The effects of pressure on pre-performance routines and performance in golf

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Lokaverkefni til BS-grádu í sálfræði
Leiðbeinandi: Hallur Hallsson

Sálfræðideild
Heilbrigðisvísindasvið
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Ritgerð þessi er lokaverkefni til BS-gráðu í sálfræði og er óheimilt að aforita ritgerðina á nökkurn hátt nema með leyfi réthafa.

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Abstract
The main goals of this study were to see if the duration of pre-performance routines (PPR) in golf would change under pressure, and if this change would affect performance. It was hypothesized that the time of PPRs would change under pressure. It was also hypothesized that performance would change under pressure. There were 12 participants in this study, six female and six male. All participants played golf regularly, with handicaps ranging from -3.1 to 14.5. An intervention was conducted where pressure was induced, and duration and performance were measured, to see if a change between the two conditions would occur. Participants were asked to answer the Immediate Anxiety Measurement Scale, to see if pressure was inflicted. The results showed that the duration of PPRs increased, and performance decreased, when pressure was induced. This indicates that pressure has a negative effect on performance, and systematic PPRs could help minimize this effect. Future research will hopefully come to a more certain conclusion, if PPR can help keep performance steady, under all conditions.
Acknowledgements

I would like to thank my instructor for guiding me with this study, and believing in me and my interest in doing this experiment. I would also like to thank Arnar Már Ólafsson, for his guidance and professional knowledge on the subject. I am also grateful for the selfless assistance from Úlfar Jónsson, who helped me gather participants, and was my right hand in the experiment itself. Thank you, to all my participants, for your patience and interest. I would also like to thank my fellow students, who did not think twice about helping me, when uncertain and in need of a second opinion.
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As the general society is realizing that mental illness needs the right treatment and understanding, so are athletes and their coaches realizing that it is important to keep track of what is going on inside an athlete’s mind and how it can affect performance. The study of people’s behavior, emotions, and thinking in sport and exercise contexts, is known as sport psychology and its function is the application of that knowledge (Gill, Williams & Reifsteck, 2017).

In this study, the main focus is on golf. Golf is a sport where an athlete's state of mind plays a big role. As the famous quote from the golfer Lee Westwood states: "Golf is played between the ears and if you are not 100 percent focused on what you are trying to do, then people will go past you no matter who you are" ("Sport Psychology Quotes", n. d.). Peter Thomson goes as far as to say that “the difference between winning and losing is always a mental one” (Adams, 2011). It is, therefore, important to understand and recognize the psychological factors that can influence performance. The knowledge that comes from studies in sport psychology can not only help athletes in competition, but in training as well. These two conditions can be very different, and the pressure that comes with competition, can be overwhelming at times.

**Factors that can affect performance**

One of the factors that can affect performance is anxiety. Anxiety is a very complex construct and is, therefore, not easily defined. Anxiety can be defined as a state of negative emotions, such as worry, nervousness, and fear, and is often connected to arousal of the body (Weinberg & Gould, 2015). In sports the definition is slightly different. It has been suggested that performance anxiety is an uncomfortable psychological state, which occurs as a reaction to a perceived threat, of performing a task under pressure (Cheng, Hardy & Markland, 2009). Psychologists make a distinction between state anxiety and trait anxiety, with state anxiety being related to mood at any given moment, whereas trait anxiety is part of the personality (Weinberg & Gould, 2015).

In this research we will be looking at state anxiety rather than trait anxiety. The state anxiety has two sides to it; cognitive state anxiety, where symptoms can be worries and negative thoughts, and somatic state anxiety where the symptoms are in physiological activation. These physiological activations may include muscle tension, headache, and cold hands. Muscle tension has a negative effect on performance, since movements get slower and less coordinated...
Anxiety can affect performance, and this has been a subject of research for many years but researchers have not quite gotten to a conclusion on this matter. One way anxiety is believed to affect performance is through changes in attention and concentration (Weinberg & Gould, 2015).

Eysenck's and Calvo's (1992) processing efficiency theory is an extensive theory about the effects anxiety can have on performance. It has been renewed by Eysenck, Derakshan, Santos & Calvo (2007) and developed into the attentional control theory. The original theory proposed that worry (a component of state anxiety) is accountable for the effects anxiety has on performance effectiveness and efficiency. In situations that are considered stressful, worry is activated, especially in individuals high in trait anxiety (Eysenck et al. 2007). The thoughts of worry take over the limited attention of working memory, which in turn is less accessible for parallel processing of the task at hand (Eysenck & Calvo, 1992). The renewed theory furthermore proposes that anxiety weakens attentional control (Eysenck et al., 2007).

