



UNIVERSITY OF EDINBURGH
COLLEGE OF ARTS, HUMANITIES,
AND SOCIAL SCIENCES

MORAY HOUSE SCHOOL OF EDUCATION AND
SPORT

Title

*Mental Skills Training in eSports: The
Impact of Pre-performance Routines on
eSports Performance*

MSc PERFORMANCE PSYCHOLOGY

**DISSERTATION
REDU11024**

AUGUST 2019

Student Number: B139660

Date: 22/08/2019

Mental Skills Training in eSports: The Impact of Pre-performance Routines on
eSports Performance

Dissertation, Journal Article

Key Words: *cybersports, professional gaming, closed-skills, open-skills,*
psychological skills training

Abstract Word Count: 198

Manuscript Word Count (excluding the abstract and the title pages): 6286

Date of Submission: 22/08/2019

Abstract

1) Background: Pre-performance Routines (PPR) focus the attention on execution of self-paced skills. However, conducting PPR intervention on externally-paced performance requires further attention. Thus, this study aims to show if PPR enhance externally-paced performance under real-time pressure. Second, a small number of studies have investigated the impact of PPR on competitive state anxiety. Therefore, the study also aims at measuring whether PPR influence competitive state anxiety levels under pressure.

2) Methods: Ten competitive Counter-Strike: Global Offensive players participated in a four-week PPR intervention. Their performance scores, the competitive anxiety levels, utilising Mental Readiness Form, and perceptions of the intervention with training logs were investigated by a pre-/post-test design.

3) Results: PPR significantly enhanced the performance scores when comparing two phases. However, cognitive and somatic anxiety as well as self-confidence scores remained the same. The training logs, in contrast, indicated an improved attention, calmness and self-confidence.

4) Conclusion: The study discovered that, akin to self-paced events, there is a possibility to improve externally-paced performance using PPR intervention. Besides, optimisation of the mental-state in competitive environment can be achieved via PPR despite the requirement of further investigations. The study also presents example of providing mental-skills training in eSports context.

Mental Skills Training in eSports: The Impact of Pre-performance Routines on eSports Performance

Introduction

Performing in a competition creates pressure on the performers. This pressure may lead to anxiety whereby the attention can be shifted from task-relevant cues (e.g., ball, pitch, position) to irrelevant ones (e.g., nervousness, audiences) (Gröpel & Mesagno, 2017). Therefore, performance psychologists aim at helping athletes to learn and develop mental skills to take control of their mind at an optimal level and thus, enhance their performance (Martindale & Martindale, 2012). Pre-performance Routines (PPR) are one of the interventions intending to help athletes to achieve an optimal state of mind needed for optimal performance.

Pre-performance Routines (PPR)

Pre-performance routines are defined as “*a sequence of task-relevant thoughts and actions*” (Moran, 1996, p.177). According to Cotterill (2011), the goals of this sequence include keeping the attention on task-relevant information, that is related to nothing but only the performance itself, such as lines on tennis court or ball, improving concentration and encouraging positive thinking to rule out distraction. Furthermore, Cohn (1990) stated that PPR include two components named behavioural/physical and cognitive/mental. The behavioural elements of the routines aim to control the attention so that distraction would not occur by using previously determined actions. To illustrate, for a basketball free-throw, a player can bounce the ball as a behavioural component of his/her routine. The other component contains cognitive elements, such as imagery and self-talk, to optimize the mental state. Czech, Ploszay and Burke (2004) suggested that performance could be enhanced once performers utilise both of these components in their routines.

It is important for both practitioners and the performers to understand how PPR function. First, Boutcher (1992) indicated that PPR have benefits to performance in terms of establishing attentional control by focusing on performance-relevant aspects, keeping the mind away from negative thinking, and preventing athletes from attending too much on their skills during the warm-up. Therefore, the chance of being distracted by any external (e.g., noise, score) or internal (e.g., worry) cues is prevented by the PPR (Mesagno, Merchant, & Morris, 2008). The other reason PPR enhance performance is that routines disable mind wandering so that any unnecessary thinking would not intervene with the performance (Thomas, 2018). Lastly, routines boost a sense of confidence and control over the tasks at hand (Czech et al., 2004). They are essential factors since feeling a sense of control and confidence help athletes manage their anxiety that potentially results in poor performance.

Pre-Performance Routines and Optimal Performance

Many studies investigated the effect of the routines on athletic performance under pressure (e.g., Hill, Hanton, Matthews & Fleming, 2011; Mesagno, Hill & Larkin, 2015). Most of the studies showed increased performance for those receiving PPR intervention from different sport context. For instance, the experimental study of Mesagno and Mullane-Grant (2010) with 60 experienced Australian football players was conducted under a manipulated pressure. Players in both non-PPR (i.e., taking no intervention) and the extensive PPR intervention group had about 20 minutes to develop their routines which included both behavioural (e.g., behavioural steps) and cognitive (e.g., cue words) components. Results showed that participants receiving the extensive PPR intervention performed statistically, significantly better in the high-pressure phase than the non-PPR group. Nevertheless, there was no real-time pressure

in this experiment and the intervention time allocated for developing PPR was very limited to confidently indicate that players have successfully learned their routines.

The other study that examined the influence of PPR on performance through anxiety and self-confidence was conducted by Hazel, Cotterill, and Hill (2014). Participants developed their PPR in a one-week period by practising both cognitive (e.g., imagery, cue words) and behavioural (e.g., setting stance) components following the guidelines provided by Cotterill (2011). Results showed that participants who learned and developed PPR in the one-week period for soccer penalty kick overperformed compared to those in the control condition. It may be explained by the reduced somatic anxiety levels they reported. However, no statistically significant difference was observed in the participants' cognitive anxiety scores. The reason that may have influenced this finding could be the absence of real-time pressure when implementing the routines. Another limitation was likely to be having no goalkeeper that could potentially decrease the level of perceived anxiety. Therefore, there was still a need to investigate if PPR influence state anxiety and self-confidence while enhancing performance under real-time pressure.

The gap that Hazel et al. (2014) left was partly filled by Thomas (2018) who aimed to investigate the relationship of PPR with tennis first-serve percentage as well as with cognitive, somatic anxiety and self-confidence. Following the Singer's Five-step Model (2002), an individualised PPR intervention was conducted over the eight-week period of an intensive competition. The intervention involved physical (e.g., behavioural cues) and mental (e.g., self-talk) components together but only measured the effectiveness of the behavioural ones. Despite small differences, findings have demonstrated the improvement in players' first serve percentage when the scores before and after PPR intervention were compared (Thomas, 2018). Besides, the use of

Competitive State Anxiety Inventory-2 (CSAID-2D) (Jones & Uphill, 2004) revealed a decrease in participants' cognitive and somatic anxiety levels as well as an increase in their self-confidence, yet again the changes were modest. Nevertheless, since the sample size of this study was too small and there was no control condition, the results of the study require further evidence to support such claim.

Gröpel and Mesagno (2017) pointed out that PPR do not result in decrements in the performance. They rather enhance or at least stabilize it. However, it is important to decide which components are to be included in the intervention. It was suggested that PPR should contain both cognitive and behavioural elements (Boutcher, 1990). Many studies mainly utilised deep breathing for arousal control (Mammasis & Doganis, 2004; Mesagno et al., 2015). Also, attentional focus (Lidor & Mayan, 2005; Lee, Lee, Kwon, 2015) was included in most of the PPR interventions used to focus players' attention on an external stimulus associated with the task (e.g. focusing on the target). In addition, cue words (Foster, Weigand & Baines, 2006) and self-talk (Hazell et al., 2014) were involved to improve concentration and facilitate motivation. Moreover, behavioural steps (Jackson & Baker, 2001) are quite common in PPR interventions since they are to eliminate any external or internal distractions.

Self-paced and Externally-paced Events on PPR Studies

The relationship between PPR and performance has been mostly examined during self-paced tasks such as rugby penalty kick (e.g., Jackson & Baker, 2001) or basketball free-throw (e.g., Foster et al., 2006). Self-paced events are defined as *“preparation time for performing an act is adequate and environmental conditions are stable and predictable”* (Singer, 2002, p. 359). The idea behind, providing PPR for only self-paced movements, could be that implementation of PPR also requires time for both physical and psychological preparation before the skill execution. The

first three steps, namely readying, imagining and focusing attention, designed to foster the thinking process to achieve the state of a quiet mind. The fourth step is to *execute* the movement followed by the *evaluation* phase by which performers focus their attention on the analysis of the completed performance (Singer, 2002). This model provides a clear strategy to follow while preparing PPR for self-paced movements.

Externally-paced events, on the other hand, have received less attention in the existing empirical literature to date in terms of PPR interventions. In an externally-paced event (see Figure 1), such as returning a serve in volleyball or tennis, quick moves in boxing, performers look for cues in the situation, where performance is ongoing, to quickly anticipate the possible intentions of the opponent(s) and make very quick decisions to execute a movement in an ongoing performance situation where circumstances alter rapidly (Singer, 2000). Therefore, in order to enhance the performance, performers should react adaptively and effectively to the situational demands that may be achieved through PPR because performers also require strategies while performing under pressure to regulate their attention and anxiety. Even though PPR have generally been designed based on pre-match/skill preparation, they have potentials to serve performers during the ongoing performance situation since they include behavioural and cognitive components to enhance players control over their emotions and attention (Mesagno et al., 2015).

**** Figure 1 near here****

electronic-Sports as an Externally-paced Situation

electronic-Sports (eSports) are best defined as “a form of sports where the primary aspects of the sport are facilitated by electronic systems; the input of players

146 *and teams as well as the output of the eSports system are mediated by human-*
147 *computer interfaces”* (Hamari & Sjoblom, 2017, p. 213). Examining whether PPR
148 enhance an externally-paced performance, eSports can be an appropriate context for
149 this investigation.

150 There are many eSports games that involve competitive environment such as
151 Counter-Strike: Global Offensive (CS:GO). It requires an ongoing competition where
152 players interact with each other and the environment very rapidly through their
153 impersonated avatars (i.e., icons that are personifications in the game representing the
154 players and controlled by them; Jenny, Manning, Keiper & Olrich, 2017) on the
155 battleground (Borecki, Tolstych, & Pokorski, 2013). These requirements induce
156 pressured environment where the audiences watch the entire performance and
157 occurred behaviours. This results in the greater psychological demands for high
158 concentration, confidence, trust and most importantly performance-related anxiety
159 regulation to occur (Cottrell, McMillen, & Harris, 2018). Moreover, CS:GO also
160 requires the use of rapid fine-motor skills (Borecki et al., 2013) when commanding
161 the avatars. Using keyboard and mouse combinations, the players give commands to
162 the avatars to move or shoot. The execution of the mentioned behaviours, being under
163 pressures, also contributes to the fulfilment of some psychological demands.

164 Competitive CS:GO and consequent demands show clear matching to the
165 externally-paced model. To illustrate, CSGO players search for both audial (e.g.,
166 footsteps) and visual (e.g., movements of the opponents’ avatars) cues from the
167 opponents to anticipate the possible intentions or actions (e.g., ambush). This
168 probability-based anticipation leads them to make very quick decisions that result in
169 performing the decided movement (e.g., headshot or evade the incoming shot).
170 Therefore, since CS:GO suits the externally-paced events model well, and there is a

need to develop a further understanding of PPR on externally-paced performance, CS:GO would be a beneficial option to conduct a study on investigating the effect of PPR on externally-paced performance.

In addition, Cotterill et al. (2018) mentioned that the psychological demands of eSports constitute a great chance of applying mental skills training (MST) in this context. Therefore, conducting PPR intervention as an MST would also contribute to seeing if that training could be applied well to this context.

