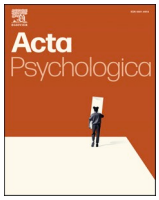
Acta Psychologica 263 (2026) 106321

Contents lists available at ScienceDirect

Acta Psychologica

journal homepage: www.elsevier.com/locate/actpsy



Daily stress and gaming – an ambulatory assessment study in individuals with pathological, risky, and non-problematic gaming behavior

Anna M. Schmid [a,*], Tobias A. Thomas [b], Andreas Oelker [c], Dominik Vollbracht [d], Niklas Meurer [c], Lukas Mallon [e], Martin Diers [e], Nanne Dominick [f], Miriam Kampa [g,h], Oliver T. Wolf [i], Matthias Brand [c,j,k], Astrid Müller [b], Sabine Steins-Loeber [a]

[a] Department of Clinical Psychology and Psychotherapy, University of Bamberg, Bamberg, Germany
[b] Department of Psychosomatic Medicine and Psychotherapy, Hannover Medical School, Hanover, Germany
[c] General Psychology: Cognition, Faculty of Computer Science, University of Duisburg-Essen, Duisburg, Germany
[d] Department of Psychology, RPTU University Kaiserslautern-Landau, Landau, Germany
[e] Clinical and Experimental Behavioral Medicine, Department of Psychosomatic Medicine and Psychotherapy, LWL University Hospital, Ruhr University Bochum, Bochum, Germany
[f] Outpatient Clinic for Behavioral Addictions, Department of Psychosomatic Medicine and Psychotherapy, University Medical Center of the Johannes Gutenberg-University, Mainz, Germany
[g] Department of Psychotherapy and Systems Neuroscience, Justus Liebig University Giessen, Giessen, Germany
[h] Bender Institute of Neuroimaging, Justus Liebig University Giessen, Giessen, Germany
[i] Department of Cognitive Psychology, Ruhr University Bochum, Bochum, Germany
[j] Center for Behavioral Addiction Research (CeBAR), Center for Translational Neuro- and Behavioral Sciences, University Hospital Essen, University of Duisburg-Essen, Germany
[k] Erwin L. Hahn Institute for Magnetic Resonance Imaging, Essen, Germany

A B S T R A C T

Stress is considered a relevant factor in the development and maintenance of not only substance-related addictions but also behavioral addictions. Against this background, the current study investigated the association between daily stress and gaming use patterns in individuals with pathological ($n = 62$), risky ($n = 62$), and non-problematic ($n = 62$) gaming behavior as assessed with a structured clinical interview. Coping motives and perceived chronic stress, for which previous research reported associations with gaming disorder, were examined as potential moderators. After a laboratory session, in which symptoms of gaming disorder, gaming motives and chronic stress were assessed, participants completed a 14-day ambulatory assessment of daily stress, daily gaming usage (yes/no), and daily use time of gaming. Individuals with pathological gaming behavior displayed significantly higher levels of chronic stress and a stronger endorsement of several gaming motives compared to individuals with risky and non-problematic gaming behavior. Daily usage and daily use time were positively predicted by social gaming motives and symptom severity but negatively predicted by daily stress. The negative association was found independently of chronic stress, coping-related gaming motives, and continuous symptom severity. Our findings may indicate that, on stressful days, individuals abstained from gaming or reduced gaming time in order to fulfil more pressing tasks. However, due to the cross-sectional design, the negative association could also reflect a potential stress-relieving effect of gaming. While the role of daily stress in gaming disorder requires further investigation, our findings support chronic stress and gaming motives as factors associated with gaming disorder.

1. Introduction

While gaming presents an enriching leisure time activity for millions of people around the globe, a minority of individuals develop problematic use patterns, characterized, for example, by diminished control over gaming and a neglect of other activities or responsibilities in multiple areas of everyday-life due to gaming (Beranuy et al., 2013; Chappell et al., 2006; Saunders et al., 2017; Shi et al., 2019). The accumulating evidence of functional impairment and distress (Saunders et al., 2017) in combination with substantial research that demonstrated its similarities with substance use disorders (Brand, Rumpf, et al., 2019; Kuss & Griffiths, 2012; Weinstein & Lejoyeux, 2015) finally led to the inclusion of gaming disorder as a disorder due to addictive behaviors in the 11th edition of the International Classification of Diseases (ICD-11; World Health Organization, 2019). Additionally, Internet gaming disorder is included in the fifth revision of the Diagnostic and Statistical Manual of Mental Disorders (American Psychiatric Association, 2013) as a condition needing further research. In the following, we will use

* Corresponding author at: Department of Clinical Psychology and Psychotherapy, University of Bamberg, Markusplatz 3, 96047, Bamberg, Germany.
E-mail address: anna.schmid@uni-bamberg.de (A.M. Schmid).

https://doi.org/10.1016/j.actpsy.2026.106321
Received 28 August 2025; Received in revised form 1 December 2025; Accepted 20 January 2026
Available online 24 January 2026

"gaming disorder" as umbrella term to refer to both gaming disorder as defined by the ICD-11 as well as Internet gaming disorder as described in the DSM-5 and only use the term Internet gaming disorder when explicitly referring to the DSM-5 criteria.

Regarding the prevalence of gaming disorder, current meta-analyses suggest worldwide prevalence rates to range between 3.1% and 6.7% (Kim et al., 2022; Stevens et al., 2021; Zhou et al., 2024).

To design effective prevention and treatment programs, more research on factors contributing to the development and maintenance of gaming disorder is still needed. According to the Interaction of Person-Affect-Cognition-Execution (I-PACE) model (Brand et al., 2016; Brand, Wegmann, et al., 2019), behavioral addictions like gaming disorder develop from the interplay of predisposing person-related variables and affective and cognitive responses to external or internal triggers. One potential risk factor described in the model is stress (Brand et al., 2016; Brand, Wegmann, et al., 2019), a factor that has already been linked to the development, maintenance, and relapse in substance use disorders (Koob & Schulkin, 2019; Ruisoto & Contador, 2019; Sinha, 2001).

In a popular conceptualization, stress has been defined as a threatened balance (homeostasis) of the organism (Chrousos & Gold, 1992; Johnson et al., 1992; Pacák & Palkovits, 2001), while stressors refer to the stimuli which disturb homeostasis (Johnson et al., 1992). Whereas physical stressors like injuries or extreme temperatures, or chemical stressors such as caffeine or yohimbine are able to directly elicit a physiological stress response, psychosocial stressors depend on cognitive appraisal mechanisms (Everly & Lating, 2019). Psychosocial stressors refer to events in which individuals perceive an environmental demand to exceed their resources and to negatively affect their well-being (Cohen et al., 1997; Koolhaas et al., 2011; Lazarus & Folkman, 1984). This implies that an incident which constitutes a psychosocial stressor for one individual does not necessarily evoke stress in another individual (Everly & Lating, 2019). When confronted with a stressor, individuals respond with an activation of the hypothalamic–pituitary–adrenal (HPA) axis, resulting in the release of the stress hormone cortisol, and the activation of the sympathetic nervous system, which is, for example, responsible for changes in heart rate or increased blood flow to skeletal muscles (Schwabe et al., 2011). Cortisol levels or cardiovascular reactivity hence constitute important markers for measuring the physiological stress response (Campbell & Ehlert, 2012). In the case of psychosocial stressors, the stress response is likely to also have an emotional component (Campbell & Ehlert, 2012; Johnson et al., 1992), which can manifest as feelings of being stressed, overwhelmed, or helpless (Campbell & Ehlert, 2012; Epel et al., 2018), but could also involve emotional states like anxiety, sadness, or anger (Epel et al., 2018), and is usually captured using self-reports (Campbell & Ehlert, 2012). Besides the different response systems, stress can also be distinguished regarding the duration of the stress exposure. In contrast to *acute stress*, which describes a momentary stress experience, *chronic stress* develops if stressors occur for longer periods of time, usually referring to time spans of at least several weeks (Epel et al., 2018).