Self-confidence can have an effect on performance as well. Self-confidence has been defined by sport psychologists as the belief of performing a desired behavior successfully (Weinberg & Gould, 2015). As with anxiety, self-confidence can be both state-like and trait-like. This was the conclusion of Vealy (1986), who developed an interactional model for self-confidence in sports (see in Feltz, 1988). It may, therefore, be connected to the game you will be playing today, (i.e., state self-confidence), or it may be part of who you are (i.e. trait self-confidence). Self-confidence can thus affect how individuals face situations that normally would create anxiety (Weinberg & Gould, 2015). If the person has low self-confidence she may not handle the situation as well as an individual with an optimal level of self-confidence. Self-efficacy theory is closely related to the topic of self-confidence, and proposes that self-efficacy is the perception of one’s capacity to perform a task effectively (Weinberg & Gould, 2015). Self-efficacy can positively influence performance, by impacting motivation (Bandura, 1986), state anxiety (George, 1994), and decision making (Bandura & Wood, 1989).

**Choking and pressure training**

How many times have elite athletes missed a goal, a putt, or a penalty at a crucial moment? It happens more often than one would like and it has a lot to do with handling the enormous pressure that comes with these decisive moments. Pressure has been defined as factors that elaborate the relevance of performing well on a given occasion (Baumeister, 1984). Baumeister
(1984) described choking as missing a decisive shot in these kinds of circumstances. A more recent definition describes choking as an intense and drastic drop in performance (Hill, Hanton, Fleming & Matthews, 2009), or as Vealy, Low, Pierce, and Quinones-Paredes (2014) put it, an "unusual performance decrement". So it is not just about missing a shot on a given occasion, but a serious drop in performance (Vealy et al., 2014). Even though choking is more likely to happen under pressure, Oudejans and Pijpers (2009) suggest that it is the state anxiety that causes choking, even though the pressure might evoke that anxiety.

There are several factors that can cause the feeling of pressure. The presence of coaction, rivalry and audience, are recognized by Wankel (1972) to establish effects of competition. Research has shown that an increase in the number of coactors results in impairment of performance, and also that the more coactors are present, the more the impairment, especially when it involved direct evaluation (Martens & Landers, 1972). In addition to these results, it has been shown that rivalry, or competition, has an arousing effect on behavior (Steigleder, Weiss, Balling, Wenninger, & Lombardo, 1980). This is interesting, because research has shown that people tend to get more self-aware when aroused (Wegner & Giuliano, 1980) and furthermore, with the attention on the self, performance of well-trained skills may be disturbed (Langer & Imber, 1979).

There are two models that have been suggested to explain choking. One of them is the self-focus model, which Baumeister (1984) proposed. It suggests that when anxiety and self-awareness begin to increase, athletes shift their attention to task execution, and hence, choking occurs. The distraction model on the other hand, suggests that when the attention of skilled athletes shifts to irrelevant cues and cues that are relevant to the task are ignored, choking occurs (Nideffer, 1992). Furthermore, Nideffer (1992) suggested that with increased arousal, athletes start giving irrelevant thoughts attention, such as worrying about a score, or the audience. Studies have shown that both working memory and task-focused attention are interrupted when in high-pressured situations, which in turn leads to decreased performance (Kane & Engle, 2000). This is true for well-learned skills as well.

In a study conducted with expertise golfers and novice golfers, choking occurred when making a putt under high pressure, but did not happen on a declarative alphabet arithmetic task. The same study also showed that self-consciousness training eliminated choking. Subjects were videotaped and told that their videos would be sent to golf teachers at their university, and
completed 270 putts, with breaks. This training counteracted the effects that self-consciousness can usually have on performance, as suggested by the self-focus model (Beilock & Carr, 2001).

Oudejans and Pijpers (2009) hypothesized that training under anxiety-provoking conditions could possibly prevent choking. They conducted two different experiments, one with basketball players, and the second one with dart-throwers. In both experiments, the researchers found support for their hypothesis. The control groups had not practiced with anxiety, and raised anxiety showed a negative effect on their performance, both before and after their practice phases. By training with anxiety, players in the experimental group formed more efficient approaches to uphold their performances with higher anxiety levels.