The Aims, Research Questions and Hypothesis

The primary aim of the present study is to investigate if PPR facilitate improved performance on externally-paced events while being under real-time pressure. Thus, the first research question regarding this aim is: What is the impact of PPR on an externally-paced e-Sports performance, which is Counter-Strike: Global Offensive, under the pressure of the real-time competition? It was hypothesized that four-week PPR intervention would enhance participants' CS:GO performance scores significantly when compared to their baseline scores.

The impact of PPR on somatic, cognitive anxiety and self-confidence levels requires further and detailed investigation to discover a clear understanding of how routines improve performance. Therefore, the secondary aim of this study is to measure if PPR affect competitive state anxiety (i.e., cognitive anxiety, somatic anxiety and self-confidence) levels. The second research goes as follows: What is the effect of PPR intervention on cognitive and somatic anxiety, and self-confidence among eSports athletes competing in CS:GO game under pressure? It was hypothesized that after taking four weeks of PPR intervention, participants' somatic and cognitive anxiety levels would decrease significantly while their self-confidence would show an increase in comparison to the baseline measurements.

Methods

Design

The study utilised pre-/post-intervention research design to determine differences between two different phases (Lynch, 2010). This design has potential to introduce training effect with the study. However, to control this effect, at least one level of experience was required from participating.

Participants

A total of ten male competitive CSGO players from the United Kingdom volunteered to take part in the study. The inclusion criteria allowed only participants over 18 years old ($M_{age} = 23.20$), with at least one year of competitive gaming experience ($M_{experience} = 6.2$), and being a member of an official CSGO team to participate in the study. All participants have met these criteria. However, none of them was full-time eSports players ($N = 4$ students; $N = 5$ employees $N = 1$, unemployed). In order to recruit participants, the first contact has been made with their team managers via e-mail, Facebook Messengers and Discord. In addition, an invite letter was posted on Twitter and hashtags were included to make CSGO players see the post. Ethical approval was received from the University of Edinburgh (see Appendix A).

Materials

Mental Readiness Form (MRF). In order to measure participants' cognitive anxiety (CA), somatic anxiety (SA) and self-confidence (SC), the 11-point Likert scale, type of Mental Readiness Form (Krane, 1994) were used (see Appendix B). The items of the scale ranged from 1 to 11 being anchored from *calm* to *worried* for cognitive anxiety; from *relaxed* to *tense* for measuring somatic anxiety; from *confident* to *scared* for self-confidence scores (Mesagno, Beckmann, Wergin, &

Gröpel 2019). Krane (1994) reported a correlation between MRF and Cognitive State Anxiety Inventory-2 (CSAI-2, Martens, Burton, Vealey, Bump, & Smith, 1990) highlighting that MRF is validated to become an alternative option to CSAI-2. Also, MRF was utilised by different studies to measure state anxiety and self-confidence in a shorter period of time with the same effectivity (e.g., Mesagno et al., 2019).

Performance Scores (PS). The artificial intelligence behind the CSGO game calculates performance scores for each player's avatar. Based on killing, assisting, dying as well as damage inflicted per round, players gain a total score taken as an individual performance measurement for the study. The low scores range from 0 to 20; the average scores are in between 20 and 40; 40 and above are considered as high scores.

Intervention. Four different workbooks (see Appendix C) were designed by the researcher under the guidance of his supervisor to be delivered in the four-week period (Mesagno et al., 2015), online. The training started with developing an understanding of what the routines are and then introduced behavioural components including deep breathing (Lautenbach, Laborde, Mesagno, Lobinger, Achtzehn, & Arnold, 2015), external focus of attention (Mesagno et al., 2019) by behavioural movements for both avatar and the players, and body stretches. The training proceeded with the introduction of the cognitive components that involved self-talk (Thomas, 2018), imagery (Foster et al., 2004), trigger/mood words (Cotterill, 2011) and evaluation (Singer, 2002; Wilson & Richards, 2011). Then, participants were told in what period of time to implement which component (see Table 1). After each session, homework was given aiming at encouraging participants to make the routines individualised although they were mainly standardised.

**** Table 1 near here ****

Training Logs. To record participants' perceptions of developing and implementing their routines, the researcher under the supervisory guidance designed training logs (See Appendix D). The logs included both open-ended questions and items in 6-point Likert scale ranging from 0 (i.e., none) to 5 (i.e., very high) to record their effort in terms of CS:GO and PPR as well as measure their perception of how PPR have affected their performance. In addition, due to the open-ended questions, information about participants' own way of implementing the PPR and their reflections on the intervention was received to have a deeper understanding of the results.

Procedure

The present study has been conducted online. That is, every document was shared and gathered individually via online platforms, confidentially. Before initiating the research, all materials and procedure were piloted with three experienced CS:GO players. No modifications were made following the pilot.

The players, who had an interest in participating, were informed about the details of the study in the participant information sheet (See Appendix E). Then, consent forms were collected from those who agreed to participate (see Appendix F). Since the design of the study was pre-/post-intervention, their performance scores as baseline (i.e. pre-intervention) measure were taken from the first four games together with their competitive state anxiety scores using MRF before each game. All players received four weeks of PPR training having four sessions based on the provided workbooks. After each week of practice, individual contacts were made to distribute training logs and answer any questions they had. After the fourth week of intervention, participants' MRF and performance scores of four more official games

were taken as post-intervention measures to compare with the baseline. Finally, a message for thanking them for their participation was sent to everyone privately.

Analysis

Due to the design of the study, the best way to detect significant differences at 0.05 alpha level was to employ the Analysis of Variance (ANOVA) with repeated measures for within-subjects. Four official games' averages together with MRFs as pre-intervention (i.e., baseline) and four more official games after the intervention (i.e., post-intervention) were analysed by using IBM's Statistical Package for the Social Sciences (SPSS) version 24.

Results

The normality of each variable was checked to meet the assumption of ANOVA with repeated measures. Performance scores ($p = .581$), cognitive anxiety ($p = .074$), somatic anxiety ($p = .083$) and self-confidence ($p = .190$) scores showed normal distributions indicating that repeated measures ANOVA can be applied for the analysis. Therefore, one group (i.e., all ten participants) X 2 (Test: pre-, post-intervention test) ANOVA with repeated measures was operated.

Performance Scores

Within-subject analysis showed that there was a statistically significant and large effect of 4-weeks of PPR intervention on performance scores, *Wilks' Lambda* = .483, $F(1,9) = 9.65$, $p = .013$, $\eta_p^2 = .517$ (see Table 2). Thus, the first hypothesis of the study was accepted.

**** Table 2 near here ****

Pairwise comparison using Bonferroni indicated statistically significant difference between participants' pre-intervention scores ($M = 41.62$, $SD = 7.56$) and post-intervention scores ($M = 50.85$, $SD = 8.18$), $p = .013^*$ (see Table 3). That is, the participant performed better after taking PPR intervention in comparison of their pre-intervention scores. In addition, the effect size indicated that the difference was large ($\eta_p^2 = .517$) meaning that the PPR's impact on performance was substantial.

**** Table 3 near here ****

Figure 2 displays the performance difference between pre-intervention and post-intervention phases for each participant. All of the players showed improvements in their CS:GO performance apart from participant number 5. It may be due to his low effort put into practising PPR ($M = 2.5$) which was deduced from his training log responses. The larger enhancement of the performance was observed in 1st participant's scores who devoted moderate effort on practising both CS:GO ($M = 3.25$) and PPR ($M = 3.25$).

**** Figure 2 near here ****

When the participants' responses to training logs were checked, it was observed that all participants thought PPR contributed to their CS:GO performance either moderately or highly. Nevertheless, participant 7 considered the contribution of PPR to his performance as low ($M = 2.5$). Furthermore, his overall reflection to the training revealed that he did not think PPR had contributed to having a quiet mind whilst playing the official games despite showing improvement in this performance.

Cognitive Anxiety, Somatic Anxiety and Self-confidence

The three factors of MRF were separately analysed with Repeated Measures ANOVA that resulted no statistically significant influence of PPR on cognitive anxiety, *Wilks' Lambda* = .994, $F(1,9) = .54$, $p = .821$, $\eta_p^2 = .006$; somatic anxiety, *Wilks' Lambda* = .810, $F(1,9) = 2.10$, $p = .180$, $\eta_p^2 = .190$; and self-confidence, *Wilks' Lambda* = .990, $F(1,9) = .088$, $p = .774$, $\eta_p^2 = .010$ (see Table 4). Therefore, the second hypothesis of the present study was rejected.

**** Table 4 near here ****

Table 3 also represents pre- and post-intervention comparisons for all MRF's factors, i.e., cognitive anxiety, somatic anxiety and self-confidence, respectively. Unexpectedly, the CA levels have increased in the post-intervention phase ($M = 2.75$, $SD = .94$) in comparison to the pre-intervention scores ($M = 2.85$, $SD = 1.36$). Yet, the difference is not significant. The important point to consider is that all players already had low CA levels in both phases (see Figure 3).

**** Table 3 near here ****

**** Figure 3 near here ****

Similarly, the SA scores in both phases were low for all participants (see Figure 4). Although the difference was not statistically significant (see Table 3), lower SA levels were observed in the post-intervention phase ($M = 2.77$, $SD = 1.26$) than the levels prior to PPR ($M = 3.50$, $SD = 1.25$).

**** Figure 4 near here ****

Lastly, Figure 5 demonstrates each participants' SC levels in pre- and post-intervention phases. As a reminder, for this item, lower scores mean higher self-confidence. Again, it is clear that all players reported being confident in both phases. Yet, they displayed improved confidence levels, albeit non-significantly, (see Table 3) after PPR intervention ($M = 2.50$, $SD = 1.32$) compared to their baseline levels ($M = 2.62$, $SD = 1.09$).

**** Figure 5 near here ****

Even though the current study does not utilise a qualitative methodology, the reflections of the players to training logs are essential to have a deeper understanding of the impact of PPR.

Participants reported alterations in their mood and confidence positively after practising PPR despite no significant changes in their competitive anxiety and self-confidence scores. For instance, Participant 1 stated that "... *benefits included things like calming down mood, relaxing muscles and focusing on present moment.*" Another example is from Participant 6 who provided his insight, "*the routines are slightly impacting my composure and confidence positively.*" Participant 9 also pointed out that "*PPR... helping you become calm and confident.*" A more detailed expression made by Participant 10: "*Keeping my confidence high is something I've always struggled with so just small things like imagery and self-talk really help with keeping it up here.*"

Moreover, in terms of the PPR's contribution to the performance, Participant 4 mentioned, "*I was extremely focused on achieving my goal... We won the tournament and I know the players (teammates who also participated) were using some of the things that we practised (PPR components).*" In addition, Participant 5 who has shown no improvement, rather decrement in his performance as stated earlier, claimed an interesting argument. He said, "*PPR made tremendous impact on ability to enter and sustain a positive mental state during tournament play.*"

These subjective reflections made by all participants revealed that PPR aided them to reach an optimal mindset with self-confidence, attention and calmness although a further qualitative analysis is required.

Discussion

The primary aim of this study was to examine whether the four-week PPR intervention has increased the externally-paced performance under a real-time competition pressure. The findings have indicated a significant improvement in CS:GO performance scores, while being under pressure of competition, from pre- to post-intervention phases. Thus, the first hypothesis expecting an enhanced performance after the four-week PPR intervention has been accepted. These findings are similar to what the previous studies have shown in terms of improved performance after PPR training (e.g., Lidor & Mayan, 2005; Mesagnot et al., 2008). Therefore, the findings proved that PPR can not only be designed for self-paced events to improve performance but also be utilised for externally-paced events to facilitate increased performance under pressure.

