4.33 (0.86)	−0.22**	0.27**	0.25**	–

Note ** $p<.01$. Boys are below the diagonal, and girls are above in the correlation matrix

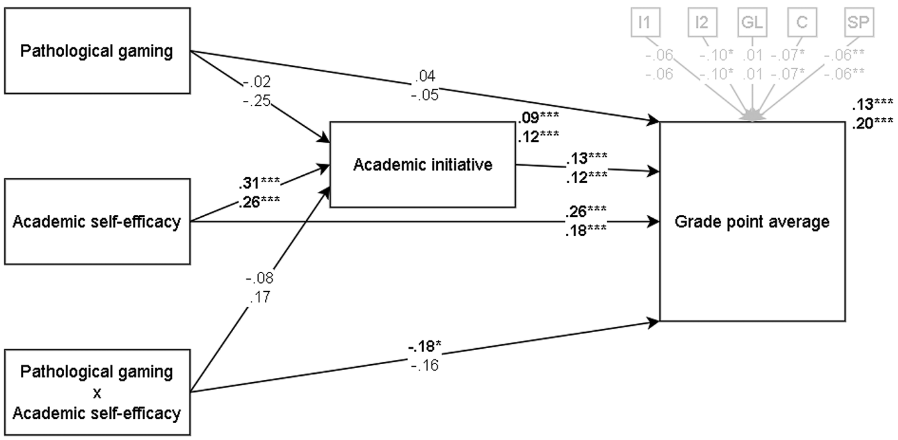

Fig. 2 The effects of pathological gaming, academic self-efficacy, and academic initiative on grade point average separate for boys and girls. *Note* * $p<.05$, ** $p<.01$, *** $p<.001$. Boys are on the upper line, and girls are on the lower line. The standardized results are presented in the model. I1 = intervention condition 1, I2 = intervention condition 2, GL = geographic location, C = cohort, SP = socioeconomic position

of pathological gaming on GPA became larger when boys reported stronger academic self-efficacy, but this effect was not significant for girls.

Table 3 shows the indirect effects of pathological gaming and academic self-efficacy on GPA through academic initiative. The results imply that the effect of academic self-efficacy on GPA was partially mediated by academic initiative for boys ($\beta = 0.04, p < .001$) and girls ($\beta = 0.07, p < .001$). Pathological gaming and the interaction between pathological gaming and self-efficacy did not significantly impact GPA indirectly through academic initiative for either sex. The sex difference test indicated that the model parameters were not significantly different across sexes ($p > .05$).

4 Discussion

This study aimed to shed light on the complexity of the relationships between pathological gaming, academic self-efficacy, academic initiative, sex, and GPA. The model results indicated that there were no direct effects of pathological gaming on academic initiative and later GPA in either sex. Academic self-efficacy directly and indirectly through academic initiative impacted later GPA for boys and girls. There was a significant moderating effect of academic self-efficacy on the association between pathological gaming and GPA for boys but not girls.

4.1 The association between pathological gaming, academic initiative, and GPA

The model results indicated that pathological gaming did not directly impact GPA for either sex. Aligning with the study by Dindar (2018), our results imply that most adolescents are able to self-regulate their own learning and function well academically despite spending a lot of time gaming. Indeed, previous research may have overestimated the effect of gaming on academic achievement. For instance, Drummond and Sauer (2014), using data from over 192,000 students in 22 countries, found that the differences in academic performance were negligible across video game usage frequencies. Like Drummond and Sauer (2014), our study utilized standardized test scores from registry data concerning academic performance. Notably, however, some studies have found negative relations between gaming and academic performance using self-reported measures of academic performance (e.g., Sahin et al., 2016; Wang

Table 3 Indirect effects of pathological gaming and academic self-efficacy on grade point average through academic initiative

Independent	Dependent	Via Academic initiative					
		Boys			Girls		
		β	SE	95% CI	β	SE	95% CI
Pathological gaming	GPA	−0.003	0.013	−0.028, 0.022	−0.062	0.041	−0.143, 0.018
Academic self-efficacy	GPA	0.041***	0.012	0.018, 0.064	0.065***	0.019	0.029, 0.102
Pathological gaming X academic self-efficacy	GPA	−0.011	0.013	−0.037, 0.016	0.042	0.047	−0.050, 0.134