Regarding the association between stress and addiction, chronic stress may present a potential vulnerability factor (Sinha, 2008). For example, the experience of chronic stress can lead to alterations in the stress response system, resulting in a maladaptive response towards acute stress (Sinha, 2008). As a consequence, individuals may be more prone to rely on drugs (Baker et al., 2004; Cooper et al., 1988) or behaviors like gaming or gambling (Brand, 2022; Brand et al., 2016; Dong & Potenza, 2014) to cope with stress, in order to feel better (Brand, 2022). Furthermore, chronic stress has been associated with a dysregulation of the dopaminergic reward system, resulting in a decreased reward sensitivity (Baik, 2020; Ironside et al., 2018). Rewarding activities like gaming (Hoeft et al., 2008; Wegmann et al., 2022) may present a way to compensate for this blunted reward sensitivity. Initial evidence, although mainly cross-sectional, indicates that symptoms of gaming disorder were indeed associated with elevated levels of chronic stress (Koenig et al., 2019) and stronger coping-related gaming motives (Bäcklund et al., 2022; Lin et al., 2021). Moreover, in the case of academic stress, coping-related gaming motives were demonstrated to mediate the association between perceived stress and symptoms of gaming disorder (Gu & Mao, 2023).

In contrast to chronic stress, which is discussed as a more distal predisposing factor, acute stress in daily life may work as situational trigger (Brand et al., 2016; Sinha, 2001), with individuals turning to drugs or potentially addictive behaviors as a coping strategy (Brand, Wegmann, et al., 2019; Dong & Potenza, 2014; Hogarth, 2018; Nower et al., 2022). Recurrent use of games, for example, to cope with stress and to feel better can be successful in the short term, but can also be a driving path to addiction (Brand, 2022). In addition, if a behavior is regularly used to cope with stress, this may promote the formation of stimulus-response associations (Brand et al., 2025). Such learning mechanisms could increase the likelihood that, under stress, short-term goals like stress relief may be activated rather automatically, possibly leading to the engagement in the behavior despite negative consequences in the long term (Brand et al., 2025). Yet, a recent study in individuals with risky gaming behavior, i.e., individuals who met some but not all criteria of gaming disorder, failed to find a general effect of acute stress on habitual responding for gaming-related rewards (Schmid et al., 2024). However, responding in the laboratory may differ from behavior in natural settings.

To elucidate the association between stress and addictive use patterns in natural contexts, researchers often rely on daily or momentary surveys. Most ecological momentary assessments exploring the role of daily stress in addictions have been conducted in the field of substance use disorders. Contrary to theoretical considerations, the support for a link between daily stress and drug use was weak (Furnari et al., 2015; Preston et al., 2018; Preston & Epstein, 2011; Wolkowicz et al., 2022). In addition to research on substance use disorders, two studies used ecological momentary assessments to examine the association between daily stress and compulsive buying (Müller et al., 2012; Silbermann et al., 2008), a condition that is also discussed as a potential behavioral addiction (Brand et al., 2020). The findings were mixed as an association between stress and compulsive buying was only observed in a study by Silbermann et al. (2008), but not in a study by Müller et al. (2012). To the best of our knowledge, daily or momentary assessments investigating the link between daily stress and gaming in individuals with risky or pathological use have not been conducted, yet. An ecological momentary assessment study by Kim and Kwon (2018) found aversive emotional states, like anger, irritation, and general negative emotion to be relevant predictors of gaming usage. Although stressors or stress levels were not directly assessed in this study, such aversive emotional states can also occur in response to acute stressors (Epel et al., 2018).

The inconsistent findings on daily stress in addictions suggest that daily stress may not be a general trigger for usage, but could be specifically relevant for some but not all individuals, as proposed by Furnari et al. (2015). This consideration implies that the association between stress and consumption/use could be more complex, and moderating variables might play a role. One such moderator may be individual coping motives. Although coping with stress and negative emotions is described as a relevant mechanism in theoretical models of addictions (Brand, Wegmann, et al., 2019; Dong & Potenza, 2014; Hogarth, 2018; Nower et al., 2022) and has also been empirically linked to addictive symptoms (Bäcklund et al., 2022; Bresin & Mekawi, 2021), it might not be the primary motive for all individuals with addictive disorders. For example, Billieux et al. (2015) reported that some individuals with problematic gaming behavior were rather characterized by high achievement motives. The link between daily stress and gaming use might be more pronounced in individuals with high coping motives, however studies investigating this association have not been conducted so far.

Another potentially relevant moderator in the association between daily stress and consumption/use could be chronic stress. For individuals already experiencing high levels of chronic stress, daily hassles

may produce a tipping point, at which their coping resources do not suffice anymore (Epel et al., 2018). The interplay of chronic and acute stress may promote addiction not only by surpassing individuals' coping capacities, but also by shifting the balance from goal-directed towards habitual behavior as suggested by Radenbach et al. (2015). In their study, a decrease in model-based (goal-directed) control under acute stress was only observed in individuals with high levels of chronic stress. While perceived chronic stress has been shown to be enhanced in individuals with gaming disorder (Koenig et al., 2019), the moderating effect of chronic stress on the association between daily stress and gaming has not been studied so far.

In light of the paucity of research exploring the role of daily stress in gaming disorder, this study investigated the influence of daily stress on daily usage (yes/no) and use time (min/day) of gaming. Furthermore, we were interested in the moderating effects of chronic stress and coping-related gaming motives. To investigate the influence of daily stress for different levels of symptom severity, our sample included individuals with pathological, risky, and non-problematic gaming behavior as defined by a structured clinical interview. In summary, the following hypotheses were formulated:

(1) Individuals with pathological, risky, and non-problematic gaming behavior were expected to differ in their levels of chronic stress and in their endorsement of coping-related gaming motives (pathological >risky >non-problematic).
(2) Daily stress was hypothesized to be positively associated with daily gaming usage and use time, and this association was expected to be enhanced in the presence of high levels of chronic stress and coping-related gaming motives.

2. Method

2.1. Procedure

The present study is part of a multi-center DFG-funded addiction research unit (FOR2974), coordinated by the University of Duisburg-Essen, which investigates affective and cognitive mechanisms of specific Internet-use disorders (Brand et al., 2021). For the current study, participants of five different subprojects conducted at the the University of Bamberg, Hannover Medical School, Justus Liebig University Giessen, LWL University Hospital (Ruhr University Bochum), and the Outpatient Clinic for Behavioral Addictions at the Johannes Gutenberg University Mainz were included. Participants were recruited between October 2021 and August 2024 at treatment facilities (e.g., inpatient and outpatient clinics for psychosomatic medicine and psychotherapy) as well as from the general population by posts on social networks, mailing lists, flyers, and word-of-mouth recommendations. Potential participants were invited to telephone screenings to inform about the study and to assess inclusion and exclusion criteria.

The overall study protocol of this multi-centered research unit was approved by the ethics committee of the University of Duisburg-Essen, Germany (ID: 1911APBM0457) as well as by the local ethics committees of all sites and conducted in accordance with the Declaration of Helsinki. The participants were informed about the study and provided written informed consent. For pseudonymization of the participant data and to comply with the General Data Protection Regulation of the European Union, we used the encryption-based pseudonymization framework ALIIAS (Englert et al., 2023).

All participants underwent the same diagnostic procedure and extensive laboratory testing plus additional site-specific measures, which, however, were not relevant for the current study. After the laboratory session, participants completed a 14-day ambulatory assessment. Every evening, for 14 consecutive days, participants were asked to fill out a 5-min online survey assessing daily emotional states and gaming-related experiences. The email was sent at 6 pm, and the participants had time to fill out the survey until noon (12 pm) the following day. However, due to a technical issue, a small number of entries (n = 18) were also made between 12 pm and 2 pm. Participants received monetary compensation for the laboratory session (10 euros per hour) and for the ambulatory assessment (3 euros per fully completed day).

