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The Relationship Between Perfectionism, Anxiety, Putting Performance and the Yips in Golf: Replication of Chambers & Marshall (2017)

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This study attempted to elucidate the effects of perfectionism and anxiety on golf putting performance and the yips by replicating a study from Chambers and Marshall (2017). Using a cross-sectional design, this study had one-hundred and seventeen participants complete an online questionnaire. This was comprised of questions relating to golfing history and included three domain-specific measures for perfectionism (Stöber, Otto, & Stoll, 2004), anxiety (Smith, Smoll, Cumming, & Grossbard, 2006) and putting performance (Chambers & Marshall, 2017). Based on mean handicap, the current sample was significantly more skilled than in the original study (20.5 in the original study versus 9.3 in the current study), yet results revealed 34.2% of participants had been affected by the yips at some point in their golfing life. Furthermore, results from the hierarchical regression analyses indicated that those who had higher levels of anxiety and higher levels of maladaptive perfectionism reported greater disruption to putting performance. Those who reported experiencing the yips did not necessarily report higher scores on the anxiety and perfectionism measures. However, anxiety did mediate the influence of perfectionism on putting performance, as in the original study from Chambers and Marshall (2017). These findings add support to the idea that anxiety and perfectionism can affect performance, however further research is needed to understand their influence on the manifestation of the yips.

Introduction

In golf, as in many sports, there are instances where even the most accomplished performers have ‘choked’ under intense competitive pressure (e.g. Jean Van de Velde at the 1999 Open Championship, Greg Norman at the 1996 Masters Tournament; Mesagno et al., 2009). The term choking refers to an acute drop in performance or poor skill execution under stressful conditions – for example hitting a tee shot out of bounds on the last hole whilst leading a golf tournament (Hill et al., 2010). Within golf (and some other sports, e.g. darts, cricket, snooker; Clarke et al., 2015) there is a specific form of chronic choking termed the ‘yips’; a condition that affects performers during fine motor skilled tasks (Bawden & Maynard, 2001; McDaniel et al., 1989). In terms of golf, the yips appear to affect putting performance more than any other aspect of the game (Adler et al., 2011). It has been suggested that the yips are a multi-aetiological phenomenon (Klämpfl et al., 2013a). This paper, however, aims to replicate a study from Chambers and Marshall (2017) to determine specifically how perfectionism and anxiety relate to the yips and putting performance.

The Yips

The yips are a chronic form of choking, characterised by involuntary movements such as jerks, tremors and freezing in the hands or forearms during skill execution (Klämpfl et al., 2013a, 2013b; A. M. Smith et al., 2003). In terms of golf putting, these movements occur prior to striking the ball and result in a loss of control and usually a missed putt (McDaniel et al., 1989). It appears that it is not necessarily long or difficult putts that are affected, but shorter, more simple putts (Marquardt, 2009). Evidently these symptoms result in poor performance, with studies suggesting yips affected golfers add between 4.7 and 4.9 strokes onto their score for 18 holes (A. M. Smith et al., 2000, 2003).

There has long been a debate on the aetiology of the yips. Some researchers have suggested the yips are a neurological issue due to the physical manifestation of symptoms and similarities with involuntary sustained muscle contractions (focal dystonia), which is exacerbated by anxiety (Adler et al., 2005, 2011; McDaniel et al., 1989). Other researchers have argued that the aetiology of the yips is purely psychological, based on the fact that there is a lot of evidence supporting the idea that the yips are a chronic form of choking, with symptoms appearing to worsen under stress (Bawden & Maynard, 2001; Klämpfl et al., 2013a, 2013b; R. Masters & Maxwell, 2008). Some more recent research has also suggested that personality traits may be potential predictors for participants suffering from choking and the yips (Clarke et al., 2015; Hill et al., 2010), which would further support the idea that the aetiology of the yips is potentially more psychological than neurological for most golfers. One study proposed the idea that there is a neurophysiological-psychological interaction, in which the aetiology of the yips works on a continuum and may lie between neurophysiological (focal dystonia; Type I yips) factors and psychological factors (e.g. severe performance anxiety; Type II Yips; A. M. Smith et al., 2003). However, this continuum model is unable to explain how beginners can also suffer from the yips (Marquardt, 2009).

Beginners have often been excluded from most previous studies investigating the yips due to the fact they did not fit the criteria regarding overuse of the skill being investigated – which is a suspected cause or factor relating to other task-specific focal dystonia (Klämpfl et al., 2015; Stinear et al., 2006). Subsequently, it was always thought that the yips are a disorder that manifests after a long period of playing. It is now known that this is not always the case (Marquardt, 2009; Philippen et al., 2012).