Note *** $p < .001$. β = standardized regression coefficient, SE = standard error, CI = confidence interval et al., 2014). In other words, the assumed negative impact of gaming on academic endeavors is inconclusive and may vary according to the performance measure utilized. Additionally, a recent meta-analysis found that academic performance is a risk factor of developing internet gaming disorder (Gao et al., 2022). This indicates that it might be beneficial to further explore this direction of effects and other possible explanatory factors in the development of gaming disorder in longitudinal studies. Such research could have important implications for intervention research and policies on local and national levels aimed at reducing the prevalence and severity of pathological gaming in adolescence (for an overview, see e.g., Chen et al., 2023).

Pathological gaming did not significantly impact academic initiative for either sex. Sun et al. (2023) found that game addiction had a negative impact on students' behavioral, emotional, and cognitive engagement, thus reducing their academic achievement motivation. Our findings do not align with this. Of note, the measure of academic initiative also includes indicators of interest and joy, central to intrinsic motivation, in addition to engagement indicators. Thus, the discrepancy between previous research and our study might partly be explained by the inclusion of intrinsic motivation as part of the academic initiative construct. Because students who are intrinsically motivated to do schoolwork are more likely to be highly engaged learners (Pintrich & de Groot, 1990; Ryan & Deci, 2017), they might not be as susceptible to the possible negative influences of pathological gaming on academic outcomes as others. However, there is a lack of studies on the association between pathological gaming and academic initiative (i.e., intrinsic motivation and engagement), and we suggest researchers include different aspects of school-related motivation to untangle the association further.

4.2 The mediating effect of academic initiative

Academic initiative mediated the relationship between academic self-efficacy and later GPA for both sexes, aligning with central assumptions of self-efficacy theory (Bandura, 1977, 1997). In other words, it is likely that students with strong academic self-efficacy had the necessary resources available to initiate self-regulated learning behaviors, resulting in greater academic performances. Indeed, research shows that academic self-efficacy is intimately related to academic initiative and academic performance across time in a mutually beneficial feedback loop (Burns et al., 2020; Kristensen et al., 2023; Talsma et al., 2018; Taylor et al., 2014). Academic self-efficacy is promoted in educational settings where teachers are supportive (Gutiérrez & Tomás, 2019) and the student's need for belonging is satisfied by warm interpersonal relationships (Zysberg & Schwabsky, 2021).

4.3 Sex differences in the relationship between pathological gaming, academic self-efficacy, and GPA

Academic self-efficacy moderated the effect of pathological gaming on later GPA for boys. We found that boys with higher levels of academic self-efficacy experienced an increasingly negative effect of pathological gaming on their overall grades in upper secondary. Surprisingly, academic initiative did not mediate this relationship. In other words, academic initiative, typically expressed as time spent planning, structuring, setting goals, and using effective coping, did not explain why academic self-efficacy impacted the effect of pathological gaming on later GPA. The lack of mediation suggests that other mechanisms are involved. For example, Moores and Chang (2009) found that overconfidence leads to a negative association between self-efficacy and subsequent performance. In a similar vein, one study found that although game addiction decreased GPA and self-esteem, it did not impact self-confidence in a late adolescent and young adult sample of students (Toker & Baturay, 2016). Hence, it is possible that confidence plays a key role in the relationships between pathological gaming, self-efficacy, and academic performance. We suggest that researchers include this factor in future studies on pathological gaming, academic self-efficacy, and academic performance to further our understanding of these complex associations.

4.4 Strengths and limitations

One strength of the present study is the large and representative sample size (including representation from both Western and Northern Norway), which strengthens the external validity of our findings in relation to the general Norwegian adolescent population.

However, some limitations of the present study should be noted. Firstly, we employed a short longitudinal study, which warrants caution in causal inferences. Additional longitudinal studies might increase the certainty of the direction of effects between the study variables. However, due to the novelty of the study's aims and variables, we still consider the present study an important contribution to the growing literature on pathological gaming and game addiction in young people.