2.2. Participants

The current study included individuals with pathological, risky, and non-problematic gaming behavior (n = 62 per group). Pathological gaming behavior was operationalized as meeting at least five of the nine DSM-5 criteria for Internet gaming disorder (American Psychiatric Association, 2013) and reporting functional impairment due to gaming. Risky gaming behavior was defined as meeting more than one and less than five of the DSM-5 criteria for Internet gaming disorder. Finally, participants were allocated to the group with non-problematic gaming behavior if they reported to game at least occasionally, but did not fulfil more than one DSM-5 criterion without functional impairment. In short, the groups were defined as follows: non-problematic gaming behavior: ≤1 DSM-5 criterion without functional impairment; risky gaming behavior: 2–4 DSM-5 criteria; pathological gaming behavior: ≥5 DSM-5 criteria & functional impairment. The group allocation was based on a standardized, DSM-5-oriented clinical interview supplemented by questions on functional impairment, which was conducted during the laboratory session (see section Diagnostic Assessment).

Main exclusion criteria were learning or developmental disorders, psychosis, substance-use disorder (except tobacco), and regular consumption of any psychoactive substances known to interfere with the performance in cognitive tasks. Some of the research projects had additional exclusion criteria, for example, use of medication known to influence the hypothalamic-pituitary-adrenal (HPA) axis due to the conduction of laboratory stress inductions.

Originally, 74 individuals with pathological gaming behavior, 138 individuals with risky gaming behavior, and 171 participants with non-problematic gaming behavior took part in the laboratory session and the subsequent ambulatory assessment. We excluded participants who admitted to responding carelessly (n = 4), displayed missing data in gaming-related variables (n = 27), or did not meet our inclusion threshold of eight completed days of the ambulatory assessment (n = 27). To create equal-sized groups with similar sociodemographic characteristics, the groups were matched regarding age and gender using the case-control matching function of IBM SPSS Statistics for Windows, version 29 (IBM Corp., Armonk, N.Y., USA). For age, a tolerance of five years was chosen. As individuals with pathological gaming behavior were the focus of our analysis and also constituted the smallest group, we matched both the sample with risky gaming behavior and the sample with non-problematic gaming behavior with the sample with pathological gaming behavior. The matching resulted in a final sample of 62 individuals *per* group. Comparing included and excluded participants *per* group on key baseline variables yielded only few differences. Significant differences only emerged regarding skill development motives in the pathological group, and regarding coping-related gaming motives, recreational gaming motives, and the number of fulfilled criteria in the non-problematic group (see Table A1 in the supplementary material). As these differences either concerned control variables or manifested in a way that should result in a more conservative testing of our group-related hypotheses, they were considered neglectable.

2.3. Measures

2.3.1. Diagnostic assessment

To classify participants as individuals with pathological, risky, or non-problematic gaming behavior, the structured clinical interview Assessment of Internet and Computer Game Addiction (AICA-SKI:IBS; Müller & Wölfling, 2017) was conducted, which is based on the DSM-5 criteria for Internet gaming disorder (American Psychiatric Association, 2013) and was supplemented by questions on functional impairment of

the World Health Organization Disability Assessment Schedule 2.0 (WHODAS 2.0; Kirchberger et al., 2014; Üstun et al., 2010). This was done to account for the (slightly stricter) ICD-11 criteria. Each of the nine criteria was assessed on a six-point Likert scale ranging from 0 (*not applicable*) to 5 (*very applicable*) regarding its occurrence in the last 12 months. If rated with 4 or 5, the criterion was considered to be fulfilled. The interviews were conducted by trained PhD and master students, who were regularly supervised by licensed psychotherapists (AM, MD, and SSL).

In addition to the clinical interview, which was used for group allocation, we used the Assessment of Criteria for Specific Internet-use Disorders (ACSID-11; Müller et al., 2022) as dimensional measure of symptom severity. The ACSID-11 is a screening instrument, which is based on the ICD-11 criteria for gaming disorder (World Health Organization, 2019) and has shown good reliability and validity (Oelker et al., 2024). Symptoms of gaming disorder are rated regarding how frequently (0 = *never*, 1 = *rarely*, 2 = *sometimes*, 3 = *often*) and how intensively (0 = *not at all intense*, 1 = *rather not intense*, 2 = *rather intense*, 3 = *intense*) they are experienced. For the present study, we used a mean score of the frequency response scale (Müller et al., 2022). Cronbach's alpha was 0.92 in our sample.

2.3.2. Assessment of gaming motives

To measure gaming motives, we relied on the Motives for Online Gaming Questionnaire (MOGQ; Demetrovics et al., 2011). The German version used in our study did refer not only to online games as the original scale but to gaming in general (cf. Brandtner et al., 2022). The 27 items are rated on a 5-point Likert scale (1 = *almost never/never*, 2 = *some of the time*, 3 = *half of the time*, 4 = *most of the time*, 5 = *almost always/always*). The Coping subscale captures the motivation to reduce feelings of distress and aggression and to meliorate one's mood. Additionally, the questionnaire assesses escape-related, social-related, fantasy-related, competition-related, and recreational motives as well as motives surrounding skill development. Internal consistencies of the subscales were mostly acceptable to high (Coping: $\alpha = 0.77$; Escape: $\alpha = 0.92$; Social: $\alpha = 0.83$; Competition: $\alpha = 0.91$; Skill development: $\alpha = 0.92$; Fantasy: $\alpha = 0.88$; Recreational: $\alpha = 0.70$).

2.3.3. Assessment of perceived chronic stress

Perceived chronic stress was assessed with the Chronic Stress Screening Scale (SSCS), a global measure of stress from the Trier Inventory of Chronic Stress (Petrowski et al., 2012; Schulz et al., 2004). The screening scale consists of 12 items, capturing chronic stress due to high demands or unmet needs in the occupational and private sphere. Participants had to indicate on a five-point Likert scale how often in the last three months they encountered the situations and experiences described. The response categories are 0 = *never*, 1 = *rarely*, 2 = *sometimes*, 3 = *often*, 4 = *very often* and a sum score of all items was computed. Cronbach's alpha for the SSCS was 0.90 in our sample.

2.3.4. Assessment of daily stress, daily gaming usage, and daily use time

The 14-day ambulatory assessment was intended to capture daily emotional states and gaming-related experiences. For the current study, only the questions regarding daily usage, use time, and stress were relevant. Daily stress was measured with a single question (*How stressed did you feel today?*), which participants had to answer on a 10-point rating scale ranging from 1 = *not stressed at all* to 10 = *very stressed.* Gaming usage was assessed by asking participants whether they had engaged in gaming that day (yes/no). In case of gaming usage, participants were asked to report the time they had spent with gaming. In case they did not engage in gaming, they were asked to name another activity they performed that day and provide a time rating for this alternative activity. This additional question ensured that participants were not tempted to deny their gaming usage just in order to reduce the number of questions.

2.4. Statistical analysis

In the first step, we prepared the use time data gathered in the ambulatory assessment. Although use time was only assessed for days individuals engaged in gaming, we decided to assign use times of zero for completed days without gaming usage to also include participants with few or no gaming usage in these analyses.

To examine differences between individuals with pathological, risky, and non-problematic gaming behavior, ANOVAs with (severity-)group as between-subject factor were computed. If significant group effects were found, post hoc tests with Bonferroni correction (i.e., *p*-values were multiplied by the number of post-hoc comparisons per outcome and compared against a constant alpha level of 0.05) were conducted. For the ANOVAs and post hoc tests on daily stress and daily use time, the degrees of freedom were estimated with the Satterthwaite's approximation.