**Understanding pre-performance routines**

In the literature, both pre-shot routines and pre-performance routines (PPR) have been described. They refer to the same preparation before performing an athletic task. Cotterill (2010) has found the distinction to be that literature about pre-shot routines always refers to sports with shots, such as basketball and golf. Thus, PPR seems to be a broader term that is used for this process, whereas pre-shot routines is a more specific term. Pre-performance routines have been defined in many ways. The one used most universally is by Moran (1996), which states that PPRs are an array of task-relevant thoughts and behaviors which are performed systematically before the performance of the actual skill. It is a procedure, or ritual, that promotes performance, and gives the performer some control over their behavior (Lidor & Singer, 2000). They are a way to put the player in her optimal arousal level, and to give confidence and focus for the upcoming performance (Lidor & Singer, 2000). PPRs have been shown to decrease the amount of attention that goes into task-irrelevant cues, and to increase attention on task-relevant cues (Weinberg & Gould, 2015). These are all factors that have been discussed before to be likely to affect performance in some way. Thus it seems that they play an important role in regulating body and mind and optimizing performance.

Mesagno, Marchant and Morris (2008), performed a theory-matched study which was designed around the distraction model, for a choking intervention, and found that PPR can greatly help players in the prevention of choking because it gives them additional control over their attention and where they focus it. Furthermore, research by Cohn, Rotella and Lloyd (1990), showed that players found that with learning specific routines they improved their concentration, decision making and their confidence as well. Interventions where routines are
taught should, however, be done carefully, as research has shown that routines should be developed individually because they are not a ‘one-size-fits-all’ (Cotterill, Sanders & Collins, 2010). In Cohn's (1990) study about PPR, he found that guidelines for creating a PPR had to depend on the nature of the task, the individual's skill level, and his or her preferences.

Normally routines are composed of both a cognitive component and a behavioral one. The behavioral components involve physical activities (Cohn, 1990). In golf this would in many cases involve one or more practice swings, taking the correct grip on the club, putting on the glove and aligning oneself to the correct aim. The cognitive components include the use of guiding strategies like self-talk and imagery, as well as relaxation and decision making processes (Cohn, 1990). On the golf course this could be to image how the ball will fall into the hole, or image the best flight of the ball for the specific shot. It also includes measuring the wind and making the decision which club to use for this shot.

When routines are performed with high consistency they seem to be more effective (Lidor & Singer, 2000). Several studies support this statement. In a study conducted by Boutcher and Crews (1987) a positive relationship was found between consistency in PPR and performance which implied that the maintenance of a consistent PPR could potentially decrease choking. This has since been found in free-throw routines in basketball, where Lonsdale and Tam (2008) investigated temporal and behavioral consistency in duration and specific patterns. Players were more successful when they performed their usual routine than when they used a different one. The same results were found in a similar experiment by Lobmeyer and Wasserman (1986). However, findings on the effects of duration differ. Researchers Farrow and Kemp (2003) found that performances were more successful if the routines were relatively shorter. This was not the case in Lonsdale and Tam’s (2008) research. Their main finding was that duration overall did not matter as long as the routines were consistent.

Mesagno and Mullane-Grant (2010) conducted a study on Australian football players, based on the distraction model (Nideffer, 1992), to find a component of PPR that would benefit performance when under pressure. They found that an extensive PPR, with both behavioral and cognitive components, as well as consistency, had a positive effect on performance under pressure. They also found that when PPRs had a longer duration, performance improved. Their experimental groups, who had gotten some training on components in their PPR, showed reduced variability in their PPR and increased performance. The control group, on the other hand, showed an increase in variability, and a decrease in performance. Similar results were
found by Gucciardi, Longbottom, Jackson and Dimmock (2010), when they interviewed golfers who had experienced choking. They found that golfers sped up their PPR time when they experienced anxiety.

In a case study conducted on one of the world's best rugby goal kicker, by Jackson and Baker (2001), results showed that when a shot was more difficult, PPR duration increased. This was true for cognitive and behavioral components of the PPR. The same could be true for golfers. Golf is different from many other sports, like basketball and tennis for example, in that situations and conditions can vary greatly. There are conditions that can be practiced every day and are „normal“, for example, the tee shot. Then, there can be conditions that players can hardly practice very well, for example when the ball lies directly at the roots of a tree. Thus, in these well practiced conditions routines would be expected to be consistent, but it should also be considered normal that in conditions that are unusual, PPRs will become slightly different.