Another limitation of the present study is the issue of generalizability. The majority of the sample was 19 years old or younger (down to 17 years). As previously noted by Krossbakken et al. (2018), this is the most at-risk age group for addictive behaviors. Nevertheless, the results might not be generalized to other age groups.

5 Conclusion

This study investigated if (1) pathological gaming negatively impacted academic initiative and later GPA, (2) academic self-efficacy, directly, and indirectly through academic initiative, impacted later GPA, (3) there was an interaction effect of pathological gaming and academic self-efficacy on academic initiative and GPA, (4) academic initiative mediated the potential interaction effect of pathological gaming and academic self-efficacy on GPA, and (5) if there were sex differences in the examined relationships. The results implied that pathological gaming did not impact academic initiative or GPA. Academic self-efficacy, on the other hand, directly and indirectly through academic initiative affected later GPA. Moreover, academic self-efficacy moderated the relationship between pathological gaming and academic performance for boys. This finding represents a novel contribution to the research field and implies complex associations between sex, pathological gaming, academic self-efficacy, and academic performance in adolescence. Because academic initiative did not mediate the interaction effect of pathological gaming and academic self-efficacy on academic performance, more research is needed to untangle the direction of effects further and increase our understanding of how pathological gaming functions in young people's academic adjustment.

Funding The present research is part of the COMPLETE project (https://complete.w.uib.no/) and has received funding from the Norwegian Ministry of Education and Research (20161789). Open access funding provided by Western Norway University Of Applied Sciences.

Data availability The data underlying this study will be shared upon reasonable request to the corresponding author.

Declarations

Conflict of interest We have no known conflict of interest to disclose.

References

Adelantado-Renau, M., Moliner-Urdiales, D., Cavero-Redondo, I., Beltran-Valls, M. R., Martínez-Vizcaíno, V., & Álvarez-Bueno, C. (2019). Association between screen media use and academic performance among children and adolescents: A systematic review and meta-analysis. *JAMA Pediatrics*, *173*(11), 1058–1067. https://doi.org/10.1001/jamapediatrics.2019.3176.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review*, *84*(2), 191–215. https://doi.org/10.1037/0033-295X.84.2.191.

Bandura, A. (1997). *Self-efficacy: The exercise of control*. Freeman.

Brunborg, G. S., Mentzoni, R. A., Melkevik, O. R., Torsheim, T., Samdal, O., Hetland, J., Andreassen, C. S., & Palleson, S. (2013). Gaming addiction, gaming engagement, and psychological health complaints among Norwegian adolescents. *Media Psychology*, *16*(1), 115–128. https://doi.org/10.1080/15213269.2012.756374.

Burns, R. A., Crisp, D. A., & Burns, R. B. (2020). Re-examining the reciprocal effects model of self-concept, self-efficacy, and academic achievement in a comparison of the Cross-lagged Panel and Random-Intercept Cross-lagged Panel frameworks. *British Journal of Educational Psychology*, *90*(1), 77–91. https://doi.org/10.1111/bjep.12265.

Chen, F. F. (2007). Sensitivity of goodness of fit indexes to lack of measurement invariance. *Structural Equation Modeling: A Multidisciplinary Journal*, *14*(3), 464–504. https://doi.org/10.1080/10705510701301834.

Chen, Y., Lu, J., Wang, L., & Gao, X. (2023). Effective interventions for gaming disorder: A systematic review of randomized control trials. *Frontiers in Psychiatry*, *14*, 1098922. https://doi.org/10.3389/fpsyt.2023.1098922.

Coyne, S. M., Stockdale, L. A., Warburton, W., Gentile, D. A., Yang, C., & Merrill, B. M. (2020). Pathological video game symptoms from adolescence to emerging adulthood: A 6-year longitudinal study of trajectories, predictors, and outcomes. *Developmental Psychology*, *56*(7), 1385–1396. https://doi.org/10.1037/dev0000939.