The secondary purpose of the study was to investigate if PPR intervention influences cognitive anxiety, somatic anxiety and self-confidence levels of the players. Similar to Mesagno et al. (2019), who also utilised MRF, no significant

decreases were observed in participants' cognitive anxiety and somatic anxiety levels. The results have indicated the same results for self-confidence levels that have shown no significant changes after PPR intervention although small differences were detected correspond to Thomas 's (2018) conclusion. However, some participants considered that their self-confidence and control over the task at hand has shown improvement due to the routines. This finding matched to the results of Hill et al., (2011) who showed the participants' perceived impact of PPR on increased self-confidence. It was also pointed out that participants thought the routines aided them, especially, to manage their anxiety and to improve their attention (Hill et al., 2011). This finding was also similar to the reflections of the players most of whom recognised the improvement of their focus on the game. Hence, even though participants' competitive state anxiety levels remained the same statistically, their perception of the routines signified that they have become better at managing their state anxiety and focusing their attention on the game *per se*.

According to Cottrell et al. (2018), eSports players share similar psychological demands as traditional performers. Consequently, it makes eSports performers eligible to be provided with mental-skills training. The present study supported this claim by showing that eSports performers are in need of self-regulation and coping strategies due to their tasks demands. Thus, since the PPR intervention as mental skills training for eSports performers was successfully implemented in this study, it can be deduced that other MTS aiming to manage different psychological variables for achieving peak performance could be adopted to this performance context.

Limitations and Future Directions

The first limitation of the study is the absence of a control condition to make between-subject analysis for pre- post-intervention phases. Hence, it is suggested to

have a control condition in further investigations. Besides, participants' demographics may have distorted the results. The participants were either students or workers along with their eSports player identification. Therefore, future studies should recruit full-time eSports players exclusively to control the possible impact of other responsibilities' (e.g., assignments for students or work tasks for employees) impact on their performance.

Another limitation of this study is that there was no measurement used to identify attention variable. The main reason is that the study did not aim at measuring attention. However, almost all of the participants reflected the improved focus of attention due to the PPR training. Hence, future studies should also measure the relationship between attention and PPR training so that the results will provide a deeper understanding of how routines contribute to performance.

Forth, the intervention took 4-weeks similar to Mesagno et al., (2015). However, it was suggested that the more time was allocated to develop and practise psychological skills training, the better the outcomes were achieved (Weingberg & Gould, 2007). Therefore, future studies should invest more time into constructing and practising the routines to make them neutral to performance. In addition, follow-up sessions should be conducted to determine the effectiveness of the intervention.

The other limitation is that the PPR was not fully individualised for each player. By letting the players choose the components that they were comfortable to implement and giving homework to develop the components based on their own strategies that they already had, a controlled person-specific PPR was targeted. Yet, making the routines fully individualised for each player could not be achieved. Future projects, thus, should consider individualising the PPR as suggested before (Cotterill, Sanders, & Collins, 2010).

The last and biggest limitation of this project was that the study did not utilise mixed-methodology (i.e., both qualitative and quantitative methods) to collect and analyse the data. Clearly, the training logs gave a clue that mixed-method analysis would potentially provide a much deeper understanding of how PPR benefitted to the players' attention, state anxiety levels and performance. Therefore, future investigations should conduct interviews while developing the PPR and making the thematic analysis of their effects together with quantitative analysis just like the present study employed.

Applied Recommendations and Implications

Performance psychologist, helping individuals to self-regulate themselves for achieving optimal performance can utilise PPR in both self-paced and externally-paced events. In order to determine what components work in best possible way, additional sessions should be included in the development of the intervention process. That would possibly improve the effectiveness of the PPR training. Moreover, they need to ensure that enough effort is put into practising the components. Therefore, weekly sessions could be very beneficial for both understanding the training's effect and making modifications in the routine if any needed. This paper also suggests applied performance psychologists to include both cognitive and behavioural components while developing PPR. Lastly, for those working with eSports performers could adopt the PPR intervention from this study to other competitive games that share similar demands with CS:GO and match the externally-paced events model.

The other recommendation to the practitioners is about consideration of the dynamics of eSports teams. Himmelstein, Liu, and Shapiro (2017) highlighted that some team dynamics such as leadership, communication, and the team cohesion can play an essential role in affecting the performance of the eSports teams. Therefore, the

mental skills that eSports players require may differ by one team to another. It is suggested to the practitioners that they should spend time and effort also into determining the quality of the teams' dynamics, and then develop relevant mental skills training to the performers. This could be achieved via conducting individual and group sessions, observations and having a strong contact with the coaches and the managers.

Conclusion

The present study has concluded that PPR could be designed and provided successfully for competitive externally-paced events and even enhance performance. Furthermore, players benefit from the routines by improving the way they approach psychologically to the pressured environment while also performing. Although, their impact on competitive state anxiety requires further analysis. In addition, the study exemplified that the context of eSports is eligible for applying mental skills training for optimizing performance and self-regulating.

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Tables

Table 1. *Example of Pre-performance Routines for Counter-Strike: Global Offensive Performance with the Behavioural and Cognitive Components*

Periods	Behavioural Components	Cognitive Components
Pre-match	Body Stretches	Remind yourself it's for relieving tension on your body
	Deep breath for 1 to 5 minutes	Bring your awareness from irrelevant thoughts into this moment
	Adjust your sitting position and control your game setting	Shift your attention to the task-relevant cues
	Take a deep breath and close your eyes	Use imagery for a good performance
	Open your eyes, take another deep breath	Use self-talk to motivate and instruct yourself
Between-rounds	Buy your weapon and check your items	Think "focus" or "relax"
	Swing the knife for three times	Think "focus" for the first swing, "calm" for the second and "relax" for the last one
	Take a deep breath	Consider opponents' possible course of action

PRE-PERFORMANCE ROUTINES AND ESPORTS
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Half-time	Start the round with another deep breath	Say “Let’s go” to attend to present moment
	Visit toilet if needed and get hydrated	Rest your mind and body
	Body stretches (any or combination)	Remind yourself that it is to switch your attention off
	Adjust your sitting position and check your settings	Evaluate opponents’ strengths and weaknesses
	Take two deep breath	Say “you are ready for the next half”
	Take another deep breath	Imagine practising the weapons of the switched team
Post-match	Logoff the game	Congratulate yourself
	Take a short break before you move on	Rest your mind and get ready for a clear evaluation
	Find a place to sit alone	Evaluate your performance in terms of strengths and weaknesses

Table 2. *Summary of Repeated Measures ANOVA for Performance Scores*

	Wilks' Lambda	F	η_p^2	p.
Performance	.483	9.652	.517	.013*

* $p < .05$ indicating statistically significant difference

Table 3. *Bonferroni Comparison for Performance and Competitive Anxiety Scores in Pre- and Post-Intervention Phases*

Pre-intervention vs. Post-intervention Comparisons	Mean Difference	Std. Error	Sig.	95% Confidence Interval	
				Lower Bound	Upper Bound
Performance	-9.225*	2.96	.013*	-15.94	-2.50
Cognitive Anxiety	-.100	.43	.821	-1.07	.87
Somatic Anxiety	.725	.49	.180	-.404	1.85
Self-confidence	1.25	.422	.774	-.830	1.08

* $p < .05$ indicating statistically significant difference

Table 4. *Summary of Repeated Measures ANOVA for MRF's Factors*

	Wilks' Lambda	F	η_p^2	p.
Cognitive Anxiety	.994	.054	.006	.821
Somatic Anxiety	.810	2.109	.190	.180
Self-confidence	.990	.088	.010	.774

