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Burnout, resilience, and coping among esports players: A network analysis approach

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ABSTRACT

Burnout among esports players is a serious issue affecting competitive and professional players. The present study investigated the relationship between resilience, coping, and burnout among esports players using network analysis. Esports players (N = 453; M_{age} = 23.0 years, SD = 4.18; in the top 40% of in-game rank) who competed in one of seven popular team-based esports completed the Connor-Davidson Resilience Scale (CD-RISC-10), Coping Functions Questionnaire (CFQ; assessing problem-focused, emotion-focused, and avoidance coping), and Athlete Burnout Scale (ABO-S; assessing a reduced sense of accomplishment, physical exhaustion, and negative feelings towards esport). Responses were assessed with Least Absolute Shrinkage and Selection Operator regularised partial correlations (EBICglasso). Findings showed a distinct network of resilience factors, coping skills, and symptoms of burnout. More specifically, resilience factors were negatively associated with symptoms of burnout and positively associated with problem-focused, emotion-focused, and avoidance coping. Problem-focused coping had a strong expected influence on the network and was positively associated with multiple resilience factors. Moreover, avoidance coping had a strong influence on the network but was positively associated with multiple symptoms of burnout. Finally, a reduced sense of accomplishment (burnout) was negatively associated with multiple resilience factors and positively associated with avoidance coping. The combined results of the present study suggest that resilience and coping are important factors for understanding burnout among esports players.

1. Introduction

1.1 Esports

The competitive playing of videogames, known as esports, has received increasing research attention (Jeong et al., 2023). An emerging focus in the esports literature is esports players' mental health and wellbeing (Poulus & Polman, 2022; Smith et al., 2022). Esports players have reported experiencing various stressors (Poulus et al., 2021) and symptoms of mental ill health (e.g., burnout; see Smith et al., 2022). Recent studies into stress and coping among esports players have shown that stable personality factors (e.g., resilience) may influence stress and coping processes (Poulus et al., 2023) and that long-term stress can lead to psychological burnout among esports players (Smith et al., 2022). The present study explored the influence of personality factors and coping on psychological burnout among esports players.

1.2 Psychological burnout

Psychological burnout, generally described as a cognitive-affective syndrome, was initially conceptualised in sports as having three main factors: (i) a reduced sense of accomplishment, (ii) devaluing or resenting their sport, and (iii) experiencing physical and emotional exhaustion (Raedeke, 1997). Burnout in traditional sports has been associated with a range of adverse outcomes, such as athletes leaving their sports prematurely, a decline in performance, and an increased vulnerability to mental health issues such as anxiety and depression (Gustafsson et al., 2017; Sarmento et al., 2021).More recently, burnout has emerged as a significant issue among esports players.

Despite decades of research being conducted exploring burnout in traditional sports, there is currently limited empirical research among esports players. Smith et al. (2022) recently examined the mental health of esports players across *Counterstrike: Global Offensive*, *Valorant*, and *Rainbow Six: Siege*. Burnout was a significant predictor of general symptoms of anxiety and depression, severe symptoms of depression, and psychological distress (Smith et al., 2022). Furthermore, basic needs

satisfaction and motivation may influence burnout among esports players. More specifically, Hong et al. (2023) found that intrinsic motivation was negatively associated with burnout factors, exhaustion and reduced sense of accomplishment. Both Smith et al. (2022) and Hong et al. (2023) highlighted a need for further burnout research to increase esports performance and protect against mental ill-health. The predominant instrument of psychological burnout used in sports psychology is the Athlete Burnout Questionnaire (ABQ; Raedeke & Smith, 2009). However, concerns have arisen about the accuracy of the physical and emotional exhaustion subscale within the ABQ (Isoard-Gautheur et al., 2018). For example, having a combined physical and emotional exhaustion subscale might not accurately assess an athlete experiencing high levels of emotional exhaustion and low levels of physical exhaustion. These concerns promted the development of the Athlete Burnout Scale (ABO-S; Isoard-Gautheur et al., 2018).

The ABO-S provides better delineation between the mental and emotional strains and examines burnout across three distinct dimensions: (i) *reduced sense of accomplishment* (RA) which is characterised by feelings of inefficacy and a tendency for individuals to evaluate themselves negatively based on athletic performance and achievements, (ii) *physical exhaustion* (PE) which is characterised by a sense of physical depletion resulting from the demands of training and/or competitions, and (iii) *negative feelings towards sport* (NF) which is characterised by a lack of emotional energy and negative attitudes or thoughts toward sports, which athletes may experience in response to the demands of training and/or competitions. For sports that are perceived to have more cognitive demands than physical demands (such as esports; Campbell et al., 2018), adapting the NF subcomponent of the ABO-S to be separate from PE is particularly relevant to capture the unique impact that mental exhaustion may have on burnout.