In golf, routines typically involve three different phases. In the first phase the player evaluates the situation, and makes a decision about the shot to be played. This includes measuring the length of the shot, how strongly the wind blows, if the ball is in a slope, which club to pick, and involves all types of conditions, both the normal ones, and the complicated ones. Therefore, this phase can be very inconsistent. That does not necessarily affect the shot in a negative way. In the second phase, often called the execution phase, the player has already evaluated the length of the shot, and picked a club. This phase usually involves taking aim, some players prefer to make a practice swing, take their position, and hit the ball. The third phase is sometimes called the evaluation frame. This phase is a part of the post-shot routine, and is equally important to the other two and involves evaluating the shot just played. In this phase the most interesting part is how the player deals with the emotions that accompany the results of the shot. Nilsson and Marriott (2017) call this the "memory box". Typically players are thrilled with great shots, but curse themselves for the bad ones. They recommend players to only allow themselves an objective reaction, or a positive one. In the current study, the second phase is measured.

Based on previous research, anxiety, self-confidence, and attention can all have an effect on performance, and PPRs can be a part that reduces those effects. Research has also shown that these factors can be evoked in research conditions (Beilock & Carr, 2001; Mesagno et al., 2008; Oudejans & Pijpers, 2009; Mesagno & Mullane-Grant, 2010). It is not entirely clear yet, what kind of effect a change in the duration of the routine has on performance, or if it has any
effect at all. Therefore, in this experiment, duration of routines will be measured and performance evaluated for each shot, with and without pressure.

Hence, one of the main questions in this research is if the duration of pre-performance routines in golf will change under pressure, and second, if this change affects performance. Thus, it is hypothesized that the duration of pre-performance routines will change under pressure. It is also hypothesized that performance will change under pressure.

**Method**

**Participants**
The participants in this experiment were twelve Icelandic amateur golfers, six men and six women. The participants were aged between 19 - 60 ($M = 32.41, SD = 16.43$). Their handicaps ranged from +3.1 - 14.5 ($M = 2.8, SD = 5.2$). The sample was picked with convenience, since many players from Iceland play in other countries during the winter.

**Measures**

*Immediate Anxiety Measurement Scale*
To measure if the method used to induce pressure did in fact do so, participants were asked to answer the *Immediate Anxiety Measurement Scale* (IAMS; Thomas, Hanton & Jones, 2002) before each condition. This inventory measures the direction and intensity of perceived anxiety, both cognitive and somatic, as well as self-confidence (Williams, Cumming & Balanos, 2010). All four items on the scale were rated on a seven-point type Likert scale, with the items; "I feel pressure", "I feel cognitive anxiety", "I feel somatic anxiety", and "I feel self-confident" (1 = not at all, 7 = extremely). The scale was translated to Icelandic by an expert in sport psychology.

*Performance measures*
Performance was measured with a Trackman 4, which is a dual radar system that provides accurate data for diagnosis and analysis of golf shots. It measures the full track of shots, with an accuracy of ±0.5 meters at 150 meters (Trackman 4, n. d.). In this experiment, performance was measured with the landing distance from the target.

Time was measured with the Stopwatch on an iPhone 6s. The timer was set when the participants' name was called and stopped when the swing had finished.
Procedure

In the beginning of this experiment, participants were asked to sign an informed consent and were ensured that their identities would be kept anonymous in terms of the questionnaires. The order of the two conditions, "pressure" and "no pressure", was counterbalanced. Thus, half the participants, group A, took part in the no pressure condition first. To keep participants’ attention away from participants hitting the ball as they waited their turn in the "no pressure" condition they were asked to answer nine different questionnaires. The questionnaires were; *Immediate Anxiety Measurement Scale* (Thomas, Hanton & Jones, 2002), *Sports Competition Trait Inventory* (SCTI; Fabian & Ross, 1983), *Sport Orientation Questionnaire* (SOQ; Gill & Deeter, 1988), *Sport Competition Anxiety Test* (SCAT; Martens, 1977), *Leadership Scale for Sports* (LSS; Chelladurai & Saleh, 1978), *Athletic Coping Skills Inventory* (ACSI; Smith, Schutz, Smoll & Ptacek, 1995), *Sport Motivation Scale* (SMS; Pelletier, Fortier, Vallerand, Tuson, Brière & Blais, 1995), *Task and Ego Orientation in Sport Questionnaire* (TEOSQ; Duda, 1989; Duda & Nicholls, 1992), and *The Sport Anxiety Scale* (SAS; Smith, Smoll & Schutz, 1990).

The experimenter set up a camera, but in the "no pressure" condition participants were ensured that it was not filming. After explaining the process of the experiment, all participants were asked to individually answer the IAMS prior to their turn. In the "no pressure" condition, each participant was asked to hit 12 shots on a 133-meter target and imagine that they were hitting it on the golf course, thus to use their usual routines. As mentioned before, PPRs can be as different as they are many. For that reason, the measures were made by giving the participants a sign for starting their routines, to be able to see exactly when it starts, regardless of its components. This sign was calling their name.

In the "pressure" condition the experimenter manipulated the environment to induce performance pressure and anxiety. The camera, a Canon 700d, was turned on and participants were told that the best swing and performance would be sent to a team of golf instructors to be evaluated. In this condition, all members of the group were asked to watch the individual that was performing. The target was the same as before, but now participants were told that their performance on the target would be evaluated later. The participants were asked, as before, to imagine they were hitting a ball on the golf course, use their routine, and start when the experimenter called their name. The timer was set the same way as in the baseline condition. After explaining the process, and before the experiment started, participants were again asked to answer the IAMS. Therefore, each participant answered the IAMS twice.
Group B had the conditions reversed, which means that they were in the anxiety condition first and the baseline condition next. The procedure was the same as with group A in both conditions.

At the end of the experiment, all participants were debriefed. They were ensured that the videos would be deleted and that all the questionnaires, except for the IAMS, would not be used and would be exterminated. Participants were told about the real purpose of the experiment. There was no reward for participating in this experiment.

Design and Statistical Analysis
The statistical analysis for this study was conducted in the Statistical Package for the Social Sciences (SPSS). Paired t-tests were used to compare the means of PPR duration and performance, with and without pressure. Paired t-tests were also used to assess if pressure was successfully created.

This experiment was a within-subjects design. The independent variable in this experiment was the introduction of pressure. The dependent variables were threefold, the duration of the PPR, the performance of shots, and the scores on the IAMS.

Results
Comparison of means between "pressure" and "no pressure",
The main goal of this study was to examine whether duration of pre-performance routines, and performance would change when pressure was introduced. One outlier was removed from the sample, since the participant seemed to have picked a wrong club in the beginning of the experiment, and changed it for the second condition, which changed the outcome vastly. When looking at the differences of means and standard deviations for duration and performance, there are changes that can be seen between both items in "no pressure" and "pressure" conditions (see Table 1). PPR duration was measured in seconds, and performance in meters from the target. A paired samples t-test for duration differences was conducted, and showed that participants' PPR took significantly longer in the „pressure“ condition, \( t(10) = -3,38, p = 0,007 \).

Lower numbers for performance demonstrate that the shot was closer to the target, than when numbers are higher. A paired samples t-test was performed to examine the differences between the two conditions. The results showed that there was a significant difference in performance between the two conditions, \( t(10) = -2,24, p = 0,049 \).
Table 1. Means for PPR duration (seconds), and performance (meters), between "pressure" and "no pressure".

<table>
<thead>
<tr>
<th></th>
<th>No Pressure</th>
<th>Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>M (SD)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PPR duration</td>
<td>19.91 (8.66)</td>
<td>24.91 (9.67)</td>
</tr>
<tr>
<td>Performance</td>
<td>12.67 (7.03)</td>
<td>15.31 (9.82)</td>
</tr>
</tbody>
</table>

Means and differences between "pressure" and "no pressure" on the IAMS.
To see if the pressure induction had the desired effect, a paired t-test was conducted. There were clear changes between the two conditions, when looking at the means (see Table 2). The results show that there was a significant difference between the feeling of pressure, in the two conditions, $t(11) = -3.22, p = 0.08$. The difference between the two conditions when looking at cognitive anxiety was also significant, $t(11) = -3.03, p = 0.012$. The differences between means for somatic anxiety, $t(11) = -1.61, p = 0.14$, and self-confidence, $t(10) = -0.00, p = 1.00$, were not significant.

Table 2. Means between "pressure" and "no pressure", for IAMS.