Figures

Figure 1. *Externally-paced Situations (adopted from Singer, 2000, p. 1673)*

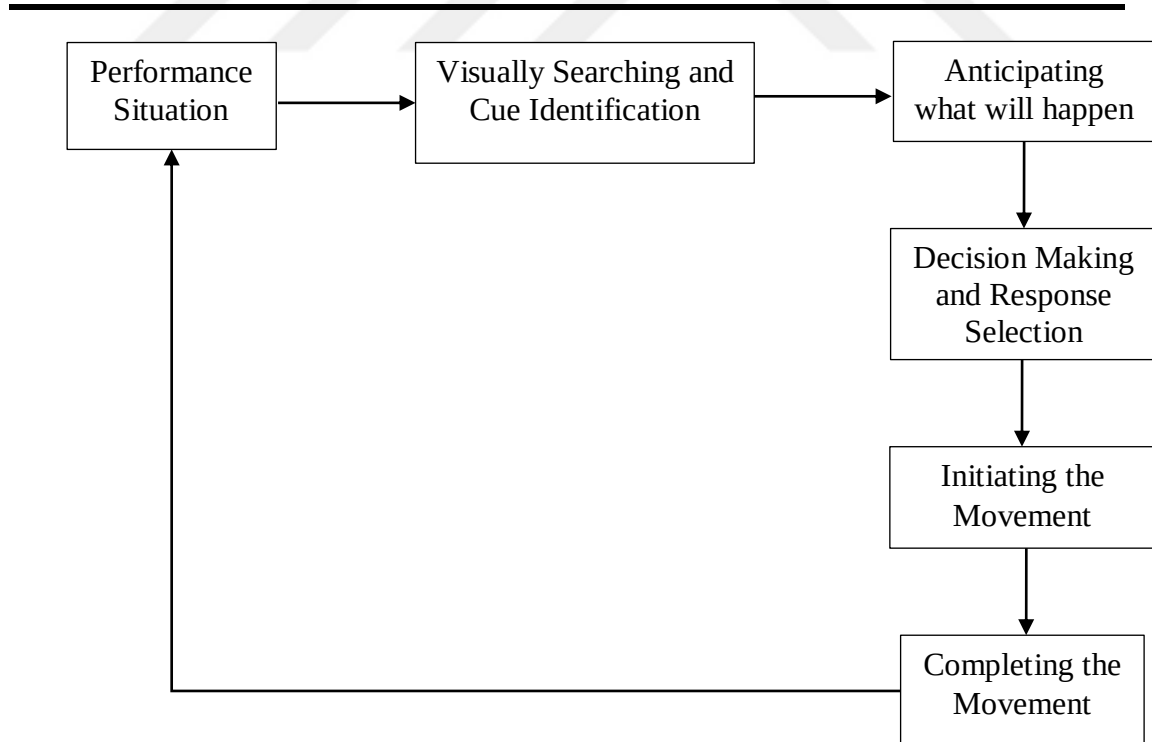


Figure 2. Comparison of Performance Scores of Each Participants

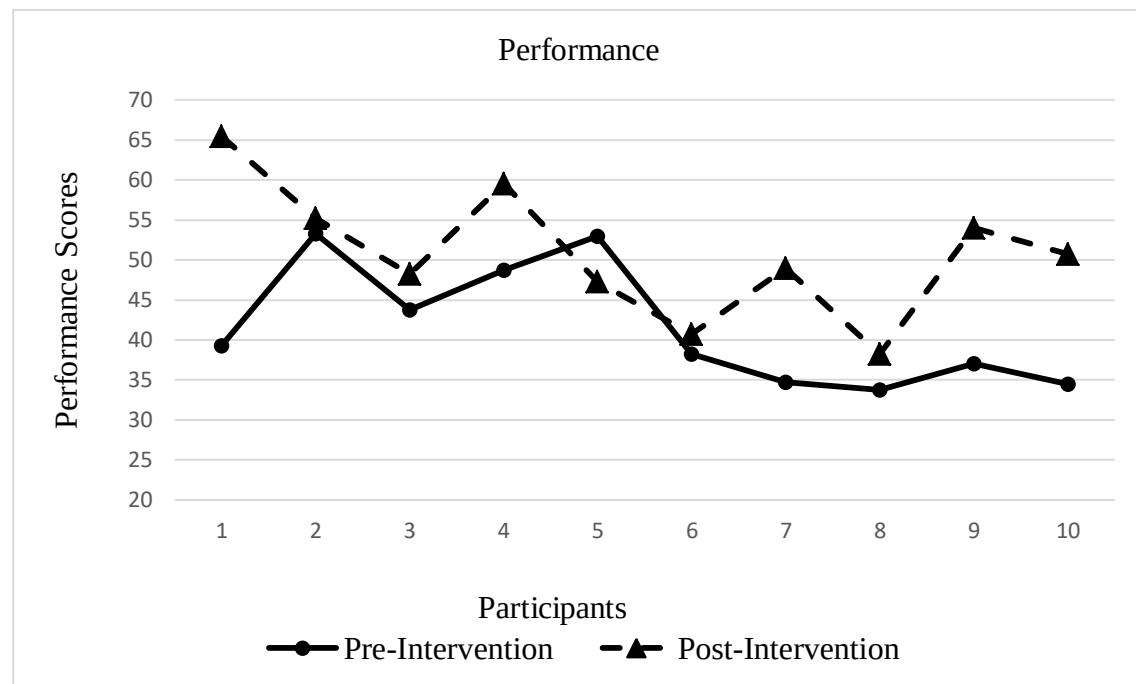
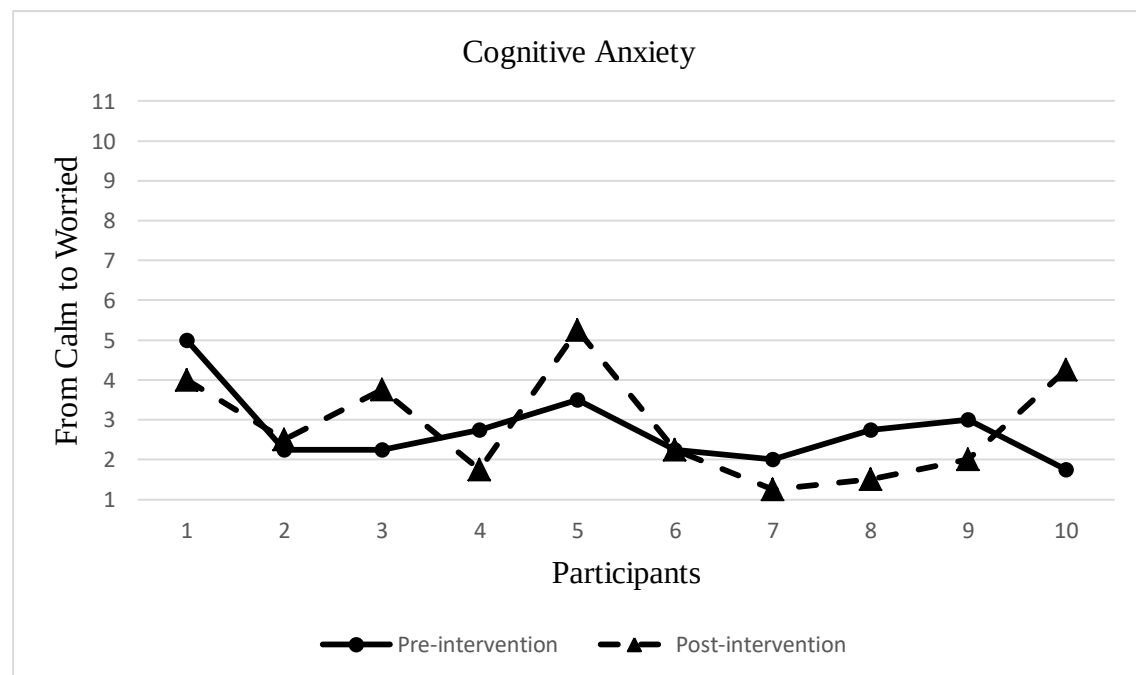
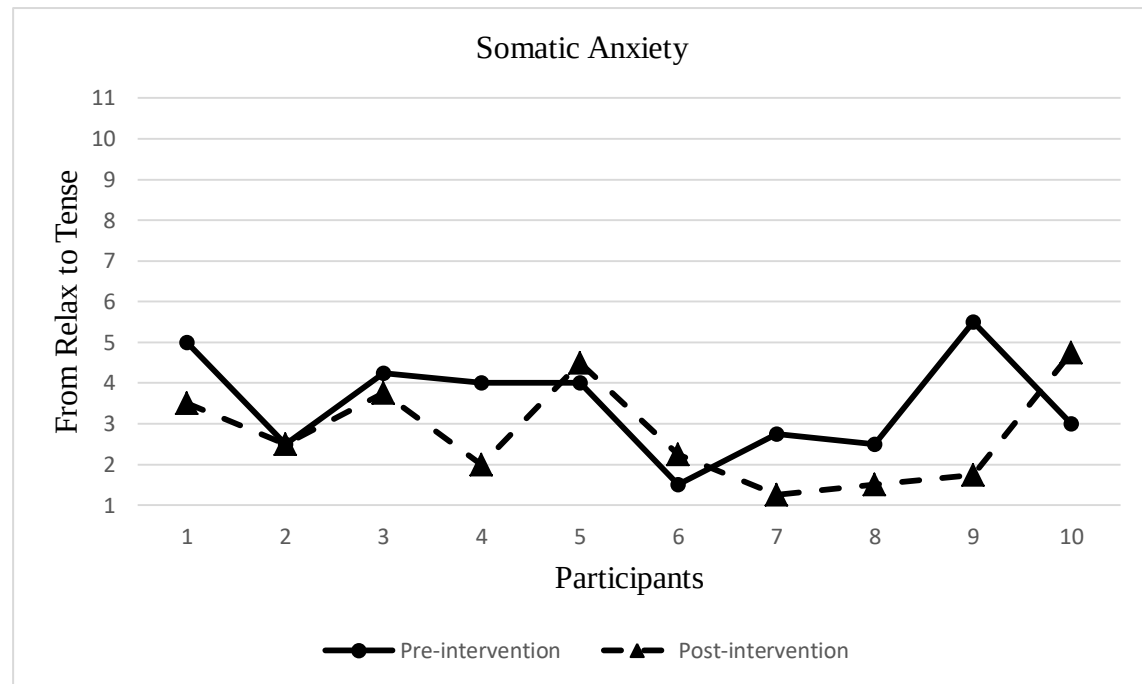


Figure 3. Comparison of Cognitive Anxiety Levels of Each Participant



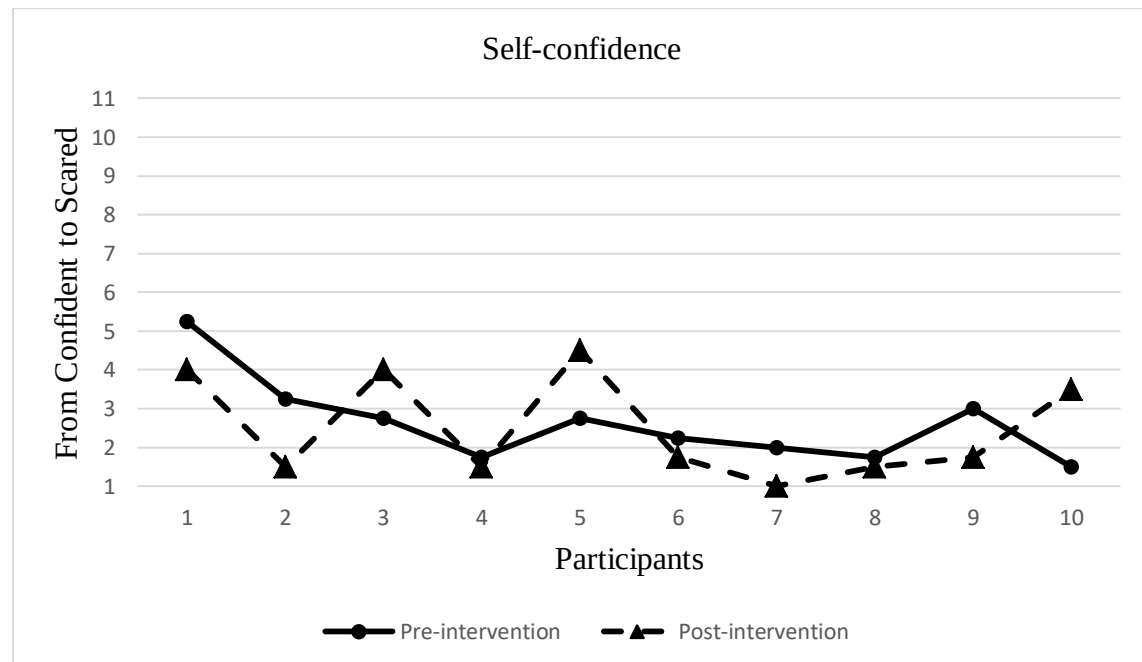
Note: The vertical axis indicates the 11-point Likert scale of the MRF's first item anchored from Calm to Worried

Figure 4. *Comparison of Somatic Anxiety Levels of Each Participant*



Note: The vertical axis indicates the 11-point Likert scale of the MRF's second item anchored from Relax to Tense

Figure 5. *Comparison of Self-confidence Levels of Each Participant*



Note: The vertical axis indicates the 11-point Likert scale of the MRF's third item anchored from Confident to Scared

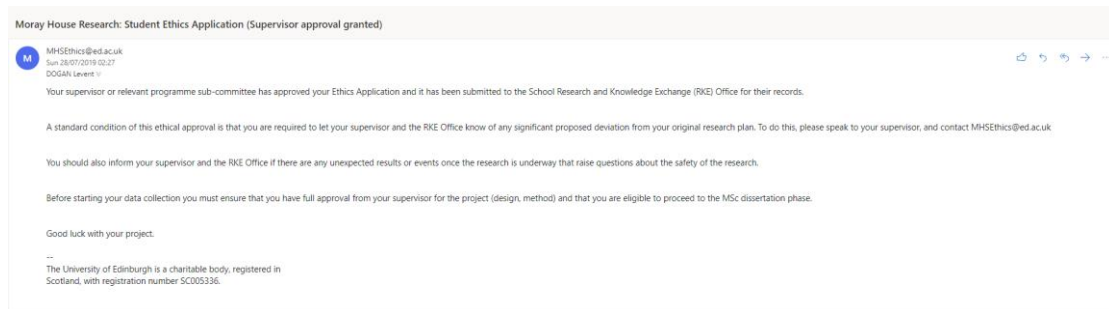
Acknowledgement

Completing this project has been a great opportunity for me since I have gained both applied and academic experience. First, I want to thank my supervisor Dr Kotryna Fraser for all of her effective guidance, kindness, patience and encouragement throughout the dissertation process. Next, I appreciate the participation of the ten amazing eSports players in my study for being so eager, responsible, and ambitious to learn new strategies for their performance development. Additionally, many thanks to the team managers who let me contact with the players to ask their participation, and provided with every possible assistance during the study.