Danielsen, A. G., Wiium, N., Wilhelmsen, B. U., & Wold, B. (2010). Perceived support provided by teachers and classmates and students' self-reported academic initiative. *Journal of School Psychology*, *48*(3), 247–267. https://doi.org/10.1016/j.jsp.2010.02.002.

Danielsen, A. G., Breivik, K., & Wold, B. (2011). Do perceived academic competence and school satisfaction mediate the relationships between perceived support provided by teachers and classmates, and academic initiative? *Scandinavian Journal of Educational Research*, *55*(4), 379–401. https://doi.org/10.1080/00313831.2011.587322.

Dindar, M. (2018). An empirical study on gender, video game play, academic success and complex problem solving skills. *Computers & Education*, *125*, 39–52. https://doi.org/10.1016/j.compedu.2018.05.018.

Dong, G., Wang, L., Du, X., & Potenza, M. N. (2018). Gender-related differences in neural responses to gaming cues before and after gaming: Implications for gender-specific vulnerabilities to internet gaming disorder. *Social Cognitive and Affective Neuroscience*, *13*(11), 1203–1214. https://doi.org/10.1093/scan/nsy084.

Drummond, A., & Sauer, J. D. (2014). Video-games do not negatively impact adolescent academic performance in science, mathematics or reading. *PLoS One*, *9*(4). https://doi.org/10.1371/journal.pone.0087943.

Ferguson, C. J., Coulson, M., & Barnett, J. (2011). A meta-analysis of pathological gaming prevalence and comorbidity with mental health, academic and social problems. *Journal of Psychiatric Research*, *45*(12), 1573–1578. https://doi.org/10.1016/j.jpsychires.2011.09.005.

Gao, Y. X., Wang, J. Y., & Dong, G. H. (2022). The prevalence and possible risk factors of internet gaming disorder among adolescents and young adults: Systematic reviews and meta-analyses. *Journal of Psychiatric Research*, *154*, 35–43. https://doi.org/10.1016/j.jpsychires.2022.06.049.

Gentile, D. A., Bailey, K., Bavelier, D., Brockmyer, J. F., Cash, H., Coyne, S. M., Doan, A., Grant, D. S., Green, C. S., Griffiths, M., Markle, T., Petry, N. M., Prot, S., Rae, C. D., Rehbein, F., Rich, M., Sullivan, D., Woolley, E., & Young, K. (2017). Internet gaming disorder in children and adolescents. *Pediatrics*, *140*(2), S81–s85. https://doi.org/10.1542/peds.2016-1758H.

Gutiérrez, M., & Tomás, J. M. (2019). The role of perceived autonomy support in predicting university students' academic success mediated by academic self-efficacy and school engagement. *Educational Psychology*, *39*(6), 729–748. https://doi.org/10.1080/01443410.2019.1566519.

Haghbin, M., Shaterian, F., Hosseinzadeh, D., & Griffiths, M. D. (2013). A brief report on the relationship between self-control, video game addiction and academic achievement in normal and ADHD students. *Journal of Behavioral Addictions*, *2*(4), 239–243. https://doi.org/10.1556/jba.2.2013.4.7.

Hansen, D. M., & Larson, R. W. (2005). *The youth experience survey 2.0: Instrument revisions and validity testing*. University of Illinois.

Hansen, D. M., Larson, R. W., & Dworkin, J. B. (2003). What adolescents learn in organized youth activities: A survey of self-reported developmental experiences. *Journal of Research on Adolescence*, *13*(1), 25–55. https://doi.org/10.1111/1532-7795.1301006.

Huang, C. (2013). Gender differences in academic self-efficacy: A meta-analysis. *European Journal of Psychology of Education*, *28*, 1–35. https://doi.org/10.1007/s10212-011-0097-y.

IBM. (2021). *IBM SPSS statistics for Windows, Version 28.0*. IBM Corp.

Inchley, J., Currie, D., Jewell, J., Breda, J., & Barnekow, V. (2017). *Adolescent obesity and related behaviours: Trends and inequalities in the WHO European Region, 2002–2014: Observations from the Health Behaviour in School-aged children (HBSC) WHO collaborative cross-national study*. World Health Organization. Regional Office for Europe. https://apps.who.int/iris/handle/10665/329417.