<table>
<thead>
<tr>
<th></th>
<th>No Pressure M (SD)</th>
<th>Pressure M (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure</td>
<td>1.83 (1.20)</td>
<td>2.92 (1.50)</td>
</tr>
<tr>
<td>Cognitive Anxiety</td>
<td>1.58 (0.99)</td>
<td>2.67 (1.37)</td>
</tr>
<tr>
<td>Somatic Anxiety</td>
<td>1.92 (1.08)</td>
<td>2.83 (1.90)</td>
</tr>
<tr>
<td>Self-Confidence</td>
<td>4.92 (1.31)</td>
<td>4.92 (1.16)</td>
</tr>
</tbody>
</table>

Correlation of PPR duration and performance
A Pearson's correlation test was performed to assess the relationship of the duration of PPR and performance. There was a strong negative correlation between PPR duration, and performance in the "no pressure" condition, $r(10) = -0.64, p = 0.026$. The same was done for the "pressure" condition, where a moderate negative correlation was found, between PPR duration, and performance, although not significant, $r(10) = -0.44, p = 0.151$. 

Discussion

The aim of this research was to see whether the duration of pre-performance routines in golf would change under pressure, and if performance would change. It was of great importance to see if the pressure manipulations actually had the desired effect, and as the results from the *Immediate Anxiety Measurement Scale* showed, it seems that they caused both perceived pressure and cognitive state anxiety. This is in accordance with previous studies that have used similar items to induce pressure (Beilock & Carr, 2001; Mesagno et al., 2008; Oudejans & Pijpers, 2009; Mesagno & Mullane-Grant, 2010). The fact that cognitive anxiety increased, might have had the effect that working memory, and task-focused attention were interrupted, which Kane and Engle (2000) suggested, would lead to a decrease in performance. Participants did not report a significant increase in somatic anxiety, and their self-confidence stayed the same in the two conditions. It is not entirely clear why participants did not report more somatic anxiety after pressure was induced. It could be that the results would have been different, had they felt more somatic anxiety, since the symptoms can have an effect on performance. The muscle tension that, often times, accompanies somatic anxiety can result in slower and less coordinated movements. This can have a very negative outcome for golfers, since coordination is very important, and could, therefore, make the swing fail.

It was hypothesized that the duration of PPR would change under pressure. As the results showed, there was a change in duration of PPRs between the two conditions of this study. The majority of participants took longer PPRs when they felt pressure than when they did not feel pressure, although the task demands were the same. This supports the hypothesis. It is also in accordance with the findings of Jackson and Baker (2001), who conducted a case study on a rugby player, and found that PPR duration increased with more difficult shots. Even though their study was valuable, and showed interesting results, the current study has an advantage over theirs. The main advantage is that this study had two identical conditions, with pressure being the only change. Therefore, it seems that pressure was the factor that affected PPR duration and performance. The results from this study differ, however, from the findings of Gucciardi et al. (2010), who found that when players experienced anxiety, they sped up their PPR duration time. These results came from interviews with the players, which are subjective. There could be a difference between what players perceive and reality. They may think that they speed up their routines, but it may not always be the case. The current study has, therefore, an advantage over the study by Gucciardi et. al. (2010), since the measures were objective.
It was also hypothesized that performance would change under pressure. The results showed that there was a difference between performance in the two conditions, which supports the hypothesis. Participants performed worse when pressure was induced, which is in accordance with the study conducted by Oudejans and Pijpers (2009). When athletes are not used to training with components that evoke anxiety, performance decreases. The results are similar to the study conducted by Mesagno and Mullane-Grant (2010). The difference between their results, and the results from the current study, is that they found that with longer PPRs, performance increased. In this study, however, performance increased with shorter PPRs, as the correlation tests showed. The main similarity between the two studies is that PPR changed, and it seems that it is the instability that has the largest effect. This is consistent with former research that has shown a positive effect of consistent PPRs on performance (Boutcher & Crews, 1987; Lonsdale & Tam, 2008; Lobmeyer & Wasserman, 1986; Mesagno & Mullane-Grant, 2010).

Since self-confidence is thought to have an effect on performance, it was an interesting finding that self-confidence stayed the same between the two conditions in this study. As Weinberg and Gould (2015) stated, self-confidence can affect how individuals face situations that cause anxiety. In this study, cognitive anxiety increased, but self-confidence did not change, and yet, performance decreased. This means that other components that affect performance, likely had a greater impact than self-confidence. It could be, for example, that self-awareness had a big impact on the performance of participant in the current study. As Wankel (1972) suggested, coaction, rivalry, and audience create effects of competition. In this study, it is not certain that there was rivalry between the participants but coaction and audience are likely to have been established. Participants in this study were not allowed to evaluate each other out loud, as Martens and Landers (1972) found to have an increased effect on performance. They were asked to evaluate them in their thoughts. As research has shown, this sense of competition, and audience, are likely to cause more self-awareness which leads to a disruption of well-trained skills (Langer & Imber, 1979). In this study, the self-awareness could have been on the swing mechanics, for example something they have been working on recently. It could also be that some start to think about their looks, or how others may be seeing, and evaluating them. These are all factors, that PPR should be able to help suppress.

It is also possible that an attentional shift caused by increased arousal, as suggested by Nideffer (1992), had an impact on performance in this study. As stated before, the model
proposes that with an attentional shift, athletes start giving irrelevant thoughts attention, such as an audience, which was present in the current study. This leads to decreases in performance for well-learned skills as well, and can cause choking. As mentioned before, PPRs seem to be able to increase attention on task-relevant cues and at the same time, decrease attention on task-irrelevant cues (Weinberg & Gould, 2015). An additional way to eliminate this kind of performance decrease, could be to increase the practice time that goes into training with anxiety (Oudejans & Pjipers, 2009), or as Beilock and Carr (2001) suggested, with using self-consciousness training, and thus eliminate the likelihood of choking.

Based on previous research and the current study, it can be seen that training should be an important element in reducing the likelihood of performance decrease, or even choking. First of all, training a consistent PPR is important. This training should include both cognitive and behavioral components. A part of that training should be how to refocus attention to task-relevant thoughts and behaviors. Consistent PPRs have been seen to uphold good performance and reduce the risk of bad performance. Second of all, training with pressure, seems to be important and helpful as well. The training could involve an audience, even if they were only fellow teammates. It could also involve evaluation by the "audience members", and some kind of competition, with rewards. The training of a consistent PPR should start early on, with an emphasis on the importance of consistency. This could help young athletes deal with the pressure that accompanies competition, and maximize their potential. When it comes to training with pressure, it is questionable how early to start. Yet another way to stabilize PPRs, would be to have an objective evaluation of the duration of the PPR. What athletes believe they are doing is not necessarily a correct evaluation, since it is subjective. They may believe that they are keeping their PPR stable, but a stopwatch could prove them otherwise. Measuring the PPR regularly could be a key to dealing with pressure. This way, athletes could develop a reliable feeling of their regular duration of PPR and could train it by using imagery to image their routine and measure the time. Furthermore, in competition, athletes could ask their caddy to measure their PPR duration on the golf course, and notify them, if they are changing it.

One of the biggest shortcomings in this experiment was the low number of participants. For this reason, this study does not have a high generalization value. Still, the results can be an indication for future research, and should be of some importance since performance improvement, especially under pressure, should be pursued. In case that a similar study would be conducted in Iceland again, it would be recommended to do so in the summer, to be able to
increase the number of participants. Many excellent Icelandic golfers stay abroad during the winter, to be able to play and compete the whole year around. They usually come back to Iceland during the summer and compete.

Even though the experimenter explained the course of the experiment, some participants still did not follow the instructions completely. One of those instructions was that the participants should not start their routines until their names were called. At these points the experimenter reminded them of the instructions. At some points, in the pressure condition, it was also difficult to get the participants to keep their focus on the player who was hitting the shots, to create the pressure.

There were many positive aspects to this experiment as well. The participants were very positive about the procedure, and took the debriefing well. It was very effective to have been able to use the Trackman 4 (Trackman, n. d.), since it is a highly reliable measure. A study like this one, has its advantages and disadvantages. One advantage is that, there is more control of all kinds of factors in an environment like the one used in this study. The number of shots gives increased variance, so it is easier to generalize from the results. It would be interesting though, to try and make the situation more realistic. This could involve, for example, carrying it out on the golf course. There, a wider range of shots could be measured, not only the "normal" ones.

For future research, it would be interesting to make an experiment on the post-shot routine, to see how it affects the next shot, and what can be done to improve this part of the routine. This study is hopefully one of many more to come, since sport psychology is becoming a more current and popular subject. Elite athletes should always strive to become better, and knowing how to work with the mind is just as important as the work with the body. A good place to begin is learning how to handle pressure. More research needs to be done to get closer to an answer on how exactly to decrease these effects, that pressure and anxiety have on performance, but pre-performance routines in golf, can reduce those effects, and should, therefore, not be underestimated.
References