I am so grateful for finding an opportunity to study a Master's Degree at one of the best universities in the whole world and spend time in this great city and country. This would not have been possible without my dear uncle's, Huseyin Irmak, sponsorship and belief. Thank you for all of your non-judgemental support and guidance. I also want to thank my dear fiancée, Ipek Irem Kose, for all of her support to my education and career. Thank you, my love, for encouraging me when I felt frustrated, listening me all the time when I was complaining about almost everything, and waiting for my way back home. My next appreciation goes to my dear sister, Ece, mother, Hacer, and father, Tahsin, for all of their belief in me completing this degree. Thank you, my beauties, for your never-ending love and unconditional support. I lastly want to thank my friends whom I have met during my time in Edinburgh. Thank you, fellas, for your friendship, time and trust. You made my times in this city even better and more enjoyable.

Appendices

Appendix A



Appendix B

Date:

Map Name:

Nickname:

Please embolden/highlight/circle the best option that represents your current state for each statement.

1. My thoughts are:										
1	2	3	4	5	6	7	8	9	10	11
Calm										Worried

2. My body feels:										
1	2	3	4	5	6	7	8	9	10	11
Relaxed										Tense

3. I am feeling:										
1	2	3	4	5	6	7	8	9	10	11
Confident										Scared

This scale is taken from its original paper:

Krane, V. (1994). The Mental Readiness Form as a Measure of Competitive State Anxiety. *The Sport Psychologist*, 8, 189-202.

Appendix C

Workbook

Session 1



Workbook designed by Levent Dogan, The University of Edinburgh, MSc Performance Psychology student working under the supervision of Dr Kotryna Fraser, The University of Edinburgh staff member and an accredited sport and exercise scientist (psychology support) by the British Association of Sport and Exercise Science (BASES).

Process of Training

General Introduction

Background

- ✓ Aim of this training is teaching mental skills to eSports athletes for enhancing their CSGO performance
- ✓ Pre-performance routine will be defined as a sequence of thoughts and behaviours which aims to establish optimal mental state

Overall Purposes of Pre-performance Routines

- ✓ Increasing the attentional focus and self-confidence on the task
- ✓ Decreasing competitive anxiety level
- ✓ Increasing the CSGO performance

Duration

- ✓ Session 1
 - 20 minutes for workbook and 5 minutes for training log
- ✓ Session 2
 - 30 minutes for workbook and 5 minutes for training log
- ✓ Session 3
 - 40 minutes for workbook and 5 minutes for training log
- ✓ Session 4
 - 30 minutes for workbook and 5 minutes for training log

Your Responsibilities

- ✓ Following instructions in the workbooks provided to learn and practise pre-performance routines until you feel comfortable with your routine
- ✓ Applying these routines to your performance while you are practicing and later competing in the tournaments
- ✓ Filling in the training logbooks after each week

My Responsibilities

- ✓ Responding to any questions you may have about the routines and the workbooks

Session 1

Objectives of the session:

After completing this session, you will be able to:

- ✓ Differentiate pre-performance routine from superstitious behaviours
- ✓ Identify behavioural components of pre-performance routines
- ✓ Implement some of the behavioural components
- ✓ Check your understanding by following the homework exercises



Part I: Introducing Pre-performance Routines

One of the most important processes to apply the pre-performance routines (PPR) successfully is developing sound understanding of what they are and why they work. The idea is that the more you know about PPR, and the more you understand and comprehend the routines, the more effectively you will apply them. Therefore, this session is designed to briefly educate you about pre-performance routines and key components that you will be learning to develop your own routine.

Pre-performance Routines (PPR)

- Contain sequential behaviours and thoughts which are relevant to the task
- Have potential to eliminate internal (e.g. being worried, feeling anxiety) and external (e.g. distracting coach/fans, noise) distractions as well as ineffective thinking
- Show potential to increase or stabilize performance under pressure
- Aim to give the performers a sense of control to increase their sense of confidence over their skills on the task
- Include both **behavioural and cognitive components** that you will learn in the first two sessions

Part II: Behavioural Components of Pre-performance Routines

In pre-performance routines, behavioural and cognitive components are related to each other as every behaviour has **a thinking process behind** in order to become a routine behaviour. The session 1 will focus you on **the behavioural components** first, and then you will be introduced to the detailed information about the cognitive components in the next session.

Behavioural components are related to physical movements of the performers. For example, for a basketball free throw, bouncing the ball for two times before shooting is a common behavioural component to keep the attention on the task. In that example, the basketball player is aware of the meaning of this behaviour. For your CSGO task, there is no task-specific muscle movement. However, **your avatar** in the game has behaviours!

Some common repetitive behaviours for many CSGO players are to swing the knife for many times or switch from the weapon to knife continuously. Yet, these behaviours in the game are often **random** and have **no meaning** behind. The most important part of these behavioural components is that you need to understand **why** you are exactly doing a specific behaviour in your routine.

Just because you do not have significant task-specific physical movement, it does not mean that you would not have behavioural components based on your real body. However, these components will not require a challenging physical effort to complete. It is again important to recall that you need to understand **the reason behind** the behavioural component that will be related to your own body.

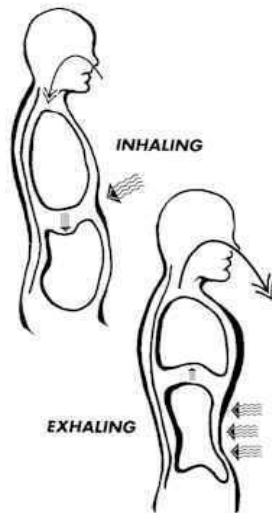
1. Deep Breathing

One of the most important behavioural components is breathing. Breathing is a well-known technique **aiming at regulating emotions and thoughts**. By deep breathing, it is aimed to keep your mind (i.e. awareness) **on the present moment**. This allows to avoid distraction caused by mind wandering. You would also have a chance **to relax your body** due to more oxygen intake.

In your routine, you will have a couple of deep breathing components so that you would stay in the present time and feel relaxed. Although it is an automatic movement that our body does every time, there are still some points to consider.

While practicing deep breathing, make sure that you take a deep breath through your nose to your stomach (i.e., diaphragm), and then exhale from your mouth. In order to be sure that you take the breath to your diaphragm, you can put your hand on your stomach to feel and see it move. If you realize that you take the breath and your chest expand with the breath, it is not a diaphragm breath.

Figure 1 shows how your diaphragm moves while you are inhaling and exhaling deeply. That is, when inhaling from your nose, your stomach needs to



expand with the air. Then, if you exhale through your mouth, your stomach will be tightened.

Figure 1. Deep breathing

You can also practise deep breathing while you are lying down on a bed.

Please follow the instructions below.

- Please find a comfortable place to lie down
- Put your hand on your belly
- Inhale through your nose by counting up to 2 (see Figure 2)
- Feel that your stomach is being filled by air (see Figure 2)

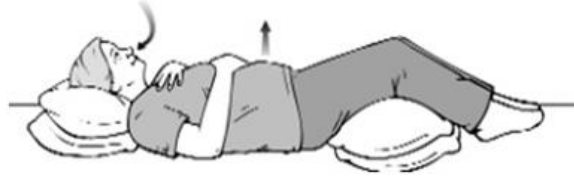


Figure 2. Inhaling phase of deep breathing

- Now, exhale through your mouth by 4 seconds (see Figure 3)
- You will realize that your stomach is tightening as you exhale (see Figure 3)



Figure 3. Exhaling phase of deep breathing

By doing that, you can practise to direct your breath towards your diaphragm. After learning more about diaphragm breathing using these activities, try to take diaphragm breath while you are sitting a chair.

2. External Focus of Attention

The aim of this component is to eliminate any chance of losing your attention but **maintaining focus on things/cues that are relevant to your task**. Let us take an example. A bowling player can use this component by focusing on the start line of the track. By doing this, they shift their attention to something that is totally related to the bowling task (e.g., thinking about their grip). This also helps them to **eliminate any distraction** that could happen around them. For other specific sports performance like tennis first serve, it could be used as touching the racket with the fingers. It seems like a superstitious behaviour and yet, it has **an aim**. The performer **knows** that this movement helps them to keep the attention on the game.

Although some sub-components of external focus of attention should also include a thinking process, it is a behavioural activity *per se*. Thus, it will stay here as a behavioural component. You will focus on cognitive components **in the next session**.

For this component, you will also utilize the behaviours of your avatar in the game.

a. Checking and Adjusting Equipment and Settings

One way to keep your attentional focus on the immediate tasks is checking your equipment and settings, and making some modification if needed (e.g., sensitivity) just before the game.

Before the match starts, please:

- have a look at your keyboard, mouse and monitor,
- adjust their position based on your own style
- go to your CSGO settings and check your sensitivity, keyboard settings, and brightness etc.
- modify any changes you think needed

Remember that you are doing this not only to be sure everything is okay before the game but also to keep your attention on the task. This will help you to eliminate unnecessary distractions!

b. Swinging the Knife

As mentioned before, your performance is mainly based on the behaviours of your avatar. For your routine, adding some specific behaviours of your avatar in the game would help you keep your attention.

In between rounds, you have a limited time to choose your weapon, speak to your teammates about your strategy. Generally, eSports players behave in a very different way during this limited time with their avatars. However, most of them are doing these behaviours **without** any meaning behind them. In that sense, the behaviours could become **superstitious** and when the players do not implement them, the player might start thinking the next round would not be as good as it could have been. Therefore, it is important to fully understand and comprehend **why** you are doing this behaviour as part of your routine. That is why, while doing this behaviour, it is better to combine it with a **cognitive component**. We will discuss the cognitive components in more detail in *workbooks 2 and 3*. But, for now, after buying the weapons, take your knife on your hand, and:

- **Swing the knife** (*this is your behavioural component*)
- While swinging the knife, choose one of the words below based on how you feel in the situation, and say it in your mind (*this is the thinking process of this behavioural component*)
 - ☐ *Relax*
 - ☐ *Calm*
 - ☐ *Think*
 - ☐ *Focus*

Session 2 will give you more information about the relationship with this specific behaviour and these words!

3. Body Stretches

This is the component when you will use your own body to do some movements. For instance, **during the half-time period**, you could do some stretching. Stretching your neck, arms, and legs would help you decrease muscle tension, increase blood flow and thus, you could feel more relaxed before starting the next half.

Your body-stretching component also serves **as an external focus of attention**. Since you will be busy stretching, there will be no space for any distractive thoughts. Stretching will help you to switch your attention off so that your mind gets a little break before it is time to focus again in the next half.

However, you do not have to complete every exercise in your routine. You could pick only one or do all of them depending on the situation you are in. But keep thinking about the exercises you are doing while performing them.

Remember, these stretches are included in your routines to perform in the half-time period for your routines. However, if you find them useful, do not hesitate to stretch arms or neck in the short break between rounds.

a. Stretches for Neck

Please use the instructions below to practise neck stretches (see Figure 4). These are quick and useful exercises for your neck. Sometimes eSports players can report feeling pain in their neck because of spending a lot of time seated while looking at a screen. The exercises would also help relieving this pain on your neck. Please try to do each stretch in or under 30 seconds.

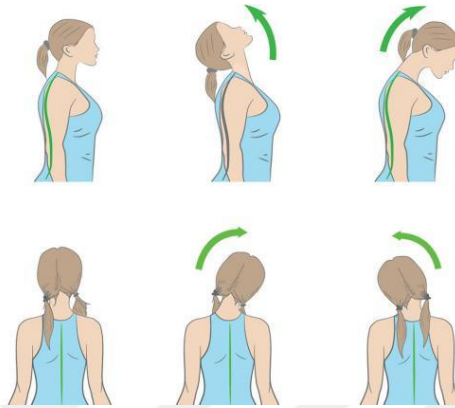


Figure 4. Stretched for you neck.

b. Stretches for Hand, Wrist and Fingers

Please use the instructions below (see Figure 5) to practise stretches for your hand, wrists and fingers. It is again very quick to complete and helpful for the blood flow in your hand. You will feel a pleasant relief of stress before you go into the game. Since eSports is heavily reliant on fingers, it would be very helpful to relax them.