Islam, M. I., Biswas, R. K., & Khanam, R. (2020). Effect of internet use and electronic game-play on academic performance of Australian children. *Scientific Reports*, *10*(1). https://doi.org/10.1038/s41598-020-78916-9.

Iversen, A., & Holsen, I. (2008). Inequality in health, psychosocial resources and health behavior in early adolescence: The influence of different indicators of socioeconomic position. *Child Indicators Research*, *1*, 291–302. https://doi.org/10.1007/s12187-008-9015-5.

Kammerl, R., Kriston, L., Lincoln, T., Wartberg, L., & Zieglmeier, M. (2019). A longitudinal study on psychosocial causes and consequences of internet gaming disorder in adolescence. *Psychological Medicine*, *49*(2), 287–294. https://doi.org/10.1017/S003329171800082X.

Kim, H. S., Son, G., Roh, E. B., Ahn, W. Y., Kim, J., Shin, S. H., Chey, J., & Choi, K. H. (2022). Prevalence of gaming disorder: A meta-analysis. *Addictive Behaviors*, *126*, 107183. https://doi.org/10.1016/j.addbeh.2021.107183.

Kristensen, S. M., Danielsen, A. G., Urke, H. B., Larsen, T. M. B., & Aanes, M. M. (2023). The positive feedback loop between academic self-efficacy, academic initiative, and grade point average: A parallel process latent growth curve model. *Educational Psychology*, 1–19. https://doi.org/10.1080/01443410.2023.2242603.

Krossbakken, E., Pallesen, S., Mentzoni, R. A., King, D. L., Molde, H., Finserås, T. R., & Torsheim, T. (2018). A cross-lagged study of developmental trajectories of video game engagement, addiction, and mental health [Original Research]. *Frontiers in Psychology*, *9*, https://doi.org/10.3389/fpsyg.2018.02239.

Larsen, T., Urke, H. B., Holsen, I., Anvik, C. H., Olsen, T., Waldahl, R. H., Antonsen, K. M., Johnson, R., Tobro, M., Brastad, B., & Hansen, T. B. (2018). COMPLETE – A school-based intervention project to increase completion of upper secondary school in Norway: Study protocol for a cluster randomized controlled trial. *Bmc Public Health*, *18*(1), 340. https://doi.org/10.1186/s12889-018-5241-z.

Lemmens, J., Valkenburg, P., & Peter, J. (2009). Development and validation of a game addiction scale for adolescents. *Media Psychology*, *12*, 77–95. https://doi.org/10.1080/15213260802669458.

Little, T. D., Slegers, D. W., & Card, N. A. (2006). A non-arbitrary method of identifying and scaling latent variables in SEM and MACS models. *Structural Equation Modeling: A Multidisciplinary Journal*, *13*(1), 59–72. https://doi.org/10.1207/s15328007sem1301_3.

Liu, Y., Wang, Q., Jou, M., Wang, B., An, Y., & Li, Z. (2020). Psychometric properties and measurement invariance of the 7-item game addiction scale (GAS) among Chinese college students. *Bmc Psychiatry*, *20*(1), 484. https://doi.org/10.1186/s12888-020-02830-7.

Loo, C. W., & Choy, J. L. F. (2013). 2017/08/14). Sources of Self-Efficacy Influencing Academic performance of Engineering Students. *American Journal of Educational Research*, *1*(3), 86–92. https://doi.org/10.12691/education-1-3-4.

Marraudino, M., Bonaldo, B., Vitiello, B., Bergui, G. C., & Panzica, G. (2022). Sexual differences in internet gaming disorder (IGD): From psychological features to Neuroanatomical Networks. *Journal of Clinical Medicine*, *11*(4), 1018. https://doi.org/10.3390/jcm11041018.