1.3 Resilience and coping

Two areas of investigation in esports and traditional sports psychology that have been shown to influence burnout are resilience and stress coping (Fletcher, 2016; Smith et al., 2022). Sarkar and Fletcher (2014) define resilience as mental processes and behaviours that promote personal assets that protect individuals from the potential adverse effects of stress. Resilience has been shown to protect against burnout among young athletes in traditional sports (Vitali et al., 2015). As highlighted by Sarkar and Fletcher's (2014) definition of resilience, the experience of stress and how resilience can support an individual to cope with it is emphasised (Wagstaff et al., 2016). How an athlete copes with stress (i.e., which strategies an athlete employs when faced with a stressor) has been shown to influence the development of burnout. More specifically, (i) using more adaptive, problem-focused coping strategies (strategies that aim to alter or change the source of stress) has been associated with fewer burnout symptoms, and (ii) using less adaptive coping, avoidance coping strategies (efforts to disengage or avoid the source of stress) has been associated with more symptoms of burnout (Madigan et al., 2020). While coping research in esports is increasing (see Poulus & Polman, 2022 for a review), the relationship between resilience, coping, and burnout among esports players is yet to be explored. Considering the potentially complex relationship between these psychological variables, advanced statistical analysis should be used (e.g., network analysis).

1.4 Network analysis

Network Analysis (NA) is a methodology focused on estimating relationships between variables or behaviours without assuming the presence of a specific underlying construct, such as burnout. These relationships can be visualised using graphical models (Epskamp et al., 2018). In the context of psychology, a network comprises a set of variables or behaviours (known as nodes) that are interconnected through non-causal relationships, represented by undirected edges (Borsboom & Cramer, 2013). This innovative approach has proven successful in psychiatry and psychology research. It has helped advance our understanding and definition of various presentations of psychopathology due to its attractive features (Borsboom & Cramer, 2013; Fried et al., 2017; van Borkulo et al., 2015). NA takes a different approach than traditional psychology and psychiatry methods. Instead of focusing on interrelations at the construct level (e.g., resilience and burnout), NA examines relationships between individual items (e.g., coping strategy, resilience aspects, or burnout symptoms; Fried et al., 2017). The dominant perspective in psychology and psychiatry typically considers mental health disorders and

personality factors as reflections of latent constructs, meaning an underlying construct can explain a group of aspects or symptoms (Borsboom & Cramer, 2013). However, NA adopts a formative approach, conceptualising symptoms or personality factors as mutually interacting and being the cause of the disorder (van Borkulo et al., 2015). This allows NA to evaluate comorbidity between symptoms within and across disorders (Fried et al., 2017; Kendler et al., 2022).

Such an understanding is particularly valuable because comorbid symptoms across different variables, known as bridge symptoms, can indicate transitions between variables or their co-occurrence (Epskamp et al., 2018). Another benefit of NA is its ability to provide centrality indices (Hevey, 2018). These indices identify symptoms or clusters of symptoms that hold greater importance or centrality within the network structure (Rodrigues, 2019). Similar to identifying "super spreaders" in public health responses in controlling an epidemic, NA allows researchers to pinpoint influential symptoms in psychopathology networks, such as a particular resilience aspect (e.g., bouncing back after hardship) and its impact on related symptoms/behaviours (e.g., feeling wearied or employing a problem-focused coping strategy; Borsboom & Cramer, 2013).

Finally, NA enables the estimation of "communities" or clusters of nodes based on their position within the network (Hevey, 2018). Nodes with short paths between each other are clustered together, forming communities (Fried et al., 2017). Through graphical features, researchers can visualise the taxonomy of structures and identify neighbouring communities (Kendler et al., 2022). In psychology networks, these communities may represent different psychological variables/factors or illustrate various comorbidity associations, offering insights into shared behavioural patterns (Borsboom & Cramer, 2013). In relation to the present study's research aims, NA provides a way to assess and visualize formative associations between burnout, resilience, and coping. For example, while pre-existing hypothetical associations are examined in path analysis, in NA, associations between nodes present organically based on their data-driven interrelationships. In the context of the present study, NA provided a way to investigate unbiased conceptual associations between burnout, resilience, and coping among esports players.

1.5 The present study

Previous research has suggested a relationship between resilience, coping, and burnout (Fletcher, 2016; Madigan et al., 2020; Smith et al., 2022). The present study is the first to explore the relationship between these variables at the item/symptom level through an examination of the network structure and centrality of the factors (i.e., resilience), skills (i.e., coping), and symptoms (i.e., burnout) among esports players. It aimed to identify 'clusters' of neighbouring factors, skills, and symptoms. Identifying these network structures (e.g., resilience and burnout symptoms) will support practitioners when working with esports players to determine which (i) resilience factors are associated with the fewest burnout symptoms, (ii) coping strategies are associated with the most symptoms of burnout (i.e., avoidance coping; Madigan et al., 2020), and (iii) which coping strategies are associated with the fewest burnout symptoms (i.e., problem-focused coping). Based on previous literature, it was hypothesised that (i) resilience factors would be positively associated with problem-focused and emotion-focused coping strategies and negatively associated with avoidance coping strategies (H_1; Madigan et al., 2020; Poulus et al., 2020), (ii) resilience factors will be negatively associated with burnout symptoms across RA, PE, and NF (H_2; Wagstaff et al., 2016), and (iii) problem-focused and emotion-focused coping strategies will be negatively associated with burnout symptoms, and avoidance coping will be positively associated with burnout symptoms (H_3: Poulus et al., 2020).

2. Methods

2.1 Participants

The sample comprised 453 English-speaking adult esports players. Participants' ages ranged from 18–52 years (M=23.0 years, SD=4.18), the majority being 372 males (82.1%, M_{age}=22.9 years, SD=4.3), as well as 74 females (16.3%, M_{age}=23.9 years, SD=3.7), and seven nonbinary (1.5%, M_{age}=22.0 years, SD=2.4). Participants competed in one of seven team-based esports videogames; *League of Legends* (*LoL*; n=282), *Valorant* (n=50), *Rainbow 6 Siege* (*R6S*; n=46), *Apex Legends* (n=20),

Counterstrike: Global Offensive (*CS:GO*, n=20), *DOTA 2* (n=19), and *Overwatch* (*OW*; n=16). Given that the aim was to collect data for competitive esports players (Bubna et al., 2023; Poulus et al., 2020), only players with an in-game rank above the 60th percentile in each esport were eligible to complete the survey. The study comprised participants from 66 countries, with the majority residing in the USA (n=167), Australia (n=63), UK (n=22), Germany (n=20), and Canada (n=18). The powerly package for R Studio (Constantin et al., 2023) determined that a minimum sample of 413 participants was needed to achieve acceptable statistical power ($1 - \beta = 0.8$, sensitivity = 0.7) for a Gaussian graphical network with 43 nodes (see Figure 1). Furthermore, the random sampling error for a sample of 453 approximated to 3% with a 95% confidence interval, which is acceptable based on the literature (Hill, 1998). Therefore, the statistical analysis was conducted considering the appropriate sampling error and *a priori* power analysis.

2.2 Measures

2.2.1 Socio-demographic variables

The socio-demographic questions asked participants about their age, gender, the esport videogame played, and in-game rank. The in-game rank cut offs for each esport game were as follows: *League of Legends* (Silver 1), *Apex Legends* (Platinum 4), *Valorant* (Silver 3), *Rainbow 6 Siege* (Gold 1), *DOTA 2* (Archon 4), *Overwatch* (2500SR), and *Counterstrike: Global Offensive* (Gold Nova Master). Please refer to the Supplementary Files for the distribution of in-game rank frequencies across different esports.

2.2.2 Resilience

Resilience was assessed using the Connor-Davidson Resilience Scale (CD-RISC-10; Connor & Davidson, 2003), which consists of 10 items rated on a five-point Likert scale ranging from 0 (*not true at all*) to 4 (*true nearly all the time*). The scale is unidimensional and assesses various aspects of resilience, such as the ability to cope with challenges (e.g., "*Having to cope with stress can make me stronger*"). Total scores on the CD-RISC-10 range from 0 to 40, with higher scores indicating higher levels of resilience. The CD-RISC-10 has been extensively utilised in studies involving traditional sports athletes and has demonstrated good internal validity (α=.85; Connor & Davidson, 2003). In the present study, the scale's internal consistency was very good (α=.84).

2.2.3 Psychological burnout

Burnout was assessed using the Athlete Burnout Scale (ABO-S; Isoard-Gautheur et al., 2018) which consists of 15 items that assess three distinct factors, each evaluated through five-item subscales: reduced sense of accomplishment (RA; e.g., "*I am not performing up to my abilities*"), physical exhaustion (PE; e.g., "*I feel physically drained*"), and negative feelings towards sport (NF; e.g., "*I feel wearied*"). Participants rate each item on a five-point Likert scale ranging from 1 (*almost never*) to 5 (*almost always*). Scores on the ABO-S range from 15 to 75 (5-25 within each factor), with higher scores indicating a higher degree of burnout. The scale has demonstrated good construct validity and reliability in previous research (Isoard-Gautheur et al., 2018). In the present study, the scale's internal consistency was excellent (α=0.90).

2.2.4 Coping

Coping functions were assessed using the Coping Functions Questionnaire (CFQ; Kowalski & Crocker, 2001) which consists of 18 items that assess three higher-order coping dimensions; problem-focused coping (PFC; e.g., "*I tried to find a way to change the situation*"), emotion-focused coping (EFC; e.g., "*I worked through my emotions in order to feel better*"), and avoidance coping (AC; e.g., *"I tried to get away from the situation to reduce the stress"*). Participants rate each item on a five-point Likert scale ranging from 1 (*not at all*) to 5 (*very often*). The CFQ has demonstrated good reliability in athletic populations (Allen et al., 2011). In the present study, the scale's internal consistency was very good (α=0.84).

2.3 Procedure

The study obtained ethical approval from the lead author's university ethics committee (Ref:2022/085). To recruit participants, the study was promoted online through various social media platforms (e.g., *Twitch, YouTube, Reddit, Twitter*) using a recruitment video and written posts (July 2022). Interested individuals were directed to a *Qualtrics* survey via a provided URL. Prior to commencing the survey, participants were presented with a Plain Language Information Statement, which clearly outlined the study's objectives, voluntary nature of participation, right to withdraw, and the requirement for informed consent. Participants indicated their informed consent by checking a box before starting the survey. The survey included the aforementioned measures. Individuals under the age of 18 years or those who did not meet the cutoff ranks (60^{th} percentile for each esport) were unable to complete the survey.

2.4 Statistical analysis

The present study employed a network analysis (NA) to investigate the associations among symptoms related to resilience, coping, and burnout. The assessment of network accuracy and stability was included, following the approach outlined by Epskamp et al. (2018). The network of regularised partial correlations, capturing the relationships between resilience factors, coping skills, and burnout symptoms, was estimated using the Bootnet package in RStudio (Epskamp et al., 2018). More specifically, the Bootnet package utilised the extended Bayesian information criterion (EBIC-LASSO) and a tuning hyperparameter (γ) to optimally regularise partial correlations and eliminate spurious edges. This methodology has been recommended by Fried (2017) for enhancing the interpretability of polychoric correlations derived from polytomous data, such as those obtained through Likert-type scales.

Subsequently, 1,000 non-parametric bootstrapped resampling was employed to evaluate the accuracy of the network (Epskamp et al., 2018). This approach enabled confidence intervals between the sample and bootstrapped mean values to be estimated, where smaller errors indicate higher result accuracy (Zarate et al., 2022). Moreover, the stability of centrality indices was assessed using case-dropping subset bootstrapping (Epskamp et al., 2018). This method utilised correlation stability coefficients (CS) to determine whether centrality indices remained stable when progressively dropping percentages of cases (e.g., 5%, 10%). A correlation stability (CS) > .5 was considered as evidence of sufficient stability.

Following the estimation of the Least Absolute Shrinkage and Selection Operator-regularised network, centrality indices and bridge symptoms were assessed. Centrality indices determine the importance and influence of specific symptoms within the overall network. These indices include strength, betweenness, closeness, and expected influence (Hevey, 2018). Strength reflects the number of connections or edges associated with a particular symptom, with higher strength indicating greater centrality. Betweenness and closeness measure the average distance between nodes, while expected influence considers both positive and negative relationships by summing the edge weights. Additionally, the analysis of bridge symptom centrality involves focusing exclusively on inter-variable node relationships (i.e., relationships between items/symptoms of different disorders), excluding intra-variable node relationships (Zarate et al., 2023). This examination allowed the further exploration the centrality indices of symptoms that bridge different factors (Vanzhula et al., 2021).

3. Results

3.1 Network of resilience, coping, burnout symptoms

To evaluate the relationships between items/symptoms of resilience, burnout, and coping strategies, extended Bayesian information criterion was used with a tuning hyperparameter of 0.5 (Epskamp et al., 2018). This resulted in a network of 43 nodes, and included ten aspects of resilience, 18 coping functions, and 15 symptoms of burnout (see Figure 1 network analysis). Of 903 possible edge weights, 251 were non-zero (27.8%), with 224 positive relationships (89.24%) and 27 negative relationships (10.76%; see Supplementary Table 1). Table 1 provides mean scores, range, and standard deviations, and Table 2 provides a correlation matrix of all three variables.

- Tables 1, 2, and Figure 1 about here -

The strongest estimated positive edges were observed between RISC-1 (*I am able to adapt when changes occur*) and RISC-2 (*I can deal with whatever comes my way*); between ABO-S-12 (*I have negative feelings toward my esport*) and ABO-S-15 (*I feel loathing toward my sport*); and between ABO-S-8 (*I feel physically drained*) and ABO-S-11 (*I feel physically exhausted)*.

3.2 Accuracy and stability of the network

1000 non-parametric bootstrapped resampling was used to assess the accuracy of our network. Initially, the accuracy of the estimated edge weights was assessed using 95% bootstrapped confidence intervals (CIs). Supplementary Figure 1, shows a visualisation of the bootstrapped estimated edge-weight matrix, which incorporates the 95% CIs. The varying sizes of the bootstrapped CIs indicate greater variability in the estimation of edge weights, suggesting some degree of bias. More specifically, larger CIs corresponded to a broader "shaded area" surrounding the mean bootstrapped estimated edge-weights (represented by the black line), thereby reducing confidence in the precise estimation of edge-weights between a specific pair of nodes (Epskamp et al., 2018). Therefore, the results of the present study should be interpreted with caution. To further evaluate the stability of edge-weights and centrality indices, the case-dropping subset bootstrap method was utilised.

The correlation stability (CS) coefficients of the centrality indices are shown in Supplementary Figure 2. These coefficients were obtained using a sample of 100% of the individuals and progressively decreasing subsets with a drop in the percentage of cases. According to Epskamp et al. (2018), meaningful inferences should have CS coefficients that do not fall below 0.25, preferably surpassing 0.5. The present study's network exhibited average correlations across expected influence and strength, both above 0.5, while closeness was below 0.25 and betweenness was less than optimal. Consequently, emphasis was placed on interpreting expected influence, strength, and closeness (with no reporting on betweenness).

3.3 Centrality indices (within variable)

The standardised estimates of the centrality indices for degree, closeness, and expected influence are presented in Table 3. Considering degree (strength) the nodes with the most connections were RISC-9 (*I think of myself as a strong person when dealing with life's challenges and difficulties*), ABO-S-13 (*It seems to me that whatever I do, I'm failing*), and CFQ-11 (*I looked for ways to solve the problem or change the situation*). More specifically, RISC-9 was negatively correlated with ABO-6, 7, 13, 14, and positively correlated with CFQ-5, 9, 14, and all RISC nodes. Moreover, ABO-13 was negatively correlated with RISC-4,8,9,10, positively correlated with CFQ-12 (*I tried to get out of the situation to get away from the stress*), and positively correlated with 9/15 ABO-S items.

Considering closeness, the node with the highest inverse sum of the shortest paths was CFQ-3 (*I worked harder to try and change the situation*) and the lowest closeness was CFQ-5 (*I tried to get out of the situation as soon as I could to reduce the stress*). Considering expected influence, nodes with the highest sum of edge weights accounting for both positive and negative relationships were CFQ-11 (*I looked for ways to solve the problem or change the situation*), CFQ-12 (*I tried to get out of the situation to get away from the stress*), and RISC-2 (*I can deal with whatever comes my way*). CFQ-11 reflects a PFC strategy and is positively associated with RISC-2 and RISC-6 (*I believe I can achieve my goals, even if there are obstacles*), suggesting that higher resilience is associated with PFC. RISC-2 and RISC-6 were also negatively associated with multiple symptoms of burnout (ABO-7/$10_{reverse}$/11/15). CFQ-12 represent an AC strategy and is positively associated with ABO-S-13,14,15. This suggests that AC is positively associated with burnout symptoms. Table 3 displays the top ten centrality indices.

- Table 3 about here -

3.4 Bridge symptoms (between variables)

The standardised estimates of bridge centrality indices are presented in Table 4. Unlike regular centrality indices, bridge centrality assesses the frequency and strength of edges connecting symptoms between different constructs/variables (i.e., they exclude intra-variable edges; Vanzhula et al., 2021). More specifically, the observations focused on the (i) strength and closeness of bridge centrality, which

refers to the frequency of connections between symptoms across different factors, and (ii) the expected influence of bridges, which is determined by the sum of positive weighted edges across factors. As seen in Table 4, bridge symptoms with the highest strength and closeness were RISC-1 (*I am able to adapt when changes occur*) and CFQ-3 (*I worked harder to try and change the situation*), respectively. Additionally, bridge symptoms with the highest sum of positive weighted inter-factor edges (expected influence) are ABO-$10_{reverse}$ (*I feel successful)*, CFQ-3, and RISC-1. Conversely, the least influential node was RISC-10 (*I am able to handle unpleasant or painful feelings like sadness, fear, and anger*). RISC-10 had a negative expected influence, suggesting that this node will likely deactivate specific nodes in other constructs. Table 4 displays the top ten bridge indices.

- Table 4 about here -

4. Discussion

The present study explored the relationship between resilience, coping, and burnout in a sample of 453 esports players across seven popular esports. To address this aim, a network analysis (NA) approach was utilised to examine the network structure and associations across resilience factors, coping skills, and symptoms of burnout. The analysis resulted in 10 resilience factors, 18 coping functions (grouped within three higher-order coping dimensions: PFC, EFC, and AC), and 15 burnout symptoms (grouped within three burnout factors: RA, PE, and NF). The resultant network structure had relatively acceptable stability and accuracy measures. The findings show partial support for H_1, with resilience factors being positively associated with PFC and EFC strategies, but AC strategy use was positively predicted by resilience factors, not negatively predicted. Full support was found for H_2 as resilience factors were negatively associated with burnout symptoms across RA, PE, and NF. H_3 was partially supported, with AC strategies being positively associated with burnout symptoms. PFC and EFC strategy use was not directly associated with burnout symptoms.

4.1 Network structure of resilience, coping and burnout

Overall, the resilience, coping, and burnout network structure showed relative symptom sparsity after Selection Operator regularisations and Least Absolute Shrinkage, with only 27.8% connection across factors, skills, and symptoms. Although relationships between symptoms of distinct variables were identified, more robust and recurrent connections were evident among symptoms within the same variable. For example, resilience factors showed a relationship with coping skills, but more frequent and stronger associations were observed between resilience factors. Finding both intra- and between-variable relationships is consistent with previous psychological research into the behaviour of online videogame players (Zarate et al., 2023). Moreover, within the 27.8% of connections across the network, 89.2% were positive and 10.8% negative, indicating that across resilience, coping, and burnout, most related factors, skills, and symptoms showed an increased presentation together (Supplementary Table 1).

4.2 Central and bridge resilience, coping, and burnout nodes

The nodes with the most connections in the network were the RISC-9 (*I think of myself as a strong person when dealing with life's challenges and difficulties*) and ABO-S-13 (*It seems to me that whatever I do, I'm failing*). More specifically, RISC-9 was negatively associated with multiple burnout symptoms (ABO-6, 7, 13, 14; H_2), positively correlated with multiple coping strategies (CFQ-5, 9, 14; H_1), and all resilience factors. It appears that individuals seeing themselves as strong people when dealing with life's challenges and difficulties may buffer against all three burnout factors: RA (ABO-7 – *I feel incompetent*, ABO-13), PE (ABO-14 – *I feel physically weak*), and NF (ABO-6 – *I feel wearied)*. This finding supports H_2 and aligns with traditional sports research that resilience helps buffer against burnout symptoms (Vitali et al., 2015; Wagstaff et al., 2018). Vitali et al. (2015) found that resilience may be protective against burnout in young athletes. Similarly, it appears that among esports players, higher levels of resilience may protect against the symptoms of burnout.

RISC-9 also appeared to be positively associated with all three higher-order coping dimensions: PFC (CFQ-9 – *I did my best to change the situation*), EFC (CFQ-14 – *I worked through my emotions in order to feel better)*, and AC (*I tried to get out of the situation as soon as I could to reduce the stress*).

These results partially support H_1 as resilience was positively associated with PFC, EFC, AC. Resilience was not negatively associated with AC use, as hypothesised. While the present study is the first to explore resilience and coping among esports players, studies have explored mental toughness, a similar personality factor related to performance, and coping (Poulus et al., 2020). Poulus et al. (2020) found that higher levels of mental toughness positively predicted PFC and EFC, and negatively predicted AC among esports players. The present study's findings highlight the difference between mental toughness and resilience in relation to coping and suggest that resilience is positively associated with a wide range of coping strategies. More specifically, resilience being positively associated with AC strategy use contrasts previous traditional sports literature. For example, Secades et al. (2016). found that higher levels of resilience were associated with lower levels of AC use among traditional sports players. Furthermore, avoidance-related coping strategies have been associated with decreased sports performance (Nicholls et al., 2016). Future research could explore whether AC use among esports players is linked to lower performance and if resilience is linked to maladaptive coping. Finally, RISC-9 was associated with all other resilience factors, suggesting that having a positive view of dealing with life's challenges and difficulties might be central to all other resilience factors and resilience as a latent construct.

The RA burnout symptom ABO-13 (*It seems to me that whatever I do, I'm failing*) was negatively associated with RISC-4,8,9,10, positively associated with CFQ-12 (*I tried to get out of the situation to get away from the stress*), and positively associated with 9/15 ABO-S items. Individuals feeling hopeless in their efforts appeared to be associated with lower resilience (RISC-4,8,9,10) and AC strategy use (CFQ-12). Building on the present study's findings regarding RISC-9, it appears that not being easily discouraged by failure (RISC-8), being able to handle unpleasant emotions and feelings (RISC-10), and viewing coping with stress as something that makes individuals' stronger (RISC-5), may also buffer against burnout. This provides further support for the predicted negative associations between resilience factors and burnout (H_2). Providing partial support for H_3, it appears that avoiding coping with stress (CFQ-12 – *I tried to get out of the situation to get away from the stress*) may lead to burnout. This is supported by previous research, which has shown that avoidance coping strategy use predicts increased burnout among traditional sports athletes (Madigan et al., 2020). Moreover, the findings aligned with previous esports coping research showing that AC is less effective than PFC and EFC in reducing stress (Poulus et al., 2022). Finally, ABO-13 being positively associated with ABO-9 and 15 (both NF) suggests that RA and NF are central to understanding burnout in esports. Considering that the esports examined in the present study are largely cognitive (Campbell et al., 2018) and require no gross motor movements, it appears that PE burnout symptoms are less central to the network.

The nodes with the highest expected influence on the network (the highest sum of edge weights accounting for positive and negative relationships) were CFQ-11 (*I looked for ways to solve the problem or change the situation*) and CFQ-12 (*I tried to get out of the situation to get away from the stress*). CFQ-11, a PFC strategy, was most strongly positively associated with RISC-2 (*I can deal with whatever comes my way*) and RISC-6 (*I believe I can achieve my goals, even if there are obstacles*), again suggesting that resilience is associated with PFC strategies (H_1). Interestingly, these resilience factors were also negatively associated with multiple burnout symptoms: RISC-2 with ABO-11 (PE) and RISC-6 with ABO-7 (RA), ABO-$10_{reverse}$ (RA), and ABO-15 (NF; H_2).

The node with the second-highest expected influence on the network was CFQ-12*,* an AC strategy. CFQ-12 was positively associated with RA (ABO-13), PE (ABO-14), and NF (ABO-6/15). This finding shows a strong association between AC and burnout symptoms and suggests that individuals who avoid coping with stress may be at higher risk of developing burnout (H_3). Support for H_3 was only partially found, whilst AC is positively associated with burnout symptoms, findings do not show a relationship between PFC and EFC, and symptoms of burnout. Combined, the expected influence results suggest that resilience is positively associated with PFC, negatively associated with burnout (across all burnout factors), and that AC is positively associated with burnout (across all burnout factors). These findings show that for esports players, there exists a complex relationship between resilience factors, coping skills, and burnout symptoms. Although these findings are novel in esports, they align with previous research suggesting that in competitive environments, positive personality factors (i.e., resilience and mental toughness) may promote the use of more adaptive coping strategies

(i.e., PFC), which can buffer against or reduce symptoms of adverse mental health (i.e., internet gaming disorder and stress; (Canale et al., 2019; Kaiseler et al., 2009; Leis et al., 2022; Leis & Lautenbach, 2020; Poulus et al., 2022).

The bridge symptom analysis explored the nodes with the highest strength, closeness, and influence between resilience, coping, and burnout. The nodes with the highest strength (most connections) and closeness (shortest distance between nodes) were RISC-1 (*I am able to adapt when changes occur*) and CFQ-3 (*I worked harder to try and change the situation*). Moreover, ABO-$10_{reverse}$ (*I feel successful*), CFQ-3, and RISC-1 were the nodes with the highest expected influence between variables. These findings again suggest that resilience is positively associated with PFC strategy use (CFQ-3) and the opposite of RA, a positive outlook (ABO-$10_{reverse}$). Finally, RISC-10 (*I am able to handle unpleasant or painful feelings like sadness, fear, and anger*) was the least influential node, suggesting that being able to handle unpleasant emotions (closely related to EFC) is likely to deactivate specific nodes in the network. This aligns with previous research by Poulus et al. (2022), who found that for elite esports players, PFC and EFC were more effective than AC at alleviating stress.

4.4 Practical implications

From an applied perspective, the study's findings highlight resilience as a key variable associated with coping strategy selection and experiencing burnout symptoms. These findings can be used to inform future esports interventions by increasing resilience and coping strategy selection (Poulus et al., 2023; Sharpe et al., 2023). Poulus et al. (2023) recently published a pilot study of an esports-adapted coping effectiveness training that reported mixed effectiveness in an elite esports population. Furthermore, Sharpe et al. (2023) validated assessing the impact of stress among esports players through gaze behaviours. Future esports intervention could incorporate resilience training, used in traditional sports (see Gonzalez et al., 2016; Morgan et al., 2019), to support better coping with stress among esports players, and potentially use gaze behaviours as an objective measure. A recent review of exercise in esports also suggested that physical activity could be used to mitigate burnout (McNulty et al., 2023; Trotter et al., 2020). Teaching esports players to actively cope with their stressors through PFC and EFC use and minimising AC use could help players avoid symptoms of burnout. Moreover, minimising AC use could help players avoid burnout symptoms associated with a reduced sense of accomplishment. Finally, the burnout factor RA was positively associated with AC and negatively associated with resilience. Therefore, players and practitioners could poteintially use RA as an indicator of increased burnout risk.

4.5 Limitations and further research

The results reported in the present study should be considered in light of its limitations. The sample was adult English-speaking esports players from seven popular esports. Therefore, the findings may not be generalisable to adolescent players, players from different cultures, or players from different esports. Future esports research should explore esports players of varying ages, cultures, and esports. Such research might also focus on the resilience, coping, and burnout network in a single esport. More specifically, do resilience, coping, and burnout differ between first-person shooter games (e.g., *CounterStrike 2*) and multiple online battle arena games (e.g., *League of Legends*)? The present study recruited players from seven different esports and, therefore cannot capture differences that might occur between esports. The CS coefficient for betweenness was less than optimal and not reported in the present study. This suggests that future research reproducing similar network structures may identify different levels of salience in alternative items/symptoms potentially curtailing the generalisability of these results. Moreover, network analysis adopts a formative perspective when examining psychological variables. This framework considers connections between resilience factors, coping skills, and burnout symptoms as causal systems (van Borkulo et al., 2015). Nevertheless, it is essential to note that since cross-sectional data was used in the present study, no assumptions can be made regarding causality. Further research may address this concern by utilising longitudinal data collection, which would facilitate the analysis of the directionality of connections between variables. Finally, future research might build on the present study's findings by using advanced machine-learning models to investigate the psychology of esports players further.

5. Conclusion

The present study is the first to examine a network of resilience, coping, and burnout among esports players. This was accomplished using psychometrically sound and widely employed scales and NA analysis. The findings highlight the complex relationship between resilience factors, coping skills, and symptoms of burnout among this cohort. More specifically, resilience was negatively associated with burnout symptoms and positively associated with PFC, EFC, and AC strategies. Notably, PFC strongly impacted the network, showing positive associations with various resilience factors. Additionally, AC significantly influenced the network and was positively associated several burnout symptoms. Moreover, the burnout factor RA could be a strong indicator of increased burnout risk.

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Data reference:
Full dataset and analysis can be found here: https://github.com/Daniel28052/Burnout-Resilience-and-Coping-among-Esports-Players-A-Network-Analysis-Approach

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599 **Tables**

Table 1. Resilience, coping, and burnout factor descriptive statistics

Variable	N	Min	Max	Mean	SD
Resilience	453	0	40	25.2	6.45
Problem-Focused Coping	453	1	5	3.46	0.73
Emotion-Focused Coping	453	1	5	3.32	0.71
Avoidance Coping	453	1	5	3.07	0.96
Total Burnout	453	15	75	41.30	10.40
Reduced Sense of Accomplishment	453	5	25	14	3.66
Physical Exhaustion	453	5	25	13.8	4.37
Negative Feelings Towards Sport	453	5	25	13.4	3.76

Note: N = sample size; SD = Standard deviation; Min = Minimum possible value; Max = Maximum possible value

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Table 2. Resilience, coping, and burnout correlation matrix.

Variable	1	2	3	4	5	6	7
1. Resilience	-						
2. Problem-focused coping	0.467**	-					
3. Emotion-focused coping	0.403**	0.541**	-				
4. Avoidance coping	-0.060	0.049	0.230**	-			
5. Total burnout	-0.283**	-0.089	-0.022	0.228**	-		
6. Reduced sense of accomplishment	-0.309**	-0.136**	-0.079	0.192**	0.837**	-	
7. Physical exhaustion	-0.224**	-0.067	0.033	0.204**	0.912**	0.624**	-
8. Negative feelings towards sport	-0.224**	-0.039	-0.021	0.209**	0.898**	0.623**	0.759**

Note: * $p < .05$; ** $p < .01$

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Table 3. Centrality measures per variable.

Node	Strength	Node	Betweenness	Node	Closeness	Node	Expected Inf
RISC9	1.771	ABO13	2.345	CFQ3	2.046	CFQ11	1.688
ABO13	1.736	CFQ3	1.889	RISC9	1.725	CFQ12	1.382
CFQ11	1.461	CFQ7	1.832	CFQ11	1.367	RISC2	1.286
RISC2	1.365	CFQ18	1.575	RISC1	1.345	RISC9	1.273
CFQ12	1.309	RISC9	1.040	CFQ1	1.297	ABO8	1.170
ABO5	1.086	ABO15	1.290	CFQ9	1.265	ABO3	0.999
ABO6	0.903	CFQ11	1.205	CFQ13	1.248	CFQ18	0.975
ABO8	0.903	RISC1	1.062	RISC6	1.206	CFQ16	0.950
ABO14	0.867	CFQ12	0.976	RISC2	1.077	ABO5	0.842
ABO7	0.787	ABO3	0.919	CFQ2	0.998	CFQ9	0.773

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Table 4. Bridge measures per variable.

Node	Expected Inf	Node	Closeness	Node	Betweenness	Node	Strength
ABO10_R	2.488	CFQ3	2.766	CFQ3	4.079	RISC1	2.621
CFQ3	1.824	ABO10_R	1.975	ABO3	3.435	RISC6	2.286
RISC1	1.718	CFQ1	1.843	RISC6	1.482	RISC9	2.250
RISC6	1.507	CFQ2	1.419	CFQ18	1.076	ABO10_R	2.018
CFQ2	1.401	RISC6	1.350	CFQ7	0.911	CFQ3	1.519
RISC9	1.297	CFQ11	1.297	RISC9	0.689	CFQ1	0.908
RISC3	1.212	CFQ13	1.286	RISC3	0.487	RISC3	0.814
CFQ1	1.146	CFQ9	1.209	ABO13	0.487	ABO13	0.681
CFQ13	0.890	RISC1	0.691	RISC2	0.376	RISC2	0.650
CFQ9	0.769	RISC5	0.483	CFQ1	0.376	CFQ1	0.648

Figures

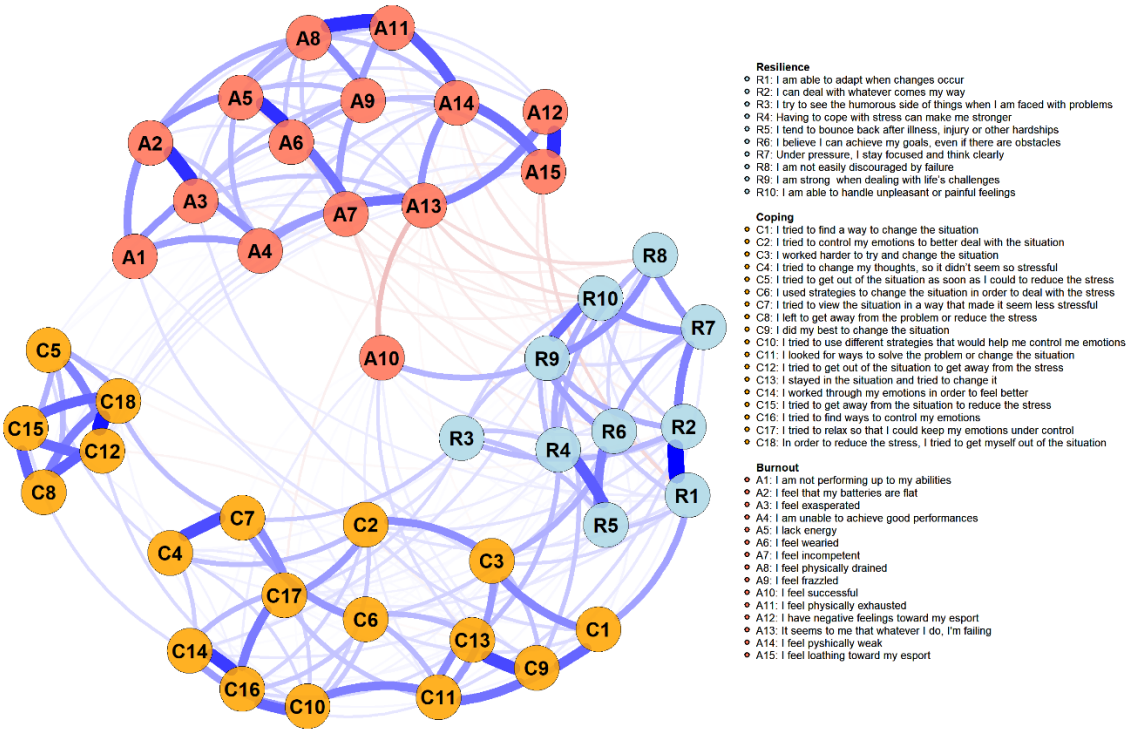

Figure 1. Resilience, coping, and burnout network. The 43 nodes represent 10 resilience factors, 18 coping functions, 15 burnout symptoms, and edges represent EBIC-LASSO regularised partial correlations. Blue edges represent positive relationships, red edges represent negative relationships, and wider and more saturated edges represent stronger ones. Nodes were labelled and coloured according to the variable they represent.