Please try to do each stretch in or under 30 seconds.

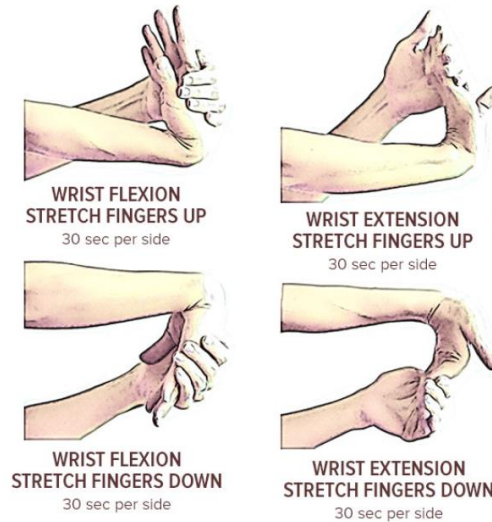


Figure 5. Hand, wrist and finger stretches.

c. Stretches for Legs

Since eSports players have to sit on a chair while performing, their legs can sometimes become tight. In order to eliminate this, it is recommended stretching your legs (see Figure 6). Many legs stretching positioning requires some movement while standing or seated.

There are some suggestions for relieving pain and relaxing your legs. Try to count for 20 seconds for each movement.



Figure 6. Leg stretches.

Part III: Homework

Before the next session, please spend some time on practising these exercises.

- I. Breathing exercise
 - a. During a day, try to practise breathing with your diaphragm for five times to be sure you have learned it
 - b. Count for 2 seconds while inhaling, then exhale in 4 seconds
 - c. Put your hand on your stomach to make sure you do not take the breath to your chest
- II. External Focus of Attention
 - a. Identify your best settings and best position to play CSGO
 - b. Think about any other behaviours that you can do during the game in order to eliminate distractions
 - c. Try to practise “switching the knife” behaviour with its thinking process
 - d. Identify any other behaviours that you could implement with your avatar to eliminate distractions and instruct yourself
- III. Body Stretching
 - a. Practise each of the stretches to find out what works for you best
 - b. Write down any changes that occurred after doing that (e.g. relaxed muscles, relieved pain etc.)

Workbook

Session 2



Workbook designed by Levent Dogan, The University of Edinburgh, MSc Performance Psychology student working under the supervision of Dr Kotryna Fraser, The University of Edinburgh staff member and an accredited sport and exercise scientist (psychology support) by the British Association of Sport and Exercise Science (BASES).

Session 2

Last Session:

- You have been introduced to pre-performance routines and their potential to your performance
- You have learned that PPR had behavioural and cognitive/mental components
- You have learned behavioural components of PPR including:
 - Deep breathing
 - External focus of attention
 - Body Stretches
 - You also had homework practices to both apply your knowledge, and explore some behavioural routines you already have

Objectives:

After completing this session, participants will be able to:

- ✓ Describe cognitive/mental components of pre-performance routines
- ✓ Identify the components that will be used in their routines
- ✓ Comprehend those components in detail
- ✓ Apply them to check their understanding via homework exercises

This session is linked to the session 1 in terms of learning the details of the routines before exactly practicing them.

Part I: Cognitive/Mental Components of PPR

The components that you will learn today are related to thinking process while competing. These are:

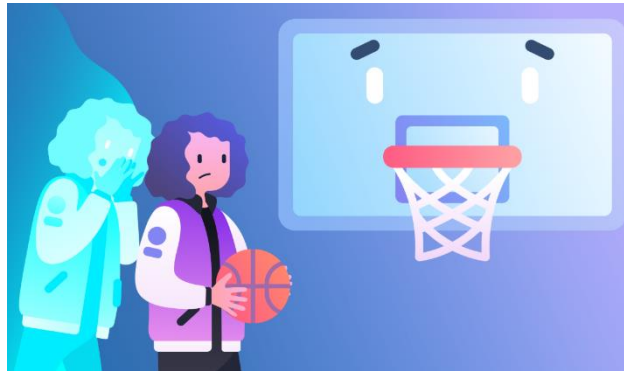
- ☐ Motivational/ Instructional Self-talk
- ☐ Imagery
- ☐ Trigger/Mood Words
- ☐ Evaluation

These mental skills aim at helping you maintain your attention better while increasing your confidence over the task. It is possible that your CSGO performance would increase due to the developed ability to control your thinking process by extinguishing distracting thoughts, feelings and behaviours. Therefore, this session will introduce you to each of these skills first before you start implementing them.

You will learn what these skills are and why they help performers in this session.

1. Self-talk

- Also called as inner monologue, inner speech or verbal thinking.
- This mental skill is widely used in almost every sport domain to enhance performance.



- The general reason for athletes to use self-talk is **motivating** and **instructing** themselves while they are training and competing. It is also used to regulate the emotional state in the competition.

a. Motivational Self-talk

Motivational self-talk aims to boost your motivation while performing. In addition, it can facilitate a behaviour that is goal-directed (*e.g., I will do more headshots in the next round!*) and that includes effort (*e.g., Give it all you got!*).

Some examples for motivational self-talk include:

- *Let's go! Let's do this! You can do this! I will score more in the next round!*

b. Instructional Self-talk

The aim of instructional self-talk is to focus on a specific technique or a movement. You evaluate your performance and use instructional self-talk to remind you what you should do next time. In addition, while instructing yourself, you also shift your attention to the cues that are related to task itself. Thus, it has potential to keep your attention on the game itself by which your performance is likely to enhance.

It is very important not to use any negative word or a statement while instructing yourself. Please prefer to use *positive* statements when you do self-talk as much as possible. For instance, instead of telling “*Don't go to the left!*” say “*Go to the right!*”

For instance, you would not say, “*How did you shoot like that? Come on you know you can do better!*” It may seem motivational at one point, but it includes a judgement to your previous movement as well as focusing the past that might affect your attention.

Some examples of instructional self-talk include:

- *Aim the head! Throw the grenade a bit higher! Follow your routine!*

c. Trigger/Mood Words

- They are mentally verbalized instructions to trigger a specific feeling or an action while you are performing.
- It is possible to use different words depending on the situation. However, best way is to decide these words for each situation before the action

The purpose of mood words is to cope with your unwanted emotions by regulating your physiological response (e.g., tightness in your muscles) and stress that might harm your performance. It is again essential to **avoid negative words** while trying to regulate your emotions. For instance, saying “*Don’t get angry!*” or “*Get rid of these worries!*” might not be the best options for regulating your emotional state. Instead, you can say something like: “*keep your mind calm and focus on the next round*” in order to shift your attention from an internal distraction (i.e., your worries, anger etc.) to the game specific cues.

Some examples of self-talk with mood words include:

- *Stay calm. Cool down. Enjoy the game.*

Example of Trigger Words

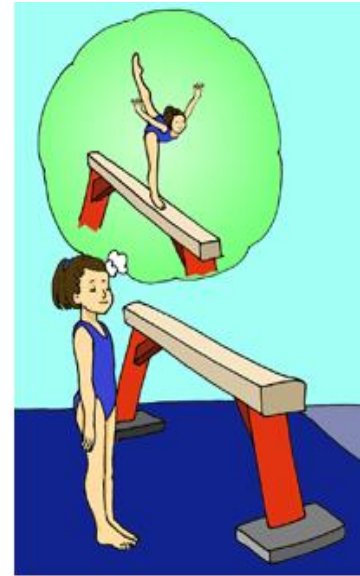
Imagine that you are playing the CSGO and you think you are not doing well. You have realized that you are losing your attention on the task because of your repeated failures. In that case, you can use the word “*Focus*” as a means to bring your attention back on task at hand. The point here is to know what each trigger word means.

In the first session, you were introduced to external focus of attention as a behavioural component of your routine. One of the behaviour was “***swinging the knife***” (please see Session 1, p. 10) and at the same time saying some words such as “*relax*” or “*focus*”. The idea is to both regulating your mental state based on the situation by using these words and keeping your attentional focus on the task itself. Please remember that if you are now aware of the meaning behind any component that could become a superstitious behaviour. In the following sessions, you will be introduced to your routine and be more familiar with the interaction between behavioural and cognitive components.

2. Imagery

- In simple words, imagery means going through all movements related to a task in your mind before you really do them. In that way, your mind will be ready for the performance and has already practised what you would do while performing.
- Some main objectives of this mental technique are regulating your thoughts, feelings and behaviours.

You can utilise all of your senses while you are doing imagery. You can imagine a CSGO performance and at the same time imagine hearing the voice of audiences or even voices from the game. This would help you get familiarize the competitive environment.



Example Imagery for your CSGO task

- I. Just before the match starts, you can imagine use of some specific weapons that you generally prefer. For instance, you can imagine how to make a great head shoot with the pistol. In that way, you will be prepared mentally for the first round that is based on pistols. You can also choose other weapons that you will use a lot in the following rounds in order to be mentally ready yourself to use it by practising it in your mind.

It is important to be sure that you are imagining the best performance. Any bad experiences or performance should be excluded from this process.

4. Evaluation

- Since CSGO is an ongoing performance, players always look for cues from the opponents. For instance, you are listening for their footsteps to detect their location, or you are quickly checking possible places on a specific map where they can hide and have an ambush.
- The short time **between rounds** is suitable to consider the opponents' possible course of action based on the information you have gathered from the previous rounds. In that way, you will make your decisions during the game **much quicker** to beat them. It is of course possible to do it with your team-mates, but your own observations and cue identifications are important for your own movements.
- During especially the **half-time** (i.e. the break after the 15th round), you will be able to make a longer evaluation. Some of the subcomponents include:
 - ✓ Considering the strengths and weaknesses of the opponent
 - ✓ Considering opponents' possible starting strategy for the next half
 - ✓ Thinking about the best course of action against some well-used skills of the opponents
- **After the game (i.e., post-match period)**, you will also utilize this component to evaluate your performance, your communication with your team, your strengths and areas of development and so on. Evaluating the performance will help you to identify your own strengths and weaknesses and was for future improvement. Important point here to consider is when exactly do the evaluation. Some emotions after a bad or a good game can intervene with your evaluation that is why it is better to take a little break to both have a little rest and clear your mind.

Part II: Homework

Before the next session, please spend some time on the following exercises.

IV. Self-Talk

- a. Try to remember as many thoughts as you can that occurred during your CSGO training or matches. Write them down under that “*Thoughts*” category.
- b. Identify whether the thoughts were positive, negative or neutral under “*Positive/Negative/Neutral*” part of the table
- c. Give some details about the situation they occurred at under “*Reasons*” row
- d. State the feelings you experienced when they occurred under “*Feelings*” row
- e. Also, please try to specify each of them in terms of its function (i.e. motivational etc.)

Thoughts	Positive/Negative /Neutral	Reason	Feelings
<i>e.g., Oh, please don't die, please!</i>	<i>Negative</i>	<i>Being the last one in the team against three opponents.</i>	<i>Anxious</i>
<i>e.g., Keep it up! Good shoot!</i>	<i>Positive</i>	<i>Motivating</i>	<i>Want to keep the same performance</i>
<i>e.g., Where should I head to for a dinner?</i>	<i>Neutral</i>	<i>Distracted, bored, hungry</i>	<i>No idea</i>



Trigger/Mood Words

- f. Please think about different situations in the game and find out the best trigger word for you based on each situation, and note them down.