Before conducting the regression analyses, correlations between stress-related and gaming-related variables were inspected in the whole sample (group with pathological, risky, and non-problematic gaming behavior) and *per* group. For the variables measured during the ambulatory assessment, both within- and between-subject correlations are reported. While the between-subject correlations refer to associations on the participant level, with daily measurements being averaged across days, the within-subject correlations refer to associations on the daily level.

For the prediction of daily usage and daily use time, multilevel models were estimated to account for the clustered structure of the data, with repeated daily measurements (level 1) being nested in participants (level 2). The use of multilevel models allowed to investigate the association of stress with usage and use time within participants, while also considering effects of interindividual characteristics like chronic stress or gaming motives. The intraclass correlations of the daily measures indicated substantial between- as well as within-person variance, hence justifying the use of multilevel models ($ICC_{daily\ usage} = 0.51$; $ICC_{daily\ use\ time} = 0.39$; $ICC_{daily\ stress} = 0.27$). We computed linear regression analyses for the continuous variable use time, and logistic regression analyses for the dichotomous variable usage. In both models, daily stress was included as level-1 predictor, and perceived chronic stress, gaming motives, and symptom severity were included as level-2 predictors. As gaming motives have been shown to be moderately to strongly correlated with each other (Demetrovics et al., 2011), we included not only coping-related but all gaming motives of the MOGQ to analyze whether coping motives were able to explain unique variance in usage/use time beyond other gaming motives. The predictors were included stepwise, beginning with daily and chronic stress and their interaction, followed by gaming motives and the interaction of coping-related gaming motives with daily stress, and finally continuous symptom severity (measured with the ACSID-11) and its interaction with daily stress. The interaction between symptom severity and daily stress was included to test for potential symptom-dependent effects of daily stress on use time/usage not covered by the interactions with chronic stress and coping motives. The level-1 predictor daily stress was person-mean centered, and the level-2 predictors were grand-mean centered (Enders & Tofighi, 2007). Both models were estimated with random slopes and intercepts. For the linear model on daily use time, the degrees of freedom for the *t*-tests of the fixed effects were estimated with the Satterthwaite's approximation.

As effect size for the linear model on daily use time, we reported $R^2_{(fvm)_{total}}$, i. e., the proportion of outcome variance explained by fixed effects, random slopes, and random intercepts, and $R^{2(f)}_{total}$, i. e., the proportion of total outcome variance explained by fixed effects only (Rights & Sterba, 2019; Shaw et al., 2023).

The analyses were conducted in R (version 4.3.3, R Core Team, 2024) and the significance level was set at 0.05. We used the R package misty (Yanagida, 2025) to calculate the within- and between-person correlations as well as the descriptive statistics for the level-1 variables. The multilevel models were estimated with the R packages lme4 (Bates et al.,

2015), lmerTest (Kuznetsova et al., 2017), and r2mlm (Shaw et al., 2023).

2.5. Transparency and openness

The data presented here was collected as part of a larger research unit on Internet-use disorders. The central project of the research unit has been preregistered at OSF: https://osf.io/6x93n/overview.

3. Results

3.1. Sample characteristics and group comparisons

Participants were predominantly male (7 females and 55 males in each group). The mean age did not significantly differ between the groups (see Table 1), which confirmed that the matching was successful. Although the number of school years was significantly lower in the group with pathological gaming behavior compared to the group with non-problematic gaming behavior, the effect size was only small, with all groups displaying a high level of education, with an average of 12 school years.

As expected, the three groups differed significantly not only in the number of criteria fulfilled in the clinical interview, which was used for group allocation, but also in self-reported symptom severity as measured with the ACSID-11. Additionally, individuals with pathological gaming behavior were characterized by significantly higher levels of perceived chronic stress and a higher agreement to use gaming to cope with negative emotions compared to the individuals with risky and non-problematic gaming behavior (see Table 1). Differences between the group with risky gaming behavior and the group with non-problematic gaming behavior were not significant. Significant group differences were also observed with regard to gaming motives of escape, competition, skill development, and fantasy.

With regard to the ambulatory assessment, participants completed on average 90.36% ($SD = 11.72$) of the 14 days. The compliance rate did not differ between the groups, $F(2, 183) = 0.80$, $p = 0.45$, $\eta_p^2 = 0.01$. The majority of entries were made in the evening between 6.00 pm and 11.59 pm (72.80%). The remaining entries were made in the night between 0.00 am and 5.59 am (15.60%) or the next day in the morning between 6.00 am and 2.00 pm (11.60%). During the ambulatory assessment, participants with pathological and risky gaming behavior engaged in gaming on significantly more days than the individuals with non-problematic gaming behavior (Table 1). Furthermore, daily use times differed significantly between groups. Individuals with pathological gaming behavior demonstrated the highest use times, followed by individuals with risky gaming behavior. Finally, group differences were

Table 1
Sociodemographic, Gaming-Related and Stress-Related Variables.

Variable	Pathological gaming (PG) ($n_{individuals} = 62$, $n_{observations} = 771$)			Risky gaming (RG) ($n_{individuals} = 62$, $n_{observations} = 790$)			Non-problematic gaming (NG) ($n_{individuals} = 62$, $n_{observations} = 792$)			Group comparison			
	M	$SD_{between}$	SD_{within}	*M*	$SD_{between}$	SD_{within}	*M*	$SD_{between}$	SD_{within}	*F*	*p*	η^2	Post-hoc comparison
Sociodemographic characteristics													
Age (years)	25.77	5.09		25.61	5.53		24.94	4.63		0.47	0.62	0.01	
Education (school years)	12.48	1.07		12.74	0.77		12.89	0.45		**4.03**	**0.02**	**0.04**	**PG < NG**
Clinical variables													
Number of criteria fulfilled in clinical interview (AICA-SKI: IBS)	6.45	1.31		2.94	0.99		0.44	0.59		**556.19**	**<0.001**	**0.86**	**PG > RG > NG**
Symptom severity (ACSID-11)	1.63	0.78		1.11	0.59		0.50	0.41		**52.84**	**<0.001**	**0.37**	**PG > RG > NG**
Coping motives (MOGQ)	3.28	0.83		2.77	0.83		2.55	0.81		**12.87**	**<0.001**	**0.12**	**PG > RG, NG**
Escape motives (MOGQ)	3.43	1.24		2.39	0.90		1.94	0.79		**36.70**	**<0.001**	**0.29**	**PG > RG > NG**
Social motives (MOGQ)	2.48	1.04		2.11	0.96		2.09	0.92		**3.13**	**0.046**	**0.03**	PG = RG = NG
Competition motives (MOGQ)	3.22	1.24		2.97	1.17		2.56	1.13		**5.01**	**0.01**	**0.05**	**PG > NG**
Skill development motives (MOGQ)	2.73	1.22		2.25	1.04		2.23	1.07		**4.06**	**0.02**	**0.04**	**PG > NG**
Fantasy motives (MOGQ)	2.83	1.34		2.17	1.05		1.77	0.80		**15.28**	**<0.001**	**0.14**	**PG > RG, NG**
Recreational motives (MOGQ)	4.07	0.74		4.22	0.72		3.98	0.87		1.46	0.24	0.02	
Perceived chronic stress (SSCS)	24.11	9.88		19.45	8.65		16.58	7.84		**11.49**	**<0.001**	**0.11**	**PG > RG, NG**
Daily measures													
Days with gaming usage (% of completed days)	59.33	31.95		59.45	28.89		43.99	30.66		**5.26**	**0.01**	**0.05**	**PG, RG > NG**
Daily gaming use time (min/day)	148.16	113.07	134.16	108.03	74.16	117.48	62.51	56.25	83.21	**13.94**	**<0.001**	**0.13**	**PG > RG > NG**
Daily stress	4.84	1.41	2.14	4.19	1.02	2.09	4.30	1.28	2.03	**4.00**	**0.02**	**0.04**	**PG > RG**

Note. To test for group difference, ANOVAs with group as between-subject factor were computed. If significant group effects were found, Bonferroni corrected post-hoc tests were conducted. Significant differences are highlighted in bold. AICA-SKI:IBS = Assessment of Internet and Computer Game Addiction – Structured Clinical Interview; ACSID-11 = Assessment of Criteria for Specific Internet-use Disorders; MOGQ = Motives for Online Gaming Questionnaire; SSCS = Chronic Stress Screening Scale.

observed with regard to daily stress, with individuals with pathological gaming behavior reporting higher levels of daily stress than individuals with risky gaming behavior. The daily stress levels of the individuals with non-problematic gaming behavior fell in between the other groups, without differing significantly either from individuals with risky or from individuals with pathological gaming behavior.

3.2. The effect of daily stress and the moderating influences of chronic stress and coping-related gaming motives on daily usage and use time

On days on which individuals experienced higher levels of stress, they were not only less likely to engage in gaming ($r_{within} = -0.06$, $p < 0.01$) but also reported shorter use times ($r_{within} = -0.11$, $p < 0.001$). Concerning daily stress and daily use time, significant negative correlations were observed in all groups (pathological gaming: $r_{within} = -0.11$; $p = 0.004$; risky gaming: $r_{within} = -0.09$; $p = 0.01$; non-problematic gaming: $r_{within} = -0.15$; $p < 0.001$). The negative association between daily usage and daily stress was also evident in all groups, however reached significance only in the control group (pathological gaming: $r_{within} = -0.06$; $p = 0.09$; risky gaming: $r_{within} = -0.04$; $p = 0.28$; non-problematic gaming: $r_{within} = -0.08$; $p = 0.02$).

In contrast, on the between-subject level, daily stress was not significantly correlated with daily usage and daily use time (see Table 2), i.e., individuals with higher daily stress levels were not more likely to engage in gaming nor did they report longer use times compared to individuals with lower daily stress levels. Both daily use time and daily usage were most strongly associated with social gaming motives and symptom severity. Perceived chronic stress was significantly associated with daily stress, in the sense that individuals with higher chronic stress levels also reported higher levels of daily stress. Furthermore, significant positive associations of coping-related and escape-related gaming motives with daily stress and perceived chronic stress emerged. Between-subject correlations *per* group can be found in the supplementary material (see Table A2, A3, and A4).

First, we tested whether daily gaming usage (yes/no) was predicted by daily stress and its interaction with perceived chronic stress, coping-related gaming motives, and symptom severity. When entering daily stress, chronic stress, and their interaction in a first step, only daily stress significantly predicted daily usage (see Table 3), with higher daily stress levels being associated with a lower likelihood to engage in gaming on that day. When entering gaming motives in the next step, social gaming motives emerged as additional significant predictor with high social gaming motives being linked to a higher probability to engage in gaming. However, neither the main effect of coping-related gaming motives nor their interaction with daily stress was significant. In the final model, after including symptom severity and its interaction with daily stress, only daily stress, social gaming motives, recreational gaming motives, and symptom severity significantly predicted gaming usage. The negative effect of daily stress on usage did not differ by continuous symptom severity, as evidenced by the non-significant symptom severity by daily stress interaction (see also Fig. 1).

Second, we tested whether daily use time of gaming was predicted by daily stress and the interaction of daily stress with perceived chronic stress, coping-related gaming motives, and symptom severity (see Table 4). Entering daily stress, chronic stress, and their interaction in a first step revealed a significant negative effect of daily stress on daily use time. Neither chronic stress nor its interaction with daily stress was significant. The negative effect of daily stress remained significant when entering gaming motives in the next step, while neither coping motives nor their interaction with daily stress emerged as significant predictors. Of all gaming motives, only social gaming motives significantly predicted daily use time. Symptom severity emerged as additional significant predictor in the final model, meaning that individuals with higher symptom severity reported higher use times. The non-significant symptom severity by daily stress interaction implied that the negative effect of daily stress did not differ by continuous symptom severity (see also Fig. 2).

4. Discussion

The aim of our study was to investigate the effects of daily stress and the moderating effects of chronic stress and coping-related gaming motives on daily use patterns of gaming in individuals with non-problematic, risky, and pathological gaming behavior.

Group comparisons revealed significantly higher levels of coping-related gaming motives in individuals with pathological gaming behavior compared to individuals with risky or non-problematic gaming behavior. This finding is in line with previous studies, which identified coping-related gaming motives as a variable associated with gaming disorder (Bäcklund et al., 2022; Lin et al., 2021). Moreover, initial evidence suggested that coping-related gaming motives may not only be associated with gaming disorder, but may also contribute to the progression of gaming disorder symptoms over time (Cudo et al., 2023). Individuals with pathological gaming behavior not only displayed stronger coping-related gaming motives but also scored higher on gaming motives related to skill development, competition, escape, and fantasy. These results might be explained with different subtypes of problematic gaming, as described by Billieux et al. (2015), with some individuals being primarily driven by escape/coping motives, while for others achievement motives were more relevant.

In addition to several gaming motives, perceived chronic stress was significantly increased in individuals with pathological gaming behavior. This observation mirrors the results of Koenig et al. (2019) and is in line with theoretical assumptions which describe chronic stress as risk factor for addictions (Sinha, 2008). The assumed pathway involves alterations in the stress response system and a reliance on addictive

Table 2
Between-Subject Correlations of Gaming-Related and Stress-Related Variables.

Variable	1	2	3	4	5	6	7	8	9	10	11
1. Daily usage (yes/no)	–	–									
2. Daily use time (min/day)	0.73*	–									
3. Daily stress	−0.15	−0.11	–								
4. Perceived chronic stress (SSCS)	−0.04	0.002	0.40*	–							
5. Coping motives (MOGQ)	0.12	0.11	0.22*	0.36*	–						
6. Escape motives (MOGQ)	0.05	0.16*	0.17*	0.51*	0.60*	–					
7. Social motives (MOGQ)	0.27*	0.27*	−0.06	0.06	0.13	0.03	–				
8. Competition motives (MOGQ)	0.13	0.17*	0.05	0.09	0.08	0.18*	0.25*	–			
9. Skill development motives (MOGQ)	0.07	0.13	−0.13	0.10	0.34*	0.17*	0.41*	0.40*	–		
10. Fantasy motives (MOGQ)	0.03	0.15*	0.14	0.37*	0.54*	0.62*	0.11	0.15*	0.37*	–	
11. Recreational motives (MOGQ)	0.20*	0.10	−0.15	−0.01	0.50*	0.10	0.20*	0.001	0.29*	0.21*	–
12. Symptom severity (ACSID-11)	0.24*	0.30*	0.27*	0.38*	0.25*	0.52*	0.06	0.33*	0.01	0.26*	−0.12

Note. $N = 186$. SSCS = Chronic Stress Screening Scale; MOGQ = Motives for Online Gaming Questionnaire; ACSID-11 = Assessment of Criteria for Specific Internet-use Disorders.
* $p < 0.05$.

Table 3
The Prediction of Daily Usage (yes/no) of Gaming by Daily Stress, Chronic Stress, Gaming Motives, and Symptom Severity.

	Model 1			Model 2			Model 3		
	OR	95% CI	*p*	OR	95% CI	*p*	OR	95% CI	*p*
Daily stress	**0.930**	**[0.880; 0.983]**	**0.010**	**0.933**	**[0.882; 0.987]**	**0.016**	**0.932**	**[0.881; 0.986]**	**0.014**
Perceived chronic stress	1.003	[0.972; 1.035]	0.853	0.992	[0.957; 1.028]	0.662	0.980	[0.946; 1.015]	0.256
Daily stress x perceived chronic stress	0.999	[0.993; 1.005]	0.720	1.000	[0.993; 1.006]	0.943	0.999	[0.992; 1.006]	0.770
Coping motives				1.168	[0.707; 1.929]	0.544	1.100	[0.677; 1.789]	0.699
Escape motives				1.084	[0.744; 1.578]	0.675	0.856	[0.583; 1.256]	0.426
Social motives				**1.630**	**[1.188; 2.238]**	**0.002**	**1.547**	**[1.138; 2.103]**	**0.005**
Competition motives				0.177	[0.906; 1.529]	0.222	0.994	[0.761; 1.299]	0.967
Skill development motives				0.798	[0.579; 1.102]	0.171	0.898	[0.654; 1.231]	0.503
Fantasy motives				0.936	[0.671; 1.306]	0.697	0.950	[0.689; 1.310]	0.754
Recreational motives				1.514	[0.966; 2.373]	0.070	**1.728**	**[1.112; 2.685]**	**0.015**
Daily stress x coping motives				0.970	[0.904; 1.040]	0.385	0.965	[0.900; 1.035]	0.324
Symptom severity							**2.458**	**[1.537; 3.933]**	**<0.001**
Daily stress x symptom severity							1.029	[0.939; 1.128]	0.536

Note. $N_{individuals}$ = 186; $n_{observations}$ = 2353. Significant effects are highlighted in bold. The level-1 predictor daily stress was person-mean centered, and the level-2 predictors were grand-mean centered before being entered in the regression analysis. The models were estimated with random slopes and intercepts. OR = odds ratio, CI = confidence interval.

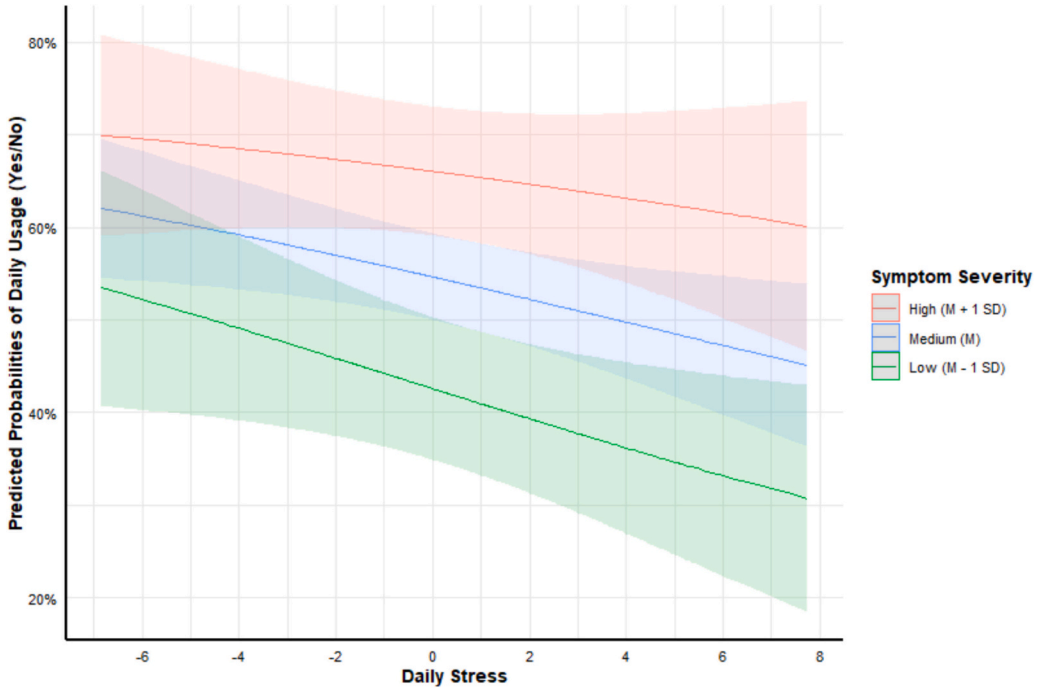


Fig. 1. Association between Daily Stress and Daily Usage (Yes/No) for Different Levels of Continuous Symptom Severity
Note. Simple slopes for the association between daily stress and daily usage (yes/no) are presented for different values of the moderator variable symptom severity (M - 1 SD, M, M + 1 SD), measured with the ACSID-11. The values of the moderator variable were derived from continuous symptom severity, independent of categorical group membership. Symptom severity was grand-mean centered, and daily stress person-mean centered.

behaviors or substances to cope with stress (Baker et al., 2004; Brand, 2022; Brand et al., 2016; Cooper et al., 1988; Dong & Potenza, 2014). Consistently, in our study, coping-related gaming motives were positively associated with perceived chronic stress. Even stronger correlations were observed between chronic stress and escape motives, which capture the motivation to escape reality through gaming (Demetrovics et al., 2011) and are sometimes considered as avoidant coping strategy (Melodia et al., 2022). The cause-effect relationship between maladaptive coping strategies, like turning to gaming to deal with stress or escape reality, and chronic stress might be bidirectional, with the effects intensifying each other. Such a vicious cycle was described by Crielaard et al. (2021) in the context of adverse socioeconomic conditions. The authors proposed that the recurrent experience of uncontrollable stressors can foster avoidance-related coping styles, preventing individuals from dealing with current stressors, thereby further increasing chronic stress levels (Crielaard et al., 2021). While there are reasonable arguments to consider chronic stress as predisposing factor for pathological gaming behavior, higher levels of chronic stress could also indicate distress caused by the pathological gaming behavior itself.

Concerning the principal aim of our study, examining the role of daily stress in daily gaming usage and use time, we found that, contrary to our expectations, daily stress was negatively associated with the likelihood of engaging in gaming and use time, independently of continuous symptom severity as measured with an ICD-11 based questionnaire. On the bivariate level, the negative association could be observed in all groups (as defined by the clinical interview), although the association between daily usage and daily stress missed significance in the group with risky and pathological gaming behavior. One explanation for the negative relationship between daily stress and usage/use time may be that stressful days required individuals to fulfil a variety of

Table 4
The Prediction of Daily Use Time (min/day) by Daily Stress, Chronic Stress, Gaming Motives, and Symptom Severity.

	Model 1			Model 2			Model 3		
	B (SE)	*β*	*p*	*B (SE)*	*β*	*p*	*B (SE)*	*β*	*p*
Daily stress	**−5.905 (1.344)**	**−0.104**	**<0.001**	**−5.952 (1.351)**	**−0.105**	**<0.001**	**−5.970 (1.351)**	**−0.106**	**<0.001**
Perceived chronic stress	0.905 (0.760)	0.093	0.235	−0.297 (0.866)	−0.030	0.732	−0.877 (0.853)	−0.090	0.306
Daily stress x perceived chronic stress	0.097 (0.147)	0.016	0.509	0.138 (0.157)	0.022	0.380	0.179 (0.169)	0.029	0.292
Coping motives				0.310 (11.972)	0.003	0.979	−2.610 (11.593)	−0.025	0.822
Escape motives				11.732 (8.780)	0.151	0.183	0.857 (8.946)	0.011	0.924
Social motives				**26.844 (7.393)**	**0.291**	**<0.001**	**24.738 (7.147)**	**0.268**	**0.001**
Competition motives				4.064 (6.110)	0.054	0.507	−3.593 (6.238)	−0.048	0.565
Skill development motives				−6.469 (7.513)	−0.080	0.390	−1.182 (7.379)	−0.015	0.873
Fantasy motives				4.643 (7.811)	0.060	0.553	5.735 (7.533)	0.074	0.448
Recreational motives				3.882 (10.391)	0.033	0.709	9.446 (10.126)	0.081	0.352
Daily stress x coping motives				−1.568 (1.663)	−0.024	0.347	−1.442 (1.673)	−0.022	0.390
Symptom severity							**42.118 (11.176)**	**0.353**	**<0.001**
Daily stress x symptom severity							−1.288 (2.052)	−0.016	0.531
$R^{2(fvm)}_{total}$	0.415			0.424			0.425		
$R^{2(f)}_{total}$	0.010			0.054			0.082		

Note. $N_{individuals} = 186$; $n_{observations} = 2353$. Significant effects are highlighted in bold. The level-1 predictor daily stress was person-mean centered, and the level-2 predictors were grand-mean centered before being entered in the regression analyses. The models were estimated with random slopes and intercepts.

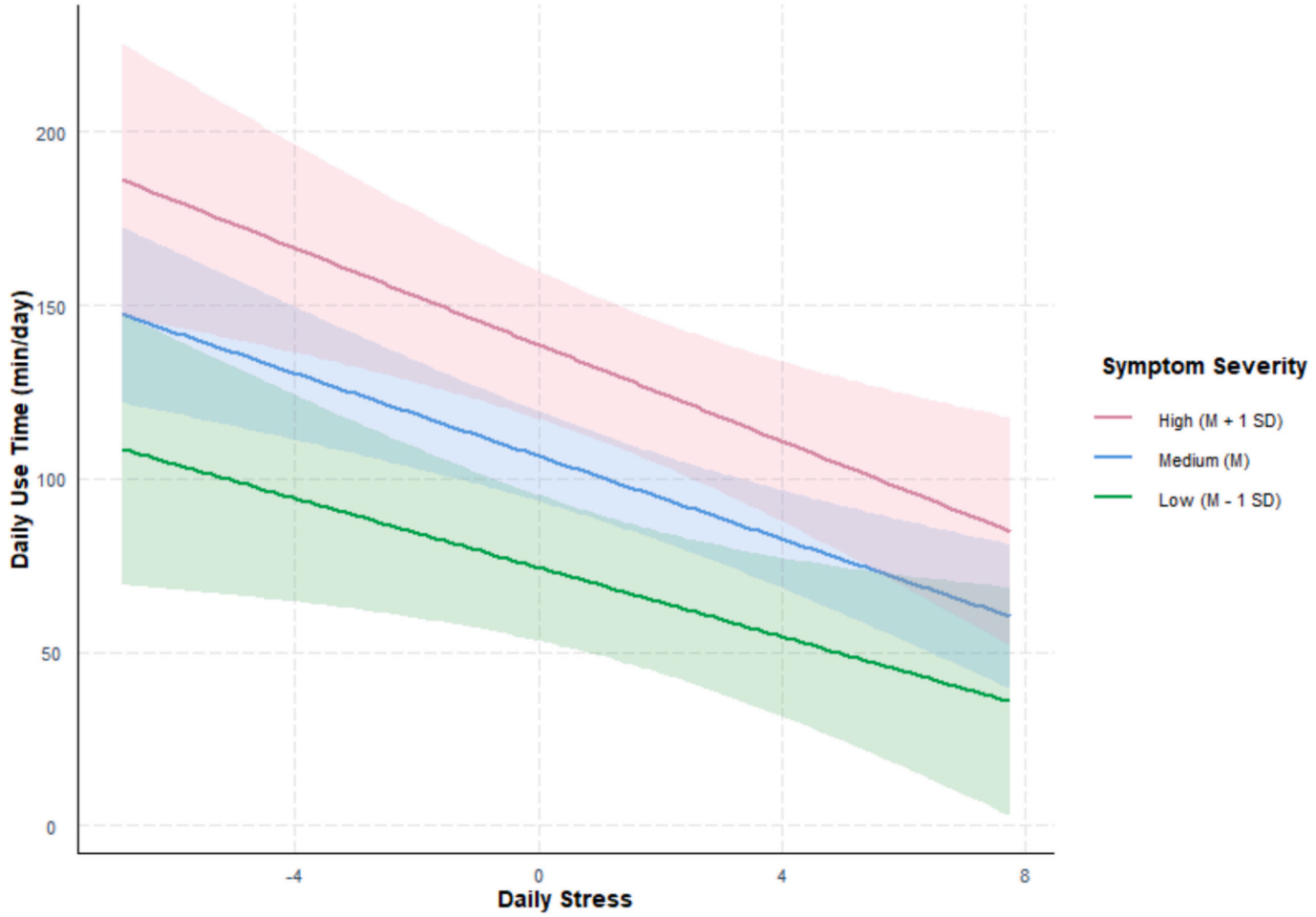


Fig. 2. Association between Daily Stress and Daily Use Time (min/day) for Different Levels of Continuous Symptom Severity
Note. Simple slopes for the association between daily stress and daily use time (min/day) are presented for different values of the moderator variable symptom severity (M - 1 SD, M, M + 1 SD), as measured with the ACSID-11. The values of the moderator variable were derived from continuous symptom severity, independent of categorical group membership. Symptom severity was grand-mean centered, and daily stress person-mean centered.

tasks, thus leaving little time for gaming. While this explanation is plausible for individuals with non-problematic gaming behavior, it is, however, less convincing for individuals with pathological gaming behavior, as reducing gaming in the case of more pressing tasks would require inhibitory control. Yet, diminished control over the behavior is a key feature of gaming disorder (American Psychiatric Association, 2013; World Health Organization, 2019). Significant impairments in inhibitory control were also observed for individuals with pathological

Internet use (including individuals with pathological gaming behavior) in our research unit (S. M. Müller et al., 2025). Although the effect sizes were only small and the results cannot be directly applied to our study, as the analyses were based not only on the participants of this study but on a larger and more diverse sample, they call into question whether our participants with pathological gaming behavior were indeed able to reduce gaming on stressful days.

However, reduced usage and use time may not necessarily be the effect of increased stress levels. As daily stress, usage, and use time were assessed only once a day in the evening, we cannot establish the temporal order and hence the causality between these events. Consequently, the results could also reflect a stress-relieving effect of gaming, with individuals reporting lower stress levels if they have engaged in gaming throughout the day. There is indeed some evidence for a stress-reducing effect of gaming (Desai et al., 2021), however, also studies reporting increased stress levels after gaming (for a review see, Krarup & Krarup, 2020; Wang et al., 2023).

One may also assume different mechanisms depending on the symptom severity of problematic gaming. In individuals with non-problematic gaming behavior, the negative association between daily stress and usage/use time could reflect successful reduction of gaming on stressful days. In contrast, in individuals with pathological gaming behavior, who appear to more strongly rely on gaming to cope with stress, the negative association with use time could present dysfunctional, albeit effective stress reduction through gaming.

Our results differ from the findings by Kim and Kwon (2018) who identified aversive emotional states as predictors of increased gaming usage. However, not only did they schedule several assessments throughout the day, which allowed them to get a more detailed picture, but they also focused on a broad range of negative emotions without directly assessing perceived stress.

As previous studies from substance-related addictions had yielded only weak support for a link between daily stress and usage, we examined chronic stress and coping-related gaming motives as potential moderators. Contrary to our assumptions, neither chronic stress nor coping motives emerged as significant moderators in the association between daily stress and gaming usage/use time. However, the participants in our study displayed rather moderate levels of chronic stress, with even the mean score of individuals with pathological gaming behavior not exceeding the scale mean. Different results might be observed if individuals with more severe levels of chronic stress are assessed. Furthermore, the relationship between daily stress and usage/use time may be more complex than examined so far, and future studies may benefit from considering additional moderators such as inhibitory control or mediating processes like stress-related craving.

Although coping-related gaming motives were elevated in individuals with pathological gaming behavior as well as associated with the continuous measure of symptom severity, they predicted neither gaming time nor gaming usage. Hence, if coping-related gaming motives contribute to the development of gaming disorder, as suggested by a longitudinal study (Cudo et al., 2023), their influence may not work via the augmentation of usage and use time. Alternatively, they might promote gaming disorder symptoms by undermining other more functional coping strategies and/or leading to gaming at the expense of other activities or obligations. Instead of coping motives, social motives emerged as a significant predictor for daily usage and use time. As social motives were not related to symptom severity, they seem to promote engagement rather than problematic involvement. Nevertheless, initial evidence from longitudinal studies points towards loneliness as a predictor for gaming disorder (Vuorinen et al., 2024; Zhuang et al., 2023), suggesting that some individuals may use gaming to compensate for a lack of social contacts outside the virtual world. In such cases, social motives could potentially have a dysfunctional component. In light of these considerations, feelings of loneliness rather than stress might trigger gaming usage and should be considered in future ambulatory assessments.

Given our findings, one might also speculate that gaming usage is motivated rather by appetitive than aversive motivation similarly to findings in a recent meta-analysis on alcohol use (Bresin & Hunt, 2025). Hence, future studies may benefit from exploring the influence of enhancement motives and positive affect, both of which emerged as significant predictors in the realm of alcohol consumption (Bresin & Fairbairn, 2019; Lannoy et al., 2019).

4.1. Strengths, limitations, and future research

To the best of our knowledge, our study is the first ambulatory assessment study that examined the link between daily stress and daily gaming use. However, when interpreting the findings of our study, there are also some limitations which should be kept in mind. Daily stress was captured with one item only and asking individuals how stressed they had felt could have left room for different interpretations. For example, some individuals may have equated feeling stressed with having many tasks to do. Furthermore, our self-report measure only captured the psychological stress response. Given the discrepancy between subjective and biological stress measures (Campbell & Ehlert, 2012), future studies should consider also assessing the physiological stress response, for example by collecting daily measures of salivary cortisol, blood pressure, or heart rate (Weber et al., 2022). When it comes to our sample, it is relevant to mention that it consisted mainly of young, male participants, hence it remains unclear if our findings also apply to other sociodemographic groups.

By including individuals with risky gaming behavior, we examined a group that has received little attention in research so far. However, due to the sparse research on this group, validated cutoffs to define risky gaming behavior are missing. Hence, we cannot be sure if our own cutoff (2–4 fulfilled criteria) was effective in distinguishing this group, especially as individuals with risky gaming behavior did turn out not to differ from individuals with non-problematic gaming behavior with regard to potential risk factors like chronic stress and coping-related gaming motives.

As mentioned before, the design of our ambulatory assessment did not allow us to identify the temporal order between daily stress and daily use of gaming. Future studies would hence benefit from using a more finely grained assessment of stress and use, for example by scheduling several random assessments during the day, as Silbermann et al. (2008), Müller et al. (2012), or Kim and Kwon (2018) did. Additionally, to clearly identify chronic stress as vulnerability factor for gaming disorder, longitudinal studies are needed.

Finally, our inclusion requirement of at least eight completed days might have resulted in a sample which was biased towards higher-functioning participants. Although comparisons between excluded and included participants did not indicate such a bias and rather pointed towards higher symptom severity in included participants with non-problematic gaming, we cannot rule out that excluded participants scored lower on variables not examined in our study, like inhibitory control. The few differences observed between included and excluded participants were considered neglectable. They either concerned control variables (such as skill development and recreational motives) or manifested in a way that should have resulted in a more conservative testing of our group-related hypotheses (i.e., higher levels of coping-related gaming motives and symptom severity in included participants with non-problematic gaming).

4.2. Clinical implications

In light of the stronger endorsement of escape- and coping-related gaming motives in individuals with pathological gaming behavior, prevention or intervention programs for gaming disorder could benefit from teaching alternative coping strategies. In fact, a positive psychology program, which focused on active coping, psychological resilience, a growth mindset, and emotion regulation, was effective in reducing

symptoms of gaming disorder in primary pupils (Cheng et al., 2024). Moreover, teaching functional coping strategies can help to reduce perceived stress (Houston et al., 2017), which may also be beneficial for individuals with gaming disorder given their elevated levels of chronic stress observed in our and a previous study (Koenig et al., 2019).

Furthermore, addressing the social component of gaming by helping individuals to build/strengthen meaningful relationships outside the gaming world and encouraging non-virtual social activities could present a relevant element in the prevention or treatment of gaming disorder. In fact, some therapy programs do already include topics like relationships (Moll & Thomasius, 2019) or interpersonal skills (Torres-Rodríguez et al., 2018). Although daily stress was not associated with increased gaming usage or time in our study, it may still be a relevant trigger for some individuals, who might hence benefit from considering this aspect in therapy. Accordingly, therapists may conduct finely grained behavioral analyses to identify whether and how daily stress or aversive emotions in general are related to gaming behavior, thereby also determining whether the behavior is used as a coping strategy. A promising approach to identify potential addiction-related triggers and deliver tailored support are ecological momentary interventions (Heron & Smyth, 2010). For example, an ecological momentary intervention for smoking cessation assessed current lapse triggers, like stress, and provided tailored messages how to cope with these triggers (Businelle et al., 2016).

5. Conclusion

Our results indicated negative associations between daily stress and daily usage/use time of gaming in individuals with non-problematic, risky, and pathological gaming behavior. More research is needed to clarify whether this negative association reflects reduction of gaming time on stressful days or results from a potential stress-relieving effect of gaming. Furthermore, chronic stress levels and the endorsement of several gaming motives were higher in individuals with pathological gaming behavior, suggesting that teaching adaptive coping strategies and finding alternative rewarding activities may be a relevant element in the prevention and treatment of gaming disorder.

CRediT authorship contribution statement

Anna M. Schmid: Writing – original draft, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Tobias A. Thomas:** Writing – review & editing, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Andreas Oelker:** Writing – review & editing, Software, Methodology, Data curation, Conceptualization. **Dominik Vollbracht:** Writing – review & editing, Formal analysis. **Niklas Meurer:** Writing – review & editing, Software, Data curation. **Lukas Mallon:** Writing – review & editing, Investigation, Data curation. **Martin Diers:** Writing – review & editing, Supervision, Project administration, Funding acquisition. **Nanne Dominick:** Writing – review & editing, Investigation, Data curation. **Miriam Kampa:** Writing – review & editing, Investigation, Data curation. **Oliver T. Wolf:** Writing – review & editing, Supervision, Project administration, Funding acquisition. **Matthias Brand:** Writing – review & editing, Supervision, Project administration, Methodology, Funding acquisition, Conceptualization. **Astrid Müller:** Writing – review & editing, Supervision, Project administration, Methodology, Funding acquisition, Conceptualization. **Sabine Steins-Loeber:** Writing – review & editing, Supervision, Project administration, Methodology, Funding acquisition, Conceptualization.

Funding

The work of AMS, TAT, AO, NM, LM, MD, ND, MK, OTW, MB, AM, and SSL on this article was carried out in the context of the Research Unit ACSID, FOR2974, funded by the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation) – 411232260. DV was supported by the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation) – GRK 2277 – project number 310365261.

Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: The authors report no financial relationships with commercial interests related to this manuscript. SSL, AM, MB, OTW, and MD receive funding from the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation). MB also receives funding from the EU, and the German Federal Ministry of Education and Research. SSL, AM, MB, OTW, and MD have performed grant reviews for research-funding agencies; have edited journals and journal sections; have given academic lectures in clinical or scientific venues; and have generated book chapters for publishers of mental health texts. If there are other authors, they declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

The authors would like to thank Stefan Blümel and Nicolas Erdal for their support with the data collection, and Ferdinand Gut, Felix Heublein, and Jarl Möhring for their support with the telephone screenings.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.actpsy.2026.106321.

Data availability

Data will be made available on request.

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