Furthermore, there is a large discrepancy between the prevalence rates of the yips and task-specific focal dystonia. It is thought that the prevalence rate of the yips lies approximately between 28-54% (McDaniel et al., 1989; A. M. Smith et al., 2003), whilst the prevalence rate of focal dystonia is approximately 3 in 10,000 (Newell & Vaillancourt, 2001). This large discrepancy may be due to numerous factors, such as the reliance on self-report data or the fact that there are likely a myriad of aetiologies (Klämpfl et al., 2015; McDaniel et al., 1989;

A. M. Smith et al., 2000). However, even after this is taken into consideration the prevalence of the yips is still much higher than that of focal dystonia in the general population (Klämpfl et al., 2015).

Based on the research above, it would be reasonable to suggest that the aetiology of the yips in a large proportion of golfers would be primarily psychologically based. The amount of evidence suggesting that a wide range of other psychological factors may contribute to the development of the yips would warrant further investigation – especially as a lot of these results are still inconclusive (Byrne et al., 2015; Klämpfl et al., 2013a; Laborde et al., 2019; Roberts et al., 2013). Despite the contradictory and inconsistent findings in research investigating the yips, one finding in particular appears to be well supported throughout the literature: that older golfers who have played for a longer period of time are more susceptible to developing the yips (Chambers & Marshall, 2017; Dhungana & Jankovic, 2013; McDaniel et al., 1989). After taking all of this into consideration, it is evident that it would be beneficial to both the field of psychology and golfers to study the psychological elements of the yips in greater depth.

Perfectionism and Anxiety

Flett and Hewitt (2002) described perfectionism as being a personality trait that can be identified by striving for flawlessness, setting extremely high-performance standards and a tendency to be overly critical of behaviour or performance. The effect of perfectionism on performance, especially within sport, has been a hotly debated topic in the field of sport psychology (Stoll et al., 2008). Whilst some researchers have argued that perfectionism is a key component in helping to create elite athletes (Gould et al., 2002), others have argued that perfectionism is a maladaptive trait that is detrimental to sports performance (Anshel & Mansouri, 2005; Flett & Hewitt, 2005). However, later research solidified the idea that like many psychometric constructs (e.g. narcissism; Miller et al., 2019), perfectionism is not in fact one dimensional, but multidimensional and multifaceted (Stoeber & Otto, 2006). As a result of this, this trait possesses both positive, adaptive dimensions, as well as negative, maladaptive dimensions (Stoeber & Otto, 2006).

Like Hamachek (1978) had originally suggested, as well as other subsequent research (Frost et al., 1993; Rhéaume et al., 2000), Stoeber and Otto (2006) split perfection into two categories: normal perfectionism and neurotic perfectionism (other researchers have used different labels for these categories). Normal perfectionism refers to healthy, adaptive perfectionism that individuals enjoy striving for (e.g. an individual such as Ben Hogan; Jenkins, 2010), whilst neurotic perfectionism refers to unhealthy, maladaptive perfectionism that may negatively affect performance (Stoeber & Otto, 2006).

Two important facets of the perfectionism trait in terms of athletic performance have also been highlighted. The first of these is positive striving, or striving for perfection (SP), which would be associated with performance goals or mastery of a particular task (Stoeber & Otto, 2006). Some research indicates that this facet may be adaptive in terms of performance (Chambers

& Marshall, 2017; Stoeber et al., 2007; Stoll et al., 2008) The second facet is maladaptive evaluation concerns, or as Stoeber & Otto (2006) termed the facet, negative reactions to imperfection (NRI), which would be associated with critical evaluations of performance, excessive concern about mistakes and differences between expectations and performance results (Stoll et al., 2008). As the name of this facet suggests, it is thought to be maladaptive in terms of performance (Chambers & Marshall, 2017; Stoeber et al., 2007; Stoll et al., 2008).

Previous research suggested perfectionism would always be negative, and that if an individual had strong indications of high SP, they would likely also show indications of high NRI (Stoeber & Otto, 2006). However, Chambers and Marshall (2017) suggested that this might not necessarily be the case, despite a strong significant correlation between high scores on SP and NRI. These researchers found evidence of some golfers who possess high levels of SP that do not show high levels of NRI. Subsequently these golfers were not affected by the negative aspects of NRI, meaning they were able to focus on the positive aspects of perfectionism which resulted in incremental performance (Chambers & Marshall, 2017).

Previous studies have shown that during sport, pressure to perform may evoke competitive anxiety which can affect performance (Baumeister, 1984). Similar to perfectionism, competitive anxiety is also a multidimensional construct. Competitive anxiety is divided into trait anxiety (which is a personality characteristic; Horikawa & Yagi, 2012), and state anxiety (an emotional response that can fluctuate depending on the situation; Bebetos & Antoniou, 2012). Individuals who possess higher levels of trait anxiety appear to respond to competitive pressure with significantly greater state anxiety than performers with low trait anxiety (Hanton et al., 2002). The effect of both trait and state anxiety on performance has been documented in many sports, with studies suggesting there is a negative correlation between anxiety and performance in both individual and team sports (Parnabas et al., 2014). This paper is focused specifically on competitive trait anxiety.

In terms of the yips, performance anxiety was always thought to contribute to the original manifestation of yips or the worsening of the symptoms once they had appeared (McDaniel et al., 1989; A. M. Smith et al., 2000). This would make sense due to the fact that the yips tend to occur short, simple putts under pressure that most golfers would usually expect to successfully hole without much effort (Marquardt, 2009; McDaniel et al., 1989; A. M. Smith et al., 2003). As high levels of NRI are associated with critical evaluations of performance, excessive concern about mistakes (Stoll et al., 2008) and self-presentational concerns (Clarke et al., 2015), it is easy to see how high levels of anxiety may manifest whilst standing over a short putt an individual feels they should successfully hole – especially if they have missed one, or numerous short putts recently.

However, a systematic review from Clarke et al. (2015) suggested that evidence to support a relationship between the yips and anxiety was insufficient, especially based on the fact that previous research was conducted in a non-competitive environment. This contradicts a lot of other research that suggests those who fall victim to the yips generally tend to suffer from performance anxiety (Lobinger et al., 2014; McDaniel et al., 1989). For example, a study from Hasegawa, Koyama and Inomata (2013) found that putting performance from a distance of only 1.25m improved under pressure for a low anxiety group, whilst putting performance decreased for individuals in the high anxiety group. Increases in anxiety also resulted in changes to movement patterns across both groups in this study (Hasegawa et al., 2013). Furthermore, anxiety has also been shown to increase muscle tension and result in less efficient movement patterns in other sports (Pijpers et al., 2003). The physical changes resulting from increases in anxiety in these studies appear to be similar the symptomology of the yips discussed above.

However, in terms of the suggestion made by Clarke et al. (2015), doubt was cast on the Competitive State Anxiety Inventory-2 (CSAI-2; Martens et al., 1990) used in the previous anxiety studies that were included in their systematic review (Chambers & Marshall, 2017). This was because of concerns with the psychometric properties of the measure (Craft et al., 2003; Lundqvist & Hassmén, 2005; Stoeber et al., 2007). After taking this and the results from Chambers and Marshall (2017) where anxiety mediated the relationship between perfectionism and disrupted putting performance into account, it would appear there may be an association between anxiety and disrupted putting performance.

Some qualitative research has suggested that it is the way in which an individual interprets anxiety that may influence performance, as opposed to the mere intensity of the anxiety that arises in a particular situation (Philippen & Lobinger, 2012; Prior & Coates, 2019). For example, those who perceive anxiety in a positive way during competition will experience enhanced performance, whilst those who perceive anxiety in a negative or threatening way will experience a drop in performance (Jones & Hanton, 2001). This would make sense based on findings from other research papers, that suggests that individuals who have more perfectionistic tendencies, specifically NRI tendencies (critical evaluations of performance, obsessive concern over mistakes etc.), are more susceptible to suffering from competitive anxiety and impaired performance (Frost & Henderson, 1991; Koivula et al., 2002).

Other theories have been proposed to try and explain the relationship between anxiety and disrupted putting performance, especially from a self-focus standpoint (Hill et al., 2010). These self-focus theories are linked to the theoretical stages of learning, which suggests that beginners will focus on explicit rule-based declarative knowledge during skill execution which is processed through working memory. However, once an individual learns a particular skill it will become automatic, which means that skill execution is then processed outside of the working memory in the form of implicit,

procedural knowledge (Hill et al., 2010). Self-focus theories such as the Consciousness Processing Hypothesis (CPH; R. S. W. Masters, 1992), suggest that increases in performance anxiety induce increases in self-consciousness. This increase in self-consciousness causes individuals to focus their attention inwardly in an attempt to consciously process their explicit knowledge of how the skill execution works (as in the novice stages), which disrupts the automaticity of the skill and results in task failure (R. S. W. Masters, 1992). In simpler terms, increases in performance anxiety induces increased self-consciousness, which causes the individual to try and control the process/mechanics of their putting instead of trusting the automaticity of the skill – this subsequently results in the individual choking. It is thought that this occurs because the working memory is unable to deal with the additional demands requested by this conscious processing, which disrupts the process of task-relevant information and causes increased numbers of performance errors (R. Masters & Maxwell, 2008). The CPH theory also suggests that beginners are less likely to suffer from performance decrements under self-focus or self-conscious conditions as they are used to performing the task in an explicit manner (Hill et al., 2010; R. S. W. Masters, 1992). It would be plausible to suggest that this may be why novice performers are less susceptible to the yips, although not fully immune as shown in the findings from Marquardt (2009).

The Current Study

The current study aims to replicate a study from Chambers and Marshall (2017), which investigated the relationship between perfectionism, anxiety and putting performance. This original study was not only novel in terms of looking at the effects of SP, NRI and anxiety on putting performance, but also in terms of the findings. For example, Chambers and Marshall (2017) found that anxiety mediated the relationship between perfectionism and impaired putting performance. Other findings included that golfers who reported higher NRI and anxiety scores also reported more disruption to putting performance. Consequently, the researchers suggested that further investigation of these relationships was warranted to try and consolidate these findings. It was also suggested that future research should sample from different nations, which is something that the current study aims to address by looking at a sample primarily from the UK. Most importantly, the lack of consensus in the current literature and the high prevalence rate of the yips discussed above suggests that more research needs to be done. The fact that the high prevalence rate of the yips does not match the prevalence rate of task-specific focal dystonia also suggests that a deeper understanding of psychological factors contributing to impaired putting performance and the yips needs to be developed. Based on previous findings and the discrepancies in the literature discussed above, four hypotheses were generated for the current study. The first three of these hypotheses are identical to those proposed by Chambers and Marshall (2017), whilst the fourth hypothesis was generated based on their findings. These hypotheses are outlined below:

1. Golfers who reported higher NRI scores will report greater disruption to normal putting performance.
2. Golfers who reported higher levels of anxiety will report greater disruption to putting performance.
3. Golfers who reported experiencing the yips will produce high scores on the anxiety scale and high NRI scores.
4. Anxiety will mediate the influence of NRI on putting performance.

Method

All data and analyses reported here can be found at:

https://osf.io/2sazm/?view_only=1588dbaf442c4b77a4f2c6bf8f1682c3

Power analysis for mediation analysis

The reported coefficients from the mediation analysis in Chambers and Marshall (2017) were .53 for the NRI → Anxiety path, .56 for the Anxiety → Putting Performance path, and .04 for the NRI → Putting Performance path. Based on these path coefficients, the necessary number of participants for discovering the mediation between NRI and Anxiety on Putting Performance with a power of .99 is 75 (Liu & Wang, 2019).

Participants

One-hundred and forty-four participants completed the survey. The sample was comprised of 124 males and 20 females (compared to the 243 males and 37 females in the original study), with ages ranging from 18 to 73 ($M = 40.56$, $SD = 15.03$). The majority of the participants were from the UK (97.2%), with a small number of participants from the USA (1.39%), South Africa (0.69%) and the UAE (0.69%). The golf handicaps in this sample ranged from +3 to 36 ($M = 9.28$, $SD = 7.73$)¹. The study was approved by Northumbria University's Psychology Department Ethical Review Committee.

Materials

The same 3 measures used by Chambers and Marshall (2017) were utilised to assess anxiety, perfectionism and putting performance.

Sport anxiety scale-2 (SAS-2; R. E. Smith et al., 2006)

Instead of using the CSAI-2 (Martens et al., 1990) for the reasons discussed above, the Sport Anxiety Scale-2 (SAS-2; R. E. Smith et al., 2006) was used to measure anxiety. The SAS-2 is comprised of 15 items that are split into three sub-scales. These sub-scales are; worry, somatic anxiety and concentration disruption. To complete the SAS-2, participants had to rate how much they agreed with each statement on a 4-point Likert scale rated from “not at all”

¹ Golf handicaps are a measure of one's golfing ability. They allow golfers with different levels of ability to compete against one another.

to “very much so”. Internal consistency, as measured by Cronbach’s alpha, was .93, .82, and .78 for worry, somatic anxiety, and concentration disruption, respectively (similar to the original study – see Supplemental Material B, SM).

Multidimensional inventory of perfectionism in sport

This measure (MIPS; Stöber et al., 2004) is comprised of 10 items and split into two subscales: Striving for Perfection (SP) and Negative Reactions to Imperfection (NRI). As above, this measure also required participants to rate how much they agreed with each statement, however this involved using a 6-point Likert scale rated from “never” to “always”. The current study showed high internal consistency with Cronbach’s alpha of .91 for SP and .93 for NRI (see SM-C for the original study’s coefficients).

Golf putting performance rating statements

The questionnaire consisted of twelve statements developed by Chambers and Marshall (2017). Within these twelve statements were 6 psychological statements and 6 physical statements relating to putting performance (see SM-D for individual statements). Participants were required to report how often they experienced the symptom mentioned in each statement on a 5-point Likert scale, rated from “never” to “always”. The higher a participant scores on this measure, the more disrupted their putting performance (scores may range between 12 and 60). The internal consistency for the physical sub-scale was .77; for the psychological subscale it was .81, and for the overall measure the internal consistency was .86. Confirmatory factor analyses and exploratory factor analyses also showed that the measurement possesses good construct validity (see SM-E).

Further Information

As in the original study from Chambers and Marshall (2017), all participants also provided information relating to age, gender, golf handicap, number of years playing golf, the average number of rounds per month, the amount of months of the year they play and the country where they predominantly play golf. They were also asked to self-report whether they have or have not suffered from the yips.

Design and Procedure

Following the procedure from Chambers and Marshall (2017), this study used a cross-sectional survey that was distributed online. The online questionnaire was developed using Qualtrics software (Qualtrics, Provo, UT). Once this was developed, a poster was created to advertise the questionnaire, which was then shared on Facebook and Instagram. A snowball sampling technique was used to promote the survey by encouraging participants to share the poster and link to the questionnaire on their own feed, as well as sending it on to other golfers directly. The order of the items on the questionnaire was presented in the following order: demographic information, past and present golf information, SAS-2 (R. E. Smith et al., 2006), MIPS (Stöber et al., 2004), and putting performance rating statements.

Table 1. Key descriptive statistics for both yips affected and yips unaffected participants.

	Yips Affected (n = 40)		Yips Unaffected (n = 77)		Total (n = 117)	
	Mean	SD	Mean	SD	Mean	SD
Age	39.6 (54.0)	16.8 (12.7)	41.1 (48.5)	14.1 (12.5)	40.6 (49.9)	15.0 (12.8)
Number of years playing golf	21.5 (30.0)	13.9 (14.7)	21.1 (23.3)	11.9 (13.3)	21.3 (25.0)	12.6 (13.9)
Handicap	9.9 (20.7)	8.1 (8.0)	9.0 (20.4)	7.5 (10.6)	9.3 (20.5)	7.7 (10.0)
Anxiety	31.7 (29.3)	7.1 (7.8)	27.4 (25.4)	8.1 (6.2)	28.9 (26.5)	8.0 (6.9)
NRI	17.0 (14.6)	6.5 (5.3)	14.8 (12.7)	6.2 (4.8)	15.6 (13.2)	6.4 (5.0)
Putting Performance	32.6 (31.9)	6.2 (8.1)	23.6 (24.7)	6.2 (6.9)	26.7 (26.6)	7.5 (7.9)

Note: n = number of participants, SD = standard deviation. Results shown in brackets are from the original study by Chambers and Marshall (2017).

Results

Preliminary Data Analyses

Twenty-seven participants were removed from the data due to incomplete or nonsensical responses. The variables years playing golf and handicap were transformed to reduce skewness prior the multivariate analysis (see SM-F for more details).

Descriptive Statistics

The key descriptive statistics for all participants in this study are displayed below in [Table 1](#), with results from the original study shown alongside in brackets. When the results are compared it appears that this particular sample had a lower mean age and had played golf for fewer years (across both yips affected and yips unaffected groups). Another important note is that the mean handicap across both of these groups is also substantially lower than in the original study. A lower mean handicap means that the standard of golfer in the current study was substantially better than in the original study from Chambers and Marshall (2017), even with the minor difference in the calculation of handicaps from the UK and Australia. Finally, as the table shows, the percentage of yips affected golfers in this sample was 34.2%.

Correlations

The results from the Pearson's Correlations (as shown in [Table 2](#)) suggest that anxiety is correlated with SP, NRI, putting performance, age, years played and increased reporting of the yips. Furthermore, the results indicate that high NRI appears to have a significant negative correlation with age and the number of years played, whilst it has a moderate to strong significant positive correlation with anxiety and SP. This sample suggested that NRI was not significantly correlated with greater reporting of the yips. It appears that those who reported disrupted putting performance also reported higher levels of SP, NRI and a greater reporting of the yips. These results do not support the idea that those who are older and have played golf for a longer period of time report greater rates of experiencing the yips, despite the abundance of previous literature suggesting that this may be the case.

Table 2. Pearson's Correlations.

	Anxiety	SP	NRI	Putting Performance	Age	Years Played	Yips
Anxiety	---	.29**	.53**	.59**	.04	-.00	-.25**
SP	.48*	---	.59**	.19**	.11	-.02	.09
NRI	.67**	.77**	---	.34**	.02	.01	-.17*
Putting Performance	.43**	.40**	.44**	---	.04	-.03	-.40**
Age	-.29**	.14	-.36**	.01	---	.53**	-.19*
Years Played	-.20*	-.05	-.26**	-.02	.54**	---	-.21**
Yips	.25**	.10	.16	.57**	-.05	-.004	---

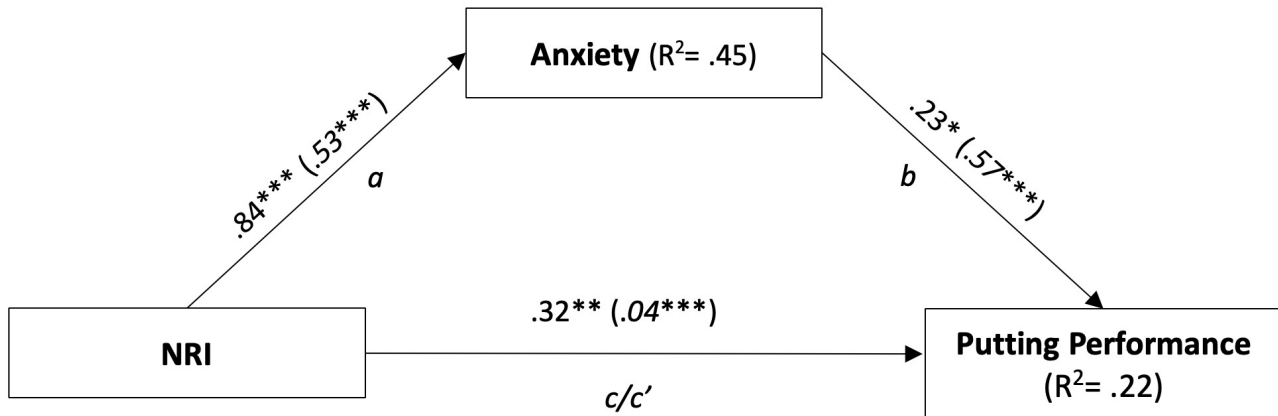
Note: * = $p < .01$, ** = $p < .001$. Results in *italic* are from the original study by Chambers and Marshall (2017).

Negative Reactions to Imperfection, Anxiety and Putting Performance Mediation analysis

The mediation model (to see more information about multicollinearity, see SM-G) indicated that NRI significantly predicts both directly and indirectly through anxiety (see [Figure 1](#)). NRI was directly a significant predictor of the putting performance even with anxiety in the model ($b = .32$, $SE = .13$, $t(114) = 2.48$, $p = .01$). NRI also influenced the putting performance indirectly, by being a significant predictor of anxiety ($b = .84$, $SE = .09$, $t(115) = 9.66$, $p < .001$) which in turn was significantly predicted the putting performance ($b = .23$, $SE = .10$, $t(114) = 2.20$, $p = .03$). This mediation (indirect) effect of anxiety on the relation between NRI and putting performance was significant ($b = .19$, BCa CI [.0138, .3869], or, $b = .16$, BCa CI [.0119, .3284], when completely standardised – see [Figure 1](#)). A structural equation model and correlation table that takes into account the three individual anxiety subscales are also available in the SM (see SM-H). The additional analyses taking all concepts into account confirmed the analysis in the main mediation analysis above.

Imperfection, Anxiety and the Yips

In order to test the effects of NRI, anxiety, age, number of years playing golf and the interaction of NRI and anxiety on the categorical variable of the yips, a multiple hierarchical logistic regression was performed (see [Table 3](#)). In step one, age and the number of years played were entered, followed by adding NRI in step 2. Despite no significant predictors within the model in the first two steps, NRI was borderline significant in step two (although not actually significant) ($p = .09$), with a χ^2 of 2.89 (df = 2.89) – it is worth noting that this predictor was significant in step two in the study from Chambers and Marshall (2017). When anxiety was added in step 3 ($p = .04$) it was the only significant predictor with a χ^2 of 4.14 (df = 1), whilst NRI became moved away from borderline significance to complete insignificance ($p = .99$) with a χ^2 of .00 (df = 1) – this finding is also very similar to that of Chambers and Marshall (2017). When the interaction between NRI and anxiety was added in step 4 there were no significant improvements to the model. These findings do not support hypothesis three, which hypothesised that golfers who reported experiencing the yips would produce high scores on the anxiety scale and high



Indirect effect, $b = .19$, BCa 95% CI [.0138, .3869]

Standardized indirect effect, $b = .16$, BCa 95% CI [.0119, .3284]

Figure 1. A model of NRI as a predictor of Putting Performance, mediated by anxiety.

Note: The confidence intervals for the effects shown below are BCa bootstrapped CI's based on 1000 samples. * = $p < .05$, ** = $p < .01$, *** = $p < .001$. Path coefficients shown in brackets are from the original study by Chambers and Marshall (2017).

NRI scores. These findings appear to be relatively similar to those of Chambers and Marshall (2017), despite the lack of significant predictors in steps one and two. A SEM that also takes into account the SP subscale is available in the SM (see SM-H), as well as additional hierarchical logistic regression models that take into account gender and handicap (see SM-I/SM-J). Results showed that adding gender and handicap into the hierarchical logistic regression model did not significantly improve the model.

Discussion

The current study aimed to replicate research from Chambers and Marshall (2017) that investigated the relationship between perfectionism, anxiety and the perceived experience of the yips in golf putting. Using the same domain-specific measures to measure perfectionism and anxiety as Chambers and Marshall (2017), the current study found support for three of the four proposed hypotheses. As mentioned previously, hypotheses one to three are identical to that of Chambers and Marshall (2017), whilst the fourth hypothesis was generated based on their findings. Similar to the original study, evidence was found for the first hypothesis; that golfers who reported high NRI scores would also report greater disruption to putting performance. Evidence was also found for the second hypothesis, which hypothesised that golfers who reported high levels of anxiety would report greater disruption to putting performance. Furthermore, support was found for the fourth hypothesis which suggested that anxiety would mediate the influence of NRI on putting performance. However, we did not find evidence to support

Table 3. Results from the hierarchical logistical regression model investigating the relationship between NRI, anxiety, age, number of years playing golf and the relationship between NRI and anxiety on the categorical variable of the yips.

Included	<i>b</i>	<i>SE b</i>	Odds Ratio
Step 1			
Constant	-.49 (-2.73)	.68 (.61)	.61
Age	-.01 (.02)	.02 (.01)	.99 (1.02)
Number of Years Played	.05 (.02)	.17 (.01)	1.05 (1.03*)
Step 2			
Constant	-1.80 (-3.74)	1.05 (.72)	.16
Age	-.002 (.02)	.02 (.01)	.998 (1.02)
Number of Years Played	.08† (.03)	.17 (.01)	1.08 (1.03*)
NRI	.06 (.08)	.03 (.03)	1.06 (1.08**)
Step 3			
Constant	-3.08 (-5.01)	1.25 (.86)	.05*
Age	-.001 (.02)	.02 (.01)	.999 (1.02)
Number of Years Played	.09 (.03)	.18 (.01)	1.09 (1.03*)
NRI	.00 (.02)	.04 (.03)	1.00 (1.02)
Anxiety	.07* (.08)	.04 (.03)	1.07* (1.08*)
Step 4			
Constant	-3.56 (-6.31)	2.39 (1.74)	.03
Age	-.001 (.02)	.02 (.01)	.999 (1.02)
Number of Years Played	.08 (.03)	.18 (.01)	1.09 (1.03*)
NRI	.03 (.10)	.13 (.10)	1.03 (1.11)
Anxiety	.09 (.12)	.08 (.06)	1.09 (1.13*)
NRI * Anxiety	-.001 (-.00)	.004 (-.00)	.999 (1.00)

Note: $R^2 = .004$ (Nagelkerke) for Step 1, $\Delta R^2 = .035$ for Step 2 (Nagelkerke), $\Delta R^2 = .049$ for Step 3 (Nagelkerke), $\Delta R^2 = .00$ for Step 4 (Nagelkerke). † $p < .10$, * $p < .05$, ** $p < .01$. Results in brackets show the results from the original study (Chambers & Marshall, 2017).

hypothesis three, which proposed that golfers who reported experiencing the yips would produce high scores on both the anxiety scale and NRI scale. These findings are discussed in terms of the current relevant literature below.

Perfectionism, Anxiety and Putting Performance

In terms of how NRI affects putting performance, the results from the regression models within this study suggest that golfers who scored higher on NRI also reported greater disruption to putting performance – as measured by the MIPS (Stöber et al., 2004) and putting performance rating statements (Chambers & Marshall, 2017). The regression model looking at NRI and putting performance indicated that higher levels of NRI accounted for 19.2% of variance in putting performance in this particular sample. The fact that these results corroborate with the findings from Chambers and Marshall (2017) is an interesting finding, as this is one of few studies that have highlighted the effects of NRI on golf putting. To our knowledge, only one other paper has investigated the effects of the maladaptive aspects of perfectionism specifically on golf putting (Lizmore et al., 2019). This study focused on perfectionism's effect on performance following failure in a competitive golf putting task, as well as looking at a potential interaction effect between adaptive and maladaptive perfectionism. Based on their findings, the authors proposed the

idea that SP is associated with improved performance when levels of NRI are low, but also associated with worse performance when levels of NRI are higher. These findings support the idea proposed by Chambers and Marshall (2017) that athletes are able to possess different levels of each facet despite the high correlation between SP and NRI. The results from the current study also support this idea due to a small number of participants possessing vastly different levels of SP and NRI.

In addition to the regression models showing that those who possessed higher levels of NRI reported greater disruption to putting performance, the models also indicated that those who possessed higher levels of anxiety reported greater disruption to putting performance. As Chambers and Marshall (2017) pointed out, this finding corroborates with the results from Mullen & Hardy (2000), who found increases in cognitive anxiety resulted in poorer putting performance. These results are also similar to those mentioned previously when Hasegawa, Koyama and Inomata (2013) found decreases in putting performance following increases in anxiety. Another important aspect of these results in terms of anxiety is that it mediated the relationship between NRI and putting performance. As the findings from Chambers and Marshall (2017) were novel contributions to the literature regarding the yips, yielding the same results is quite a compelling finding. This is especially true in terms of recommendations for future research and trying to gain a better understanding of psychological variables that may contribute to impaired putting performance or the manifestation of the yips.

Another important aspect of these findings is that they oppose the suggestions from the systematic review by Clarke et al. (2015), due to the fact that there appears to be a relationship between anxiety and putting performance. Despite the fact that the relationship is a mediated one with perfectionism, it is still an interesting finding in terms of future research based on the fact that very few studies have detected a mediated relationship between anxiety and performance (Chambers & Marshall, 2017). Furthermore, the fact that a relationship was found when employing the SAS-2 to measure anxiety may raise further concern about the interpretation of results from studies who employed the CSAI-2. As Chambers and Marshall (2017) pointed out in the original study, when measuring performance, focusing on the experiences of yips symptomology as opposed to focusing on an external task outcome may have also contributed to detecting a relationship between anxiety and performance. Had an external task been used to measure performance the outcome of the study may have been different.

Perfectionism, Anxiety and The Yips

Contrary to the abundance of previous research, but similar to findings from Chambers and Marshall (2017), the results from this study failed to find a relationship between higher anxiety, maladaptive perfectionism and the yips (Kenny et al., 2004; Stoeber et al., 2007). The results did however show that anxiety is a significant predictor of experiencing the yips, albeit the relationship was relatively weak. This corroborates with other previous findings (Chambers

& Marshall, 2017; Lobinger et al., 2014) and further dismisses the idea that anxiety is unrelated to the yips in a competitive environment as suggested by Clarke et al. (2015). Although the majority of the participants were amateurs, the fact that they hold a handicap would suggest that they still play golf competitively and will therefore play under pressure – provided their handicap is a registered, active CONGU® handicap². Based on the fact that the mean handicap in this sample was single figured and substantially lower than in the original study, it is plausible to suggest that a lot of the participants play regular competitive golf.

The only other significant predictor of experiencing the yips was putting performance, which contradicts the findings from the original study and other previous work. Results from previous studies have indicated that the number of years playing golf is a significant predictor of experiencing the yips (Chambers & Marshall, 2017; McDaniel et al., 1989). Theoretically, not finding a relationship between these variables in the current study could make sense based on the fact that it is now known that beginners can experience the yips (Marquardt, 2009; Philippen et al., 2012), however based on previous findings and the CPH theory discussed in the introduction it is unlikely that this is the case.

Additional Findings

In contrast to previous findings from Chambers and Marshall (2017) and McDaniel et al. (1989), the current study failed to find that older golfers and those who had played for a longer period of time were more susceptible to experiencing the yips. However, the prevalence rate of the yips within this particular sample is consistent with previous literature investigating the yips, with 34.2% of participants having experienced the yips at some point in their golfing life. This finding fits in with the previous estimates of 28-54% of golfers experiencing the yips at some point in their career (McDaniel et al., 1989; A. M. Smith et al., 2003). This also provides further evidence to support the idea that the aetiology of the yips is likely psychological for the vast majority of golfers, as opposed to being caused by a task-specific focal dystonia. It would be possible to suggest that this may not be representative of the actual percentage of golfers who have experienced the yips in the general population, due to the fact that it was self-reported data. For example, participants may have thought they were suffering from the yips when it was simply an issue with their putting mechanics, but similarly, golfers may not be able to identify the symptomologies of the yips to self-diagnose. However, based on the plethora of previous research suggesting that the estimate of yips affected golfers lies in this region, it appears to be a fairly accurate finding.

² At the time of writing, a player must have played 3 competitive rounds in the golfing year to maintain a CONGU® handicap.

Contrary to past findings, the current study also found instances where individuals who were high in SP were not necessarily high in NRI, despite a significantly high correlation. This suggests that perfectionism is not always necessarily negative and corroborates with other findings from Chambers and Marshall (2017), Stoeber et al. (2007), and Koivula et al. (2002).

Finally, it is difficult to say whether the findings are generalisable in terms of gender due to the high male to female ratio in both the current and original study.

Future directions

We have shown how an interplay between two psychological traits, NRI and anxiety, influences the performance. Future research may investigate the interaction between SP and NRI proposed by Lizmore et al. (2019) in order to gain more insight into the impact of the positive and negative aspects of perfectionism on performance. Future research could also investigate whether there are any gender differences in the relationship between perfectionism, anxiety, putting performance and golfers who have suffered from the yips. In terms of improving the measurement of perfectionism, future studies could also use a combination of items from subscales measuring the construct as opposed to just the SP and NRI subscales – this is due to the fact they may not fully capture the breadth of the two broad higher-order dimensions of perfectionism in sport (perfectionistic strivings and perfectionistic concerns; Stoeber & Madigan, 2016). Additionally, future research may find it useful to present performance related questions prior to presenting the SAS-2 and MIPS to prevent the potential of an order effect impacting scores on performance measures. Finally, using a longitudinal approach as opposed to a cross-sectional design to investigate the impact of anxiety and perfectionism is warranted to give findings more external validity. Within a longitudinal study, laboratory-based analysis could be combined with self-report data to try and validate the already existing literature.

Conclusion

Our study replicated most of the findings in Chambers and Marshall (2017) by using a more skilled sample primarily from a different nation – maladaptive perfectionism and anxiety have a negative impact on performance. Most importantly, we found that 34.2% of golfers reported experiencing the yips at some point, which is well within the suspected prevalence rate – and is much higher than the prevalence rate for task-specific focal dystonia. This is an important note to highlight when trying to develop interventions to tackle yips symptomology. Continuing to try and enhance the understanding of the psychological factors discussed above will be instrumental in developing strategies to provide relief from both disrupted performance and the yips.

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Supplementary Materials

Supplemental Material

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