Trigger/Mood Word	Situation
<i>e.g., focus</i>	<i>e.g., when I realized that I was distracted by my thoughts that weren't relevant to the game</i>

V. Imagery

- a. Just before the training matches, spend some time on imagining use of a preferred weapon. Try to imagine every step starting from choosing and finishing with using the weapon.

VI. Evaluation

- a. Try to detect some of your audial and visual cues from the opponents and note them down.
- b. Evaluate your strengths and areas for development after each training and record them in the table below (*see an example*)

Strengths	How to keep	Weaknesses	How to improve
<i>e.g., I use pistols well</i>	<i>e.g., train more to become better</i>	<i>e.g., I need improvement on use of Submachine guns</i>	<i>e.g., in the training, choose submachine guns to practise more</i>

Workbook

Session 3



Workbook designed by Levent Dogan, The University of Edinburgh, MSc Performance Psychology student working under the supervision of Dr Kotryna Fraser, The University of Edinburgh staff member and an accredited sport and exercise scientist (psychology support) by the British Association of Sport and Exercise Science (BASES).

Session 3

Last Session:

- You learned and practised cognitive components of the pre-performance routine (PPR) including self-talk and trigger words, imagery and evaluation while first session looked at the behavioural components. This week will combine both to fully develop your pre-performance routine.

Objectives:

After completing this session, participants will be able to:

- ✓ Review past two sessions (i.e. PPR and the components)
- ✓ Put behavioural and cognitive components together as a routine
- ✓ Understand when to use these components
- ✓ Learn what their routines are and how to apply them while training and performing
- ✓ Practise their pre-performance routines

Part I: Review of the PPR Components

From the previous sessions, you were expected to learn what the pre-performance routines are and why they would help you to enhance your performance.

Session 1. You were introduced to behavioural components of the routines. These components are likely to improve your attention by eliminating any distraction that might occur inside you (e.g., fear of failure) or around you (e.g., noise). You have recognized that every behaviour in session one had a specific meaning behind. It was suggested to keep these meanings in your mind while implementing them. For instance, external focus of attention include some tasks to check your equipment or adjust game settings. The meaning behind that is to avoid any attentional shift from task-relevant cues to task-irrelevant ones. You also learned to use this component by behaving with your avatar. For instance, you may swing the knife for three times while at the same time telling yourself some words depending on the situation.

In addition, you have learned how to do some easy body stretches. These stretches would help you switch your attention off in the half-time period so that you could rest your mind as well as relieve your body.

The last component was deep breathing. You learned how to do deep breathing and why it may be useful. Whenever you do deep breathing, you should bring your mind to the present moment. That way you will be more aware of what is happening in the present situation. That will also improve your concentration on task at hand and help you to relieve some stress.

Session 2. This session aimed to introduce cognitive components of your routine. These components include mental skills that would help you manage your thinking process in the game and thus help you focus more on the task itself and regulate your emotions. You have learned that self-talk has three types. One is **motivational** by which you speak to yourself to prompt you to perform better. The other one is called **instructional** self-talk that aims at reminding you a specific movement or skill and how to execute it. The last type of self-talk was to regulate your emotions when you feel a bit discomfort during the game.

You also learned more about imagery. You will use this component in order to visualise a best performance in your mind to both practise the skills you want and focus on the game itself. Moreover, you will use **mood/trigger words** to quickly relax or refocus during the game. The last cognitive component was **evaluation** that will help you to gather information from the opponents and make much quicker

decisions. Although you may conduct analysis and evaluation throughout CSGO anyway, staying more conscious, strategic and aware of benefits of evaluation will help you to become more focused on the game.

The aim of this session is to put all these components together and develop your own pre-performance routine before you can apply the pre-performance routine to your CSGO performance.

Part II: Pre-performance Routines for Counter-Strike: Global Offensive

You have learned how to implement each of component from the previous sessions. Now, it is time for you to identify **when** and **how** you will apply each component. You will have **four** different occasions to apply the PPR components and all of them is **during the match**.

1. Pre-match Preparation

This could be one hour or half-an hour before the game starts. You will apply ***external focus of attention, body stretches and breathing exercise*** as your behavioural components. The behaviours under these components are listed in the Table 1 and you **could choose any of the sub-elements to implement**.

In addition, you will have two different cognitive/mental components to implement in this occasion which are ***Imagery and Self-talk***.

! *Please remember why you are using each component. If you do not recall the meaning behind each behaviour, please check previous workbooks for meaning of each component.*

Table 1: Behavioural and Cognitive Components and Options for Pre-Match Preparation Period

Instruction: Please choose one option for each section/component.

	<i>Pre-match Preparation</i>
<i>Behavioural/ Physical</i>	Body Stretches ☐ Stretching Neck ☐ Stretching Arms ☐ Stretching Legs ☐ Other stretches you prefer to do ☐ Combination of stretches (please specify below:) Breathing ☐ Take three deep breath and remind yourself to relax and focus ☐ Close your eyes and do 1 to 3 minutes of breathing exercise ☐ Combination of both External focus of attention ☐ Check your equipment and settings ☐ Apply changes to your settings if needed ☐ Adjust your sitting position and make yourself physically ready for the game ☐ Take a sip of water ☐ A combination or other behaviours (please specify below:)
<i>Mental/ Cognitive</i>	Imagery ☐ Choose a specific skill/movement (e.g., pistol shot, use of AWP, throwing long range grenade, etc.) and visualize it ☐ Imagine a round and visualize a best performance in this round ☐ Imagine the beginning of the game and try to identify your feelings and regulate them ☐ A combination (please specify below:) Self-talk ☐ Motivational ☐ Instructional ☐ Trigger/mood words ☐ Any other self-talk that you developed last week and that works for you

2. Between Rounds

In CSGO tournaments, this period generally takes 10 seconds. The game basically provides this period in order for players to buy weapons for the next round and get prepared. This period could be also used for your PPR. The main objectives of the components that you will use between rounds is to:

- avoid any useless thoughts, especially those related to the past performance;
- refocus back on to the game and the round itself;
- regulate your emotions if needed;
- re-evaluate your strategy based on the information you have gathered on the opponents.

You will again use both behavioural and cognitive components that you have learned together in this period. Please choose the best options among different sub-components for you to implement as your routine.

! *Please remember why you are using each component. If you do not recall the meaning behind, please check previous workbooks for meaning of each component.*

Table 2: Behavioural and Cognitive Components and Options for Between Rounds Period

Instruction: Please choose one option for each section/component.

	<i>Between Rounds</i>
<i>Behavioural/ Physical</i>	External Focus of Attention ☐ Buy weapons and other items you need ☐ Check if you have every item you need for the next round (e.g., grenade, helmet, vest etc.) ☐ Swing the knife for three times and remind yourself why you are doing this ☐ A combination or other behaviours (please specify below:) Breathing ☐ Take two deep breath to calm you down, focus, and stay in the present time
<i>Mental/ Cognitive</i>	Trigger/Mood Words ☐ Relax ☐ Focus ☐ Breathe ☐ Calm ☐ A combination (please specify below:) Self-Talk ☐ You can make it ☐ Aim the head ☐ Make quicker decisions ☐ Any other self-talk that you developed last week and that works for you ☐ A combination (please specify below:) Evaluation ☐ Consider opponents' possible course of action

3. Half-Time

Half time break gives a considerable amount of time to rest and get ready for the next half both physically and mentally. In this time, the main objective for your routine is **to switch your attention off** so that your mind will rest and become much more ready for the next half. You can use body stretches to take your mind off the game to let it rest for a minute (see Table 3). However, before you begin the next half, you will need to switch your attention back on and re-focus on the game.

In addition, half time is a great opportunity to engage with a quick **evaluation** of your individual performance. That is, use the information you have gathered from the previous half and evaluate the opponents' basic strategies, strengths and weaknesses. Use this information to adjust your strategy and course of action accordingly. Importantly, re-evaluate your own strategy (e.g., use of weapons) and you are going to switch your team from Counter Strike to Terrorists or vice versa. Some cognitive components that were introduced in the previous sections of this workbook will be included (see Table 3).

! *Please remember why you are using each component. If you do not recall the meaning behind, please check previous workbooks for meaning of each component.*

Table 3: Behavioural and Cognitive Components and Options for Half-Time Period

Instruction: Please choose one option for each section/component.

	<i>Half-Time</i>
<i>Behavioural/ Physical</i>	Switching attention off ☐ Toilet break if needed ☐ Get hydrated Body Stretches ☐ Stretching Neck ☐ Stretching Arms ☐ Stretching Legs ☐ Other stretches you prefer to do ☐ Combination of stretches (please specify below:) External focus of attention (<i>switching the attention on</i>) ☐ Check your equipment and settings ☐ Apply changes to your settings if needed ☐ Adjust your sitting position and make yourself physically ready for the game ☐ A combination or other behaviours (please specify below:) Breathing ☐ Take two deep breath to calm you down, focus, and stay in the present time
<i>Mental/ Cognitive</i>	Evaluation ☐ Evaluate opponent's strategy, skills, weaknesses and strength ☐ Think about the demands of the new team that you have switched (Terrorists or Counter-Terrorist) and identify a best starting strategy Self-Talk ☐ Look for audial and visual information before making decision! ☐ You are ready for the next half! ☐ Any other self-talk that you developed last week and that works for you ☐ A combination (please specify below:) Imagery ☐ Imagine using weapons relative to your new team (e.g., AK-47 for Terrorist or M4A4 for Counter-Terrorist)

4. Post-Match

This is the last period for your routine which aims to make use of newest information to evaluate your skills and overall performance. You could identify areas

for development as well as your strengths when playing CSGO to aid improve your future performance. Please look at the Table 4 for your routines in this occasion.

In this period, the suggestion is to follow the behavioural component and **take a little break** before you move on with evaluating your own performance as stated in the previous session. While evaluating your performance, remember to focus on both process (i.e., your skills, strategy, decision you made, etc.) as well as results (e.g., kills, final score, etc.).

! *Please remember why you are using each component. If you do not recall the meaning behind, please check previous workbooks for meaning of each component.*

Table 4: Behavioural and Cognitive Components and Options for Post-Match period

Instruction: <i>Please choose one option for each section/component.</i>	
	<i>Post-match</i>
<i>Behavioural/ Physical</i>	Switching the Attention off ☐ Logoff from the game <i>Take a break before you move on with the cognitive component</i>
<i>Mental/ Cognitive</i>	Switching the Attention off ☐ Congratulate yourself Evaluation ☐ Evaluate your own performance and the situations that went well (i.e., strengths) ☐ Consider situations that need improvement for future games

Part III: Homework

Before the next session, please spend some time on the following exercises.

- ☐ Try to apply the routine you have just learned at least three times during your training
- ☐ Consider each component, and try to find the best routine for **you**
- ☐ Review your knowledge of the components if you cannot remember why you are applying them
- ☐ Follow the table below (see Table 6) to adjust your own routine

Workbook

Session 4



Workbook designed by Levent Dogan, The University of Edinburgh, MSc Performance Psychology student working under the supervision of Dr Kotryna Fraser, The University of Edinburgh staff member and an accredited sport and exercise scientist (psychology support) by the British Association of Sport and Exercise Science (BASES)

Last Session:

- You have learned how to associate behavioural and cognitive components throughout different stages of your pre-performance routine (PPR). You also started developing and practising your own pre-performance routine (PPR).

Objectives:

After completing this session, participants will be able to:

- ✓ Review the previous three sessions
- ✓ Apply pre-performance routines to CSGO
- ✓ Become more confident and comfortable with your PPR
- ✓ Identify further suggestions for future trainings



Part I: Review of the Previous Sessions

From the previous three sessions, you have learned what the pre-performance routines are and how they can increase your performance by enhancing attentional control and decreasing anxiety.