Mentzoni, R. A., Brunborg, G. S., Molde, H., Myrseth, H., Skouverøe, K. J., Hetland, J., & Pallesen, S. (2011). Problematic video game use: Estimated prevalence and associations with mental and physical health. *Cyberpsychology Behavior and Social Networking*, *14*(10), 591–596. https://doi.org/10.1089/cyber.2010.0260.

Midgley, C., Maehr, M. L., Hruda, L. Z., Anderman, E., Anderman, L., Freeman, K. E., Gheen, M., Kaplan, A., Kumar, R., Middleton, M. J., Nelson, J., Roeser, R., & Urdan, T. (2000). *Manual for the patterns of adaptive learning scales (PALS)*. University of Michigan.

Mihara, S., & Higuchi, S. (2017). Cross-sectional and longitudinal epidemiological studies of internet gaming disorder: A systematic review of the literature. *Psychiatry and Clinical Neurosciences*, *71*(7), 425–444. https://doi.org/10.1111/pcn.12532.

Moberg, K. E., & Vogt, K. (2022). Gutters tidsbruk på dataspill og skolearbeid [Boys' time spent on computer games and schoolwork]. *Nordic Journal for Youth Research*, *3*(2), 171–189. https://doi.org/10.18261/ntu.3.2.3.

Moores, T. T., & Chang, J. C. J. (2009). Self-efficacy, overconfidence, and the negative effect on subsequent performance: A field study. *Information & Management*, *46*(2), 69–76. https://doi.org/10.1016/j.im.2008.11.006.

Multon, K. D., Brown, S. D., & Lent, R. W. (1991). Relation of self-efficacy beliefs to academic outcomes: A meta-analytic investigation. *Journal of Counseling Psychology*, *38*, 30–38. https://doi.org/10.1037/0022-0167.38.1.30.

Muthén, L. K., & Muthén, B. O. (1998–2017). *Mplus user's guide. Eight edition*. Muthén & Muthén.

Paulus, F. W., Ohmann, S., von Gontard, A., & Popow, C. (2018). Internet gaming disorder in children and adolescents: A systematic review. *Developmental Medicine & Child Neurology*, *60*(7), 645–659. https://doi.org/10.1111/dmcn.13754.

Pintrich, P. R., & de Groot, E. V. (1990). Motivational and self-regulated learning components of classroom academic performance. *Journal of Educational Psychology*, *82*(1), 33–40. https://doi.org/10.1037/0022-0663.82.1.33.

Reeve, J. (2002). Self-determination theory applied to educational settings. In E. L. Deci, & R. M. Ryan (Eds.), *Handbook of self-determination research* (pp. 183–203). University of Rochester.

Reilly, D., Neumann, D. L., & Andrews, G. (2019). Gender differences in reading and writing achievement: Evidence from the National Assessment of Educational Progress (NAEP). *American Psychologist*, *74*, 445–458. https://doi.org/10.1037/amp0000356.

Ryan, R. M., & Deci, E. L. (2017). *Self-determination theory: Basic psychological needs in motivation, development, and wellness*. Guilford Press.

Sahin, M., Gumus, Y. Y., & Dincel, S. (2016). Game addiction and academic achievement. *Educational Psychology*, *36*(9), 1533–1543. https://doi.org/10.1080/01443410.2014.972342.

Schunk, D., H., & DiBenedetto, M., K (2016). Self-efficacy theory in education. In K. R. Wentzel, & D. B. Miele (Eds.), *Handbook of motivation at School*. Routledge/Taylor & Francis Group. https://doi.org/10.4324/9781315773384.ch3.

Skoric, M. M., Teo, L. L. C., & Neo, R. L. (2009). Children and video games: Addiction, engagement, and scholastic achievement. *CyberPsychology & Behavior*, *12*(5), 567–572. https://doi.org/10.1089/cpb.2009.0079.

Stevens, M. W., Dorstyn, D., Delfabbro, P. H., & King, D. L. (2021). Global prevalence of gaming disorder: A systematic review and meta-analysis. *Australian & New Zealand Journal of Psychiatry*, *55*(6), 553–568. https://doi.org/10.1177/0004867420962851.

Sumuer, E., & Kaşıkcı, D. N. (2022). The role of smartphones in college students' mind-wandering during learning. *Computers & Education*, *190*, 104616. https://doi.org/10.1016/j.compedu.2022.104616.

Sun, R. Q., Sun, G. F., & Ye, J. H. (2023). The effects of online game addiction on reduced academic achievement motivation among Chinese college students: The mediating role of learning engagement [Original Research]. *Frontiers in Psychology*, 14. https://doi.org/10.3389/fpsyg.2023.1185353.

Talsma, K., Schüz, B., Schwarzer, R., & Norris, K. (2018). I believe, therefore I achieve (and vice versa): A meta-analytic cross-lagged panel analysis of self-efficacy and academic performance. *Learning and Individual Differences*, *61*, 136–150. https://doi.org/10.1016/j.lindif.2017.11.015.

Taylor, G., Jungert, T., Mageau, G. A., Schattke, K., Dedic, H., Rosenfield, S., & Koestner, R. (2014). A self-determination theory approach to predicting school achievement over time: The unique role of intrinsic motivation. *Contemporary Educational Psychology*, *39*(4), 342–358. https://doi.org/10.1016/j.cedpsych.2014.08.002.

Teng, Z., Pontes, H. M., Nie, Q., Xiang, G., Griffiths, M. D., & Guo, C. (2020). Internet gaming disorder and psychosocial well-being: A longitudinal study of older-aged adolescents and emerging adults. *Addictive Behaviors*, *110*, 106530. https://doi.org/10.1016/j.addbeh.2020.106530.

Toker, S., & Baturay, M. H. (2016). Antecedents and consequences of game addiction. *Computers in Human Behavior*, *55*, 668–679. https://doi.org/10.1016/j.chb.2015.10.002.

Voyer, D., & Voyer, S. D. (2014). Gender differences in scholastic achievement: A meta-analysis. *Psychological Bulletin*, *140*, 1174–1204. https://doi.org/10.1037/a0036620.

Wang, C. W., Chan, C. L. W., Mak, K. K., Ho, S. Y., Wong, P. W. C., & Ho, R. T. H. (2014). Prevalence and correlates of video and internet gaming addiction among Hong Kong adolescents: A pilot study. *The Scientific World Journal*, *2014*, https://doi.org/10.1155/2014/874648. Article 874648.

West, P., & Sweeting, H. (2003). Fifteen, female and stressed: Changing patterns of psychological distress over time. *Journal of Child Psychology and Psychiatry*, *44*, 399–411. https://doi.org/10.1111/1469-7610.00130.

WHO (2018). *Inclusion of gaming disorder*. https://www.who.int/news/item/14-09-2018-inclusion-of-gaming-disorder-in-icd-11.

Wittek, C. T., Finserås, T. R., Pallesen, S., Mentzoni, R. A., Hanss, D., Griffiths, M. D., & Molde, H. (2016). Prevalence and predictors of video game addiction: A study based on a national representative sample of gamers. *International Journal of Mental Health and Addiction*, *14*(5), 672–686. https://doi.org/10.1007/s11469-015-9592-8.

Zimmerman, B. J., & Martinez-Pons, M. (1990). Student differences in self-regulated learning: Relating grade, sex, and giftedness to self-efficacy and strategy use. *Journal of Educational Psychology*, *82*(1), 51–59. https://doi.org/10.1037/0022-0663.82.1.51.

Zysberg, L., & Schwabsky, N. (2021). School climate, academic self-efficacy and student achievement. *Educational Psychology*, *41*(4), 467–482. https://doi.org/10.1080/01443410.2020.1813690.

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Authors and Affiliations

Sara Madeleine Kristensen[1,2] · **Magnus Jørgensen**[1] · **Ellen Haug**[1]

✉ Sara Madeleine Kristensen
Madeleinekristensen@outlook.com

[1] Department of Health Promotion and Development, University of Bergen, Årstadveien 17, Bergen 5009, Norway

[2] Department of Pedagogy, Religion and Social Studies, Western Norway University of Applied Sciences, Inndalsveien 28, Bergen 5063, Norway