Please go through the following questions below to review your understanding of PPR and its key components.

- 1. What are the meanings behind each behavioural component you have been applying as a part of your routine?*
- 2. Which cognitive components have you included in your routine?*
- 3. Why did you choose these components?*
- 4. What were the aims for the components that you have been asked to implement **in between rounds**?*
- 5. What were the aims for the components that you have been asked to implement **during half-time**?*

Part II: Practising Your PPR

In the previous session, you have developed your own pre-performance routine. After trying it out, you should decide which sub-component would form your pre-performance routine. This session will show you how to apply **an exemplar routine** (see Table 1). By following these steps, you should implement and continuously practise your own routine.

Please make use of the table below (Table 1) in order to see how each behaviour is related to a thinking process. In this way, your routine will make more sense to **you** while implementing it. In addition, you will eliminate any chance of developing a superstitious behaviour.

You can either follow this example while practising your routine or you can modify it with the sub-components that you have developed as a result of your homework practices. For instance, rather than using the given self-talk examples, you can use your own self-talk strategy for this component.

After the table, you will see the exemplary routine in a more detailed way.

Table 1: Example of Pre-performance Routines for Counter-Strike: Global Offensive

<i>Periods</i>	<i>Behavioural/Physical Step</i>	<i>Cognitive/Mental Step</i>
<i>Pre-match</i>	1. Body stretches (any or combination) 2. Do deep breathing for 1 to 5 minutes 3. Adjust your sitting position and control your settings 4. Take a deep breath and close your eyes 5. Open your eyes, take another deep breath	1. Remind yourself it's relieving the tension in your body 2. Bring your awareness from irrelevant thoughts into this moment by focusing on your own breath 3. Shift your attention to the task-relevant cues 4. Use imagery for a good performance 5. Use self-talk to motivate and instruct yourself
<i>Between Rounds</i>	1. Buy your weapon and check your items 2. Swing the knife for three times 3. Take a deep breath 4. Start the round with another deep breath	1. Think "focus" or "relax" 2. Think "focus" for the first swing, "calm" for the second and "relax" for the last one 3. Consider opponents' possible course of action 4. Say "Let's go" to attend to present moment
<i>Half-time</i>	1. Visit toilet if needed and get hydrated 2. Body stretches (any or combination) 3. Adjust your sitting position and check your settings 4. Take two deep breath 5. Take another deep breath	1. Rest your mind and body 2. Remind yourself that it is to switch your attention off 3. Evaluate opponents' strengths and weaknesses 4. Say "you are ready for the next half" 5. Imagine practising the weapons of the switched team
<i>Post-match</i>	1. Logoff the game 2. Take a short break before you move on 3. Find a place to sit alone	1. Congratulate yourself 2. Rest your mind and get ready for a clear evaluation 3. Evaluate your performance in terms of strengths and weaknesses

1. Pre-match Preparation

Today is the match day. There are 30 minutes (*please modify this period based on your comfort*) left before the game starts. You have prepared for this game in terms of strategy, skills and techniques you have. You also have practised your routine so that you would keep your attention on the task and cope with any unwanted emotions that could harm your performance.

- ☐ Stretch your arm, legs, and/or neck to relieve the tension on your body
- ☐ Sit in your chair and close your eyes
- ☐ Take a deep breath and focus on the air that comes through your nose
- ☐ Exhale through your mouth and count for 4 seconds while exhaling
- ☐ Do this for 1 to 5 minutes
- ☐ Try to accept any thoughts that come to your mind while doing this but gently bring your awareness into this moment by focusing on your own breath

Remember, by doing this you aim to regulate your emotions, control your thinking process with your breath and bring your awareness into the present moment and the situation!

- ☐ Open your eyes
- ☐ Go to your computer desk (*the place you will play CSGO soon*)
- ☐ Sit on your chair and adjust your position based on your comfort
- ☐ Open CSGO and go to the settings
- ☐ Check if your settings are applied and if not, edit them to your own style

Remember, this is for you to focus on task-relevant cues so that any distractions could be eliminated!

- ☐ Then, lay back and close your eyes with a deep breath
- ☐ Imagine that you have the pistol and heading to the opponents' zone

- ☐ You reach there and see that there are two opponents left and you are the only one alive in your team
- ☐ Imagine a best aim for a clear head-shot
- ☐ Get ready and pull the trigger
- ☐ Open your eyes again and take another deep breath
- ☐ Instruct yourself by saying:
 - ☐ Follow your routine and stick to your team's plan!
 - ☐ Aim the head!
 - ☐ Look for cues before action!
- ☐ Take another deep breath and remind yourself that:
 - ☐ I have worked too hard for this!
 - ☐ I know I can do this!
- ☐ Take the last deep breath and talk to yourself by saying:
 - ☐ Keep calm and focus on your game!
 - ☐ Try to enjoy the game itself!

2. Between Rounds

You have played your first round and now have approx. 10 seconds to implement your routine.

- ☐ Buy weapons, helmet, grenade, etc.
- ☐ Check your items
- ☐ Take your knife on your hand
- ☐ Swing it for three times and each time you swing the knife, tell yourself to:
 - ☐ Focus
 - ☐ Calms
 - ☐ Relax

- ☐ Consider quickly the opponents' possible course of action based on the information obtained during the previous round
- ☐ Take two quick breaths when the round starts as a reminder to fully attend to what is happening now and tell yourself "Let's go!"

Follow this routine after each between-round period.

3. Half-Time

- ☐ Toilet break if needed
- ☐ Get hydrated
- ☐ Do body stretches, especially for legs and neck
- ☐ Give yourself time to rest

Just before the game starts, again do as follows:

- ☐ Check your settings and apply changes if needed
- ☐ Adjust your sitting position
- ☐ Think about your own performance in terms of what went well and bad in the first half
- ☐ Evaluate what were the situations that the opponent did well and not so well
- ☐ Consider any possible course of action to stand against their strength and benefit from their weaknesses
- ☐ Take two deep breaths and tell yourself:
 - ☐ You are ready for the next half!
- ☐ Imagine yourself using the weapons of the team that you would be playing for in the next half

4. Post-match

- ☐ Get offline from the game
- ☐ Congratulate yourself
- ☐ Take your time to rest and clear your mind before you move on with the evaluation
- ☐ Evaluate your own performance in terms of:
 - ☐ Use of specific weapons
 - ☐ Contribution to the team
 - ☐ Areas of development for future games

Part III: Follow-up Suggestions and Instructions for Further Practices

The example above gives you an idea how to apply PPR during the tournament. You will become more confident with your routine as you practise more. Both behavioural and cognitive components will become automatic with practice. As such, you should spend some time practising your routine during the training sessions to use them successfully during the tournament.

Whenever you feel that you do not recall the meaning or the aim of any component, please just go back to the workbooks and find relevant information. If you need further help to clarify certain aspects, do not hesitate to get in touch with the researcher or the supervisor.

For the following competitions, try your best to put as much effort as into applying your routine. Stick to the practised routine as any unpractised modifications can inhibit your performance. All changes and modifications should be made during the training sessions so that you would feel fully confident in your preparation when you are competing.

Appendix D Training Logbook

After Session #:

Date:

Participant No:

Please fill this logbook in based on training of the first session. After completing, please return it back to the researcher.

Please answer each question on a scale of 1 (very little) to 5 (very high).

Items	None	Very Little	Little	Medium	High	Very High
1. How much effort did you put into training the CSGO?	0	1	2	3	4	5
2. How much effort did you put into practising the pre-performance routines?	0	1	2	3	4	5
3. How much do you think the routines have influenced your CSGO performance?	0	1	2	3	4	5

*** Please **embolden** or **highlight** your response! ***

4. How many times did you practise your pre-performance routine in the training or games this week?

- ☐ Once per training session
- ☐ Once per each game
- ☐ Once per each map
- ☐ Once a day
- ☐ Twice a day
- ☐ Once per week

Other (Please specify below)

5. Please indicate the components of your routine that you have practised this week.

- ☐ Body Stretches
- ☐ Deep Breathing
- ☐ External Focus of Attention

6. Please state the reasons why you have excluded, if any, some components from your routine.

7. What were the main objectives of this week with respect to your pre-performance routines training?

8. To what extent have you achieved your objectives this week? *(Please **embolden**/**highlight** your choice)*

<i>Not at all</i>	<i>Very little</i>	<i>Little</i>	<i>More or Less</i>	<i>Large</i>	<i>Very Large</i>
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9. What were the main outcomes of this week's workbook?

10. What were the main challenges you have faced when practising both your pre-performance routines and CSGO this week?

11. What is your overall reflection on practising your pre-performance routine this week?

Mental Skills Training in eSports: The Impact of Pre-Performance Routines on eSports Performance

Participant Information Sheet

What is the research about?

Pre-performance routines include behaviours and thoughts that aim at facilitating attentional focus on the task. By implementing these routines, performers keep themselves away from unnecessary distractions and focus on their performance instead. This can potentially help them to eliminate any negative feelings or thoughts that may intervene with their performance. Therefore, this study aims to investigate if pre-performance routines have an effect on an eSports performance (i.e., CSGO).

Do I need to take part?

Your participation in this study is entirely voluntary. If you wish to withdraw, you can do so at any time without providing any reason. If you withdraw then we will give you the opportunity to have any data already collected destroyed.

What will I be asked to do?

If are willing to participate in the study, you will be asked to:

- Fill in a short scale after each game on two different occasions,
- Learn and practice pre-performance routines which require you to complete a workbook on weekly basis for 4 weeks. Each workbook should take you approximately 30 minutes to complete.
- You will be asked to fill in a short questionnaire on weekly bases asking you to recall how much time you spend practice both routine and CSGO.

What will happen to the information collected?

Only the researcher and the supervisor will have access to your data. It will be used for a postgraduate dissertation study and potential publications or conference presentations. Your data will be processed in accordance with the Data Protection Law. All information collected about you will be kept strictly confidential and anonymised. All electronic data will be stored anonymously on a password-protected file on a password-protected computer/laptop, and all paper records will be stored in a locked filing cabinet. Your consent information will be kept separately from your responses. The data will be securely destroyed 40 days after graduation. In case of publication, the data will be kept for 5 years, and then securely destroyed.

What are the potential risks?

There is no potential risk associated with this research study.

What are the potential benefits?

You may benefit from learning more about pre-performance routines and their potential effectiveness of your performance.

Contact information

Should you require further information, please do not hesitate to contact with the researcher, Levent Dogan, L.Dogan@sms.ed.ac.uk or the supervisor, Dr Kotryna Fraser, Kotryna.Fraser@ed.ac.uk. If you wish to make a complaint about the study, please contact (Dissertation course organiser – Dr Hugh Richards, hugh.richards@ed.ac.uk). For general information about how we use your data go to: <https://www.ed.ac.uk/records-management/privacy-notice-research>





Appendix F

Participant Consent Form

Mental Skills Training in eSports: The Impact of Pre-Performance Routines on eSports Performance

Please initial
box

1. I confirm that I am 18 years of age or older and competently play CSGO for more than one year.

2. I confirm that I have read and understood the Participant Information Sheet for the above study.

3. I have been given the opportunity to consider the information provided, ask questions and have had these questions answered to my satisfaction.

4. I understand that my participation is voluntary and that I can ask to withdraw at any time without giving a reason.

5. I understand that my anonymised data will be stored as detailed in the information sheet.

6. I agree to take part in this study.

Name of person giving consent:

Date: __/__/__

Signature:

Name of person taking consent:

Date: __/__/__

Signature: