

Yips and Lost Move Syndrome : assessing impact and exploring levels of perfectionism, rumination, and reinvestment

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9 Yips and Lost Move Syndrome: Assessing Impact and Exploring Levels of Perfectionism,

10 Ruminatation, and Reinvestment

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1 Abstract

2 This study examined whether the *yips* and *lost move syndrome* (LMS) are associated
3 with higher levels of perfectionism, rumination, and reinvestment, and whether individuals
4 experiencing these problems perceive them as highly stressful. Samples of *yips* ($N = 15$) and
5 LMS-affected ($N = 15$) individuals, and two matched control groups, completed the Frost
6 *multidimensional perfectionism scale* (FMPS; Frost, Marten, Lahart & Rosenblate, 1990), the
7 *ruminative response scale* (RRS; Nolen-Hoeksema, 1991), the *reinvestment scale* (Masters,
8 Polman & Hammond, 1993), and the *impact of event scale* (IES; Horowitz, Wilner &
9 Alvarez, 1979). Findings indicate higher scores in the *yips* and LMS groups for
10 perfectionism, rumination, reinvestment, and IES compared to their respective control groups.
11 The results suggest that rumination, reinvestment, and aspects of perfectionism increase
12 vulnerability to the *yips* and LMS, and that that both the *yips* and LMS are equally
13 distressing.

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15 *Keywords:* performance block, anxiety, trauma, self-focussed attention.

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1 Yips and Lost Move Syndrome: Assessing Impact and Exploring Levels of Perfectionism,
2 Ruminations, and Reinvestment

3 **1.0 Introduction**

4 Research exploring the *yips* and *lost move syndrome* (LMS) has appeared in sport
5 psychology literature for some time (e.g., McDaniel, Cummings & Shain, 1989; Silva, 1994),
6 with frequent comparisons being made to dystonic difficulties in occupational psychology
7 (Philippen & Lobinger, 2012; Smith et al., 2000; 2003). The yips is traditionally associated
8 with golf and cricket, and is thought to be a psychological disorder of control, involving the
9 loss of ability to execute a specific movement pattern, manifesting in the guise of involuntary
10 jerks, spasms, tremors, and freezing (Bawden & Maynard, 2001). Research has distinguished
11 between two types of yips, thought to lie at each end of a continuum (Smith et al., 2003;
12 Stinear et al., 2006). Specifically, type I yips (a form of focal dystonia) is associated with
13 higher intensities of practice, concentration, tension, and years competition. At the other end
14 of the continuum, type II yips, is thought to manifest in disrupted attention as a result of
15 increased self-focus, and/or distraction (Beilock & Gray, 2007). Hence type II yips is
16 considered a form of choking, and research has found that it can be alleviated through
17 traditional psychological skills training (e.g., pre-performance routines, distraction training;
18 Mesagno, Marchant & Morris, 2008; 2009). However, successful treatment methods are yet
19 to be presented for type I yips, and comparatively little is known about the disorder
20 (Rotheram, Thomas, Bawden & Maynard 2007; Philippen & Lobinger, 2012), therefore the
21 current study will be addressing type I, rather than type II yips.

22 Similar disorders of control are evident in artistic sports such as diving, trampolining,
23 and gymnastics, where the problem is more commonly referred to as LMS (Day, Thatcher,
24 Greenlees & Woods, 2006; Rotheram et al., 2007). The manifestation of these problems in
25 artistic sports involves a loss of awareness of body position, and locking of limbs and the

1 ability to execute a particular technique or skill, which can result in involuntary twists,
2 rotations, or unwanted body positions (Day et al., 2006).

3 Although existing literature appears to characterise type I yips and LMS as two
4 distinct disorders, evidence to date indicates that the symptoms associated with type I yips
5 and LMS are similar, irrespective of sport (Bennett, Hays, Lindsay, Olusoga & Maynard,
6 2015). For example, perfectionism, locked and/or obsessive thought processes, loss of motor
7 and cognitive control, and intrusive thoughts related to the experience have been shown to be
8 characteristic of both (Bennett et al., 2015; Roberts, Rotheram, Maynard, Thomas &
9 Woodman, 2013; Rotheram et al., 2007). Research has also suggested similarities exist
10 between components of both type I yips and LMS, and the symptoms reported by individuals
11 affected by anxiety-based disorders, including anxiety, intrusive thoughts, avoidance
12 behaviour, and irrational fear (Bennett et al., 2015; Rotheram et al., 2012). Consequently, it
13 could be that type I yips and LMS are in fact a specific type of conversion disorder caused by
14 internalised fear and anxiety presented in the form of physical symptoms, i.e., spasms, jerks,
15 and freezing (Sachdev, 2009). Indeed, research has reported that individuals suffering from
16 either type I yips or LMS, experience an irrational fear and anxiety towards the affected
17 movement (Rotheram, Maynard, Thomas, Bawden & Francis, 2012).

18 The development of anxiety-based disorders has been linked to history of trauma
19 experience, with the occurrence of a further traumatic-event at a later time triggering the
20 associated symptoms (e.g., anxiety, panic, avoidance; Dohrenwend, Yager, Wall & Adams,
21 2013). Importantly, a growing body of research has also linked type I yips and dystonic
22 disorders to previous trauma experience (c.f., Baker & Humblestone, 2005). For example,
23 Rotheram et al. (2007) demonstrated a relationship between type I yips and a history of
24 traumatic life-events, often experienced years before onset of the yips symptoms. Indeed,
25 individuals exposed to trauma and prolonged stress can sometimes suffer adverse effects

1 years after the event (Christianson & Marren, 2008; Forbes et al., 2007). For example, in
2 Christianson and Marren's (2008) study of trauma victims, symptoms such as re-
3 experiencing, emotional numbing, behavioural avoidance, and increased physiological arousal
4 were all reported. While the majority of trauma victims will make a full recovery in the first
5 few months, many subsequently suffer from anxiety-related disorders (APA, 2013). Several
6 explanations for this have been proposed, including the suggestion that certain personality
7 characteristics might increase susceptibility (Taylor, 2014). Perfectionism, for example, is
8 considered to be a consistent predictor of anxiety across a range of populations (Frost &
9 Henderson, 1991; Hall, Kerr & Matthews, 1998). Indeed, perfectionism has shown to be
10 elevated across 13 different anxiety-related disorders, including *post-traumatic stress*
11 *disorder* (PTSD), *obsessive-compulsive disorder* (OCD), *panic disorder*, and *depression*
12 (Egan, Hattaway & Kane, 2013; Ehring & Watkins, 2008). It has also been predicted that
13 individuals with perfectionistic tendencies experience higher levels of anxiety following a
14 perceived setback or mistake, due to an internal need for achievement. Consequently,
15 perfectionism has received widespread attention throughout both sport and non-sport
16 psychology literature (e.g., Flett & Hewitt, 2008; Frost & DiBartolo, 2002; Stoeber & Otto,
17 2006).

18 Several conceptualisations of perfectionism have been proposed, although to date,
19 Frost and colleague's (1990) model remains one of the most widely accepted (e.g., Koivula,
20 Hassmen & Fallby, 2002; Philippen & Lobinger, 2012; Roberts et al., 2013). The *Frost*
21 *multidimensional perfectionism scale* (FMPS; Frost et al., 1990) proposes that perfectionism
22 consists of six major components: *personal standards*, *organisation*, *concern over mistakes*,
23 *doubts about actions*, *parental expectations*, and *parental criticism*. Since its introduction,
24 two broad dimensions have been recommended to incorporate the respective subcomponents:
25 *perfectionistic striving* (i.e., striving for perfection, personal standards, organisation), and

1 *perfectionistic concern* (i.e., concern over mistakes, doubts about actions, parental
2 expectations, and parental criticism). Stoeber and Otto (2006) extended this by distinguishing
3 between healthy and unhealthy profiles of perfectionism, the latter involving high-levels of
4 both perfectionistic striving and perfectionistic concern, consequently increasing vulnerability
5 to contextual difficulties and performance breakdown. Together, perfectionistic striving and
6 perfectionistic concern often reveal high positive correlations with negative outcomes (e.g.,
7 neuroticism, maladaptive coping, negative affect), and indicators of psychological
8 maladjustment (e.g., depression) (cf. Stoeber & Otto, 2006). Thus, it is not surprising that
9 perfectionism has been considered within a traditional diathesis-stress model (Zuckermann,
10 1999), and viewed as a vulnerability factor for numerous psychopathologies (O'Connor &
11 O'Connor, 2003). Egan, Wade and Shafran (2011) reviewed the role of perfectionism across a
12 number of psychological issues (e.g., anxiety disorders, depression, and eating disorders), and
13 supported the notion that perfectionism does indeed appear to embody both cognitive and
14 behavioral characteristics that increase vulnerability to a number of psychological disorders
15 (e.g., obsessive actions, extreme vigilance, and body control behavior; Yang & Stoeber,
16 2012). Although it appears that perfectionism might have both positive and negative
17 components (Stoeber, 2011), perfectionism, coupled with self-criticism, is often seen as
18 maladaptive for sports performers, with negative self-defeating outcomes on behaviour (e.g.,
19 depression, body image dissatisfaction, avoidance behaviour) reported among extreme
20 perfectionists (Flett & Hewitt, 2008). Given the major factors associated with type I yips and
21 LMS (e.g., anxiety, intrusive negative thoughts, obsessive thinking), it is fair to assume that
22 unhealthy perfectionism might well be an antecedent of these problems, and could also
23 exacerbate responses to the disorders. Specifically, perfectionism might cause individuals to
24 negatively appraise an experience of type I yips or LMS, doubt their ability, and invest

1 increased conscious effort to regain control over the movement. In turn disrupting the
2 automaticity with which the movement was originally executed.

3 Flett, Hewitt, Blankstein and Gray (1998) suggested that psychological distress
4 associated with recurrent perfectionistic thinking patterns, was exacerbated by ruminative
5 thought patterns. Rumination, or *post-emotional elaboration*, includes conscious thoughts,
6 images, and/or memories revolving around the causes, symptoms, and consequences of a
7 significant emotional experience that recur without intention (Nolen-Hoeksema, 2000).
8 Rumination has traditionally been viewed as three-dimensional: *reflection*, *brooding*, and
9 *depression*. It is thought that the brooding construct of rumination (i.e., passive judgement of
10 one's current situation with an unachieved expectation), might maintain the relationship
11 between perfectionism, psychological distress, and anxiety disorders (Egan, Hattaway &
12 Kane, 2013). Michael, Halligan, Clark, and Ehlers (2007) suggested that ruminative brooding
13 maintains anxiety symptoms, due to focusing on "why" and "what if" questions, rather than
14 processing the actual trauma experience. Flett and Hewitt (2008) also suggested that
15 perfectionists ruminate about failure, and that those scoring highly on the concern over
16 mistakes aspect of the FMPS, were more likely to participate in ruminative brooding.

17 Flett, Madorsky, Hewitt and Heisel (2002) investigated the extent to which
18 perfectionism is associated with rumination and cognitive intrusion, in response to a
19 particularly stressful experience. The authors administered the FMPS, the *ruminative*
20 *response scale* (RRS; Nolen-Hoeksema, 1991), and the *impact of events scale* (IES; Zilberg,
21 Weiss & Horowitz, 1982) to a sample of 65 individuals. Results indicated that high-levels of
22 perfectionism and rumination were associated with depression and anxiety following a
23 traumatic experience. These findings support the notion that perfectionism and rumination
24 contribute to psychological distress and anxiety following trauma. Given that anxiety, along
25 with recurrent thoughts, images, and memories, are central components of type I yips and

1 LMS, it is feasible to assume that increased levels of both perfectionism and rumination might
2 also be present. Indeed, existing qualitative investigations exploring type I yips would appear
3 to support this. Several studies have reported that individuals affected by type I yips invest
4 considerable time and cognitive resource engaging in obsessive thinking about the experience,
5 specifically focusing on the negative outcome and potential causes (Bawden & Maynard,
6 2001; Rotheram et al., 2007). More recently, Roberts et al. (2013) administered a shortened
7 version of the FMPS in order to assess levels of maladaptive perfectionism, obsessional
8 thought processes, and self-consciousness. A sample of 60 yips-affected athletes from golf,
9 cricket, and darts revealed unhealthy perfectionistic profiles (i.e., high-levels of personal
10 standards, concern over mistakes, and organisation), compared to a sport-matched control
11 group. While this study advances our understanding of the yips, research is yet to measure the
12 same characteristics among LMS sufferers.

13 Recent research has demonstrated that individuals experiencing type I yips and LMS
14 obsess over the problem in a highly self-critical manner. Furthermore, they also appear to
15 display high-levels of self-focused awareness, specifically attending to physical sensations,
16 thoughts, and emotions associated with the affected skill (Bennett et al., 2015). Masters
17 (1992) referred to the conscious awareness of explicit declarative knowledge to control
18 movement as *reinvestment* and proposed the conscious processing hypothesis to support this.
19 Specifically, under increased anxiety, performers will reinvest conscious control of movement
20 execution inhibiting automatic processing. It is thought that while self-focus can be induced
21 from a variety of stimuli it is more commonly linked to anxiety (Gray, 2004), a major
22 component of both type I yips and LMS (Bennett et al., 2015). A substantial amount of
23 research has demonstrated the effects of self-focus and rumination in exacerbating anxiety-
24 related disorders (Morrison & Heimberg, 2013). Research has also reported links between
25 *focal dystonia* and self-conscious reinvestment (Grattan et al., 2001). Given the major role

1 anxiety appears to play in type I yips and LMS, and the similarities between type I yips, LMS,
2 dystonic problems, and anxiety-related disorders, one might expect to see similar patterns of
3 self-focussed reinvestment emerging in type I yips and LMS.

4 In order to assess the effect of reinvestment, Masters, Polman and Hammond (1993),
5 developed the reinvestment scale, their hypothesis being that self-focussed awareness
6 (initiated by various stimuli) promotes reinvestment, which can in turn cause performance
7 breakdown. Indeed, Gray et al (2004) utilised the scale to demonstrate that cricket batters
8 increased conscious control, and therefore reinvestment, during a poor performance streak in
9 an attempt to overcome the problems that in fact escalated. Thus, reinvesting in an attempt to
10 overcome type I yips/LMS might only fuel the problem. Roberts et al. (2013) proposed that
11 self-consciousness might be a characteristic of type I yips, and suggested that performance
12 breakdowns caused yips-affected golfers to reinvest more conscious effort over performance,
13 effectively causing repeated yips experiences.

14 **1.1 Aims of the current study**

15 The aim of the current study is two-fold: First, to examine whether type I yips and
16 LMS are associated with higher-levels of perfectionism, rumination, and reinvestment when
17 compared with matched controls; second, to explore whether individuals who experience type
18 I yips/LMS perceive worst performance experiences as more stressful than controls. It is
19 expected that perfectionism, rumination, and reinvestment will be similarly high in both type I
20 yips and LMS groups. It is also predicted that individuals experiencing type I yips and LMS
21 will report significantly higher scores on the IES than matched control groups. To date only
22 one study has concurrently examined type I yips and LMS, presenting evidence to show that
23 they are very similar constructs (Bennett et al., 2015). It is envisaged that the present study
24 will provide further support for this finding and also advance our understanding of the
25 antecedents involved.

2.0 Method

2.1 Participants

With institutional ethics approval, 60 participants (41 men, 19 women) took part in the study. Fifteen were considered to be experiencing LMS (diving, $n = 2$; trampolining, $n = 9$; gymnastics, $n = 4$; $M_{\text{age}} = 25.0$, $SD = 6.65$), 15 were considered to be experiencing type I yips (cricket, $n = 8$; golf, $n = 4$; darts, $n = 3$; $M_{\text{age}} = 37.0$, $SD = 14.33$), the remaining participants formed two control groups, each consisting of 15 non-LMS sufferers (diving, $n = 2$; trampolining, $n = 9$; gymnastics, $n = 4$; $M_{\text{age}} = 25.73$, $SD = 4.71$), and 15 non-yips sufferers (cricket, $n = 8$; golf, $n = 4$; darts, $n = 3$; $M_{\text{age}} = 33.53$, $SD = 13.51$). Participants had an average of 14 years playing experience at a minimum of National level or equivalent (LMS $M_{\text{years}} = 10.5$, $SD = 4.3$; yips $M_{\text{years}} = 17.9$, $SD = 7.3$; LMS control group $M_{\text{years}} = 11.93$, $SD = 4.45$; yips control group $M_{\text{years}} = 15.20$, $SD = 7.25$). Yips and LMS participants were recruited through applied sport psychologists, known to the primary researcher, and who were working either directly or indirectly with those individuals. Participants in the control group were recruited via the use of posters and online media campaigns.

Inclusion in the LMS group was assessed using the following criteria outlined by Tenn (1995), and used in previous studies (e.g., Day et al., 2006): a) an inability to take off for at least one somersault when previously able; b) an inability to perform a somersault with a certain degree of twist when previously able; c) unintentionally executing a different move midway through a skill chain; and/ or d) an inability to land a particular move when previously able. Inclusion in the type I yips group was assessed according to criteria outlined by Smith et al. (2000), and also adhered to in previous research (e.g., Rotheram et al., 2007). That is, participants were experiencing abnormal movements in the hand or forearms, defined as jerking, shaking or freezing of the movement, when executing a previously mastered skill (e.g., putting in golf/bowling in cricket). All participants were identified as experiencing type

1 I yips or LMS by self-description and professional observation, and were required to have
2 been experiencing the problems for a period of at least three-months. Participants who met
3 these criteria as a direct result of injury or accident were not included in the study, to rule out
4 symptoms experienced simply due to fear of re-injury (Day et al., 2006). Sport psychologists
5 were contacted via email and provided information regarding the study purpose and selection
6 criteria for participants. They were asked to contact any participants they considered suitable
7 for participation, and, with their consent, identify them to the primary researcher. Participants
8 included in the control groups had never experienced a physical skill disruption of any skill in
9 their main or subsidiary sport, and had never been diagnosed with a movement disorder.
10 Participants were matched by age, gender, sport, and ability.

11 **2.2 Procedure**

12 Before completing the measures, participants were contacted by email and provided
13 with standardised information regarding the purpose of the study, use of data, issues regarding
14 confidentiality, anonymity, and data protection, and given the opportunity to ask any
15 questions they might have prior to consenting. Participants then received an email from the
16 primary researcher containing the measures and instructions for their completion. The order in
17 which participants were instructed to complete the measures was randomised to avoid order
18 effects. Participants were informed that completion of the measures was considered as
19 consent to participate, and, once returned, all measures were entered into a Microsoft Excel
20 spread-sheet (Microsoft Corporation, USA), and stored in a password-protected file,
21 accessible by the primary research team only. Participants were informed that they could
22 withdraw their data at any point up until submission of the study for review.

23 **2.3 Psychometric and Screening Measures**

1 Participants were asked to take part in a study exploring the relationship between
2 personality characteristics and performance breakdown in sport. Participants completed the
3 following scales:

4 **2.3.1 Frost Multidimensional Perfectionism Scale (FMPS; Frost et al., 1990)**

5 The FMPS assesses the six dimensions of perfectionism (i.e., personal standards,
6 organisation, concern over mistakes, doubts about actions, parental expectations, and parental
7 criticism). Using a scale of 1 to 5 (where 1 = *strongly disagree*; 5 = *strongly agree*),
8 participants are required to respond to a series of questions assessing each dimension, for
9 example concern over mistakes was assessed using items like: “I hate being less than the best
10 at things”, and “I should be upset if I make a mistake”. Frost et al. (1990) reported the
11 Cronbach’s alpha for functional ($\alpha = 0.89$) and dysfunctional ($\alpha = 0.91$) perfectionism to be
12 satisfactory, as well as the internal consistency for the subscales ($\alpha = 0.73 - 0.93$) and the
13 overall scale ($\alpha = 0.90$). Although the use of domain specific measures is recommended (e.g.,
14 Stoeber & Stoeber, 2009), it was felt that previous use of the FMPS as a measure of
15 perfectionism among type I yips-affected athletes, and individuals experiencing anxiety-
16 related disorders, justified its use here (e.g., Harris, Pepper & Maack, 2008; Roberts et al.,
17 2013).

18 **2.3.2 Ruminative Response Scale (RRS; Nolen-Hoeksema, 1991)**

19 The RRS is a self-report measure of rumination in which participants rate 22
20 statements about how often they engage in ruminative responses following negative
21 emotional affect, using a scale from 1 (*almost never*), to 4 (*almost always*). Ruminative
22 brooding was considered by items such as “think what am I doing to deserve this?”
23 Ruminative reflection was considered using items such as “go someplace alone to think about
24 your feelings”, and ruminative depression was considered using items such as “think why

1 can't I get going?" Nolen-Hoeksema (2000) indicated that the RRS has adequate internal
2 consistency ($\alpha = .82$), and test-retest reliability over a 1 year period ($r = 0.47, p < .001$).

3 **2.3.3 Reinvestment Scale (Masters et al., 1993)**

4 The reinvestment scale contains 20 items drawn from three scales considered to be
5 predictive of individual tendency to reinvest in controlled processing. Specifically, 12 items
6 are taken from the *self-consciousness scale* (e.g., "I am aware of the way my mind works
7 when I work through a problem"; Feningstein, Scheier & Buss, 1975). A further seven items
8 are taken from the rehearsal factor of the *emotional control questionnaire* (e.g., "I often find
9 myself thinking over and over about things that have made me angry"; Roger & Nesshoever,
10 1987). The final item is borrowed from the *cognitive failures questionnaire* (e.g., "do you
11 have trouble making up your mind?"; Broadbent, Cooper, Fitzgerald & Parkes, 1982).
12 Masters et al. (1993) indicated that the reinvestment scale has adequate internal reliability for
13 use in sport ($\alpha = 0.86$), and test-retest reliability over a four-month period ($r = 0.74$).

14 **2.3.4 Impact of Events Scale (IES; Zilberg, Weiss & Horowitz, 1982)**

15 The IES is a 22-item self-report measure, and is widely used for the assessment of
16 traumatic experience responses (Joseph, 2000). The IES has been specifically used to assess
17 the symptoms of anxiety-related disorders, namely intrusion (intrusively experienced ideas,
18 images, feelings and/dreams) and avoidance (conscious avoidance of ideas, feelings or
19 situations related to the event) (cf. Sundin & Horowitz, 2002). Considering the dimensions
20 that appear to be defining characteristics of type I yips and LMS (e.g., intrusive cognitions,
21 increased fear and somatic anxiety symptoms, avoidance behaviour), it is felt that the IES also
22 offers an appropriate means of assessment for the current study. Furthermore, research has
23 demonstrated that the content of experience represented by the IES is similar for type of event
24 and patient versus non-patient samples (Zilberg, Weiss & Horowitz, 1982). Participants were
25 asked to respond to each statement indicating the level of distress they experienced during

1 their worst performance experience. Distress level was reported using a scale of 0 (*not at all*)
2 to 4 (*extremely*), with a total range of 0-88. The three-month time frame was selected to
3 enable an adequate time period for significant events to occur, while not being overly
4 demanding on memory recall. This time frame is also consistent with previous research
5 assessing trauma experience in various population groups (Sundin & Horowitz, 2002).
6 Intrusive responses were measured by items such as “I thought about it when I didn’t mean
7 to”, avoidance was measured by items such as, “I stayed away from reminders about it”, and
8 physiological arousal was measured by items such as “my feelings about it were kind of
9 numb”. Extensive evidence attesting to the internal reliability and validity of this measure has
10 been reported ($\alpha = .86$; Zilberg, Weiss & Horowitz, 1982), adding further support for its use
11 in the current study.

12 **2.4 Analysis**

13 The data generated in this study was initially tested for statistical assumptions and was
14 deemed suitable for further analysis. Subsequently, a series of one-way between-groups
15 ANOVAs were conducted for each of the dependant variables, to test the difference between
16 the type I yips-affected group, the LMS-affected group, and the matched control groups.
17 Dependant variables were rumination, perfectionism, personal standards, organisation,
18 concern over mistakes, doubts about actions, parental expectations, parental criticism,
19 reinvestment, and IES scores. Follow-up comparisons were conducted using Bonferroni to
20 assess where differences arose. It is suggested that because obtained *p*-values vary according
21 to the number of participants, they do not provide adequate information regarding the
22 magnitude of an effect (Winter, Abt & Nevill, 2014). Thus, to identify the extent to which the
23 results were meaningful; outcomes were evaluated using effect sizes, and 95% confidence
24 intervals (CI; Cumming, 2012). Alpha was set to 0.05, and *p*-values were supported by effect-
25 size statistics in line with Cohen’s *d* (*d*) (1988), where differences in effect were considered to

1 be either trivial (0.19), small (0.20 - 0.49), medium (0.50 - 0.79), or large (≥ 0.80). Because
2 this study had two independent control groups, a pooled standard deviation was used as the
3 denominator to determine effect sizes (Mullineaux, Bartlett & Bennett, 2001).

4 **3.0 Results**

5 Analysis revealed significant differences between the LMS and LMS control groups
6 on rumination ($F_{(3,56)} = 19.360, p = < 0.001, 95\% \text{ CI } [24.81, 25.45], d = 0.74$), perfectionism
7 ($F_{(3,56)} = 195.827, p = < 0.001, 95\% \text{ CI } [49.80, 50.34], d = 1.67$), concern over mistakes
8 ($F_{(3,56)} = 131.879, p = < 0.001, 95\% \text{ CI } [16.98, 17.29], d = 1.48$), doubts about action, ($F_{(3,56)}$
9 $= 44.635, p = < 0.001, 95\% \text{ CI } [6.20, 6.46], d = 1.19$), personal standards ($F_{(3,56)} = 58.678, p =$
10 $< 0.001, 95\% \text{ CI } [12.81, 13.19], d = 0.91$), organisation ($F_{(3,56)} = 112.211, p = < 0.001, 95\%$
11 $\text{ CI } [10.32, 10.62], d = 1.02$), reinvestment ($F_{(3,56)} = 80.856, p = < 0.001, 95\% \text{ CI } [4.68, 4.92],$
12 $d = 0.93$), and IES ($F_{(3,56)} = 44.017, p = < 0.001, 95\% \text{ CI } [26.04, 26.63], d = 0.82$), with a
13 medium to large magnitude of effect. No differences were found between the LMS and LMS
14 control groups on parental expectations ($F_{(3,56)} = 3.203, p = 1.000$), and parental criticism
15 ($F_{(3,56)} = 9.470, p = 0.029$). Significant differences were found between the type I yips and
16 yips control groups on rumination ($F_{(3,56)} = 19.360, p = 0.004, 95\% \text{ CI } [13.81, 14.45], d =$
17 0.42), perfectionism ($F_{(3,56)} = 195.827, p = < 0.001, 95\% \text{ CI } [50.34, 50.86], d = 1.49$), concern
18 over mistakes ($F_{(3,56)} = 131.879, p = < 0.001, 95\% \text{ CI } [13.42, 13.78], d = 1.18$), doubts about
19 action, ($F_{(3,56)} = 44.635, p = < 0.001, 95\% \text{ CI } [4.73, 4.99], d = 0.91$), personal standards
20 ($F_{(3,56)} = 58.678, p = < 0.001, 95\% \text{ CI } [11.29, 11.64], d = 0.80$), parental criticism ($F_{(3,56)} =$
21 $9.470, p = 0.002, 95\% \text{ CI } [3.52, 3.81], d = 0.30$), organisation ($F_{(3,56)} = 112.211, p = < 0.001,$
22 $95\% \text{ CI } [9.47, 9.73], d = 0.94$), reinvestment ($F_{(3,56)} = 80.856, p = < 0.001, 95\% \text{ CI } [5.77,$
23 $5.97], d = 1.15$), and IES ($F_{(3,56)} = 44.017, p = < 0.001, 95\% \text{ CI } [27.75, 28.38], d = 0.87$),
24 revealing a medium to large magnitude of effect. No difference was revealed between the
25 type I yips and yips control groups on parental expectations ($F_{(3,56)} = 3.203, p = 0.616$).

1 ANOVA revealed no differences between the LMS and type I yips groups on any of the
2 dependant variables. See table 1 for a full breakdown of results.

3 **4.0 Discussion**

4 The first aim of this study was to identify whether type I yips and LMS are associated
5 with higher-levels of perfectionism, rumination, and reinvestment. The second aim was to
6 quantify whether individuals experiencing type I yips/LMS perceived their worst performance
7 experience as more stressful than those in a control group. We expected the type I yips and
8 LMS groups to report similarly high-levels of perfectionism, rumination, reinvestment, and
9 subjective stress response, and that these scores would be consistently higher than both
10 matched control groups.

11 The current results show that rumination, reinvestment, total perfectionism, and all
12 aspects of perfectionism (with the exception of parental expectations) were greater in the type
13 I yips group compared to the yips control group. In comparison to the LMS control group, the
14 LMS group revealed greater levels of rumination, reinvestment, total perfectionism, and four
15 aspects of perfectionism only: personal standards, organisation, concern over mistakes, and
16 doubts about actions, with no difference on parental expectations and parental criticism.
17 Importantly, there was no difference between the type I yips and LMS groups on any of the
18 variables measured, supporting the suggestion that these disorders might be similar problems
19 with different presentations. Finally, both the type I yips and LMS groups scored higher on
20 the IES than their respective control groups.

21 Previous research has suggested that the combination of harsh personal criticism,
22 whilst striving for perfectionism, leads to underperformance (Stoeber & Otto, 2006). The
23 findings from the present research lend strong support to this notion, in that scores for
24 perfectionistic striving and perfectionistic concern were higher in the type I yips group than in
25 matched controls. Furthermore, previous research has associated unhealthy perfectionism

1 with pre-performance state and trait anxiety, and higher-levels of general anxiety in situations
2 others typically find less stressful (Frost & DiBartolo, 2002). To our knowledge, the present
3 study is the first to find profiles of unhealthy perfectionism in LMS sufferers, similar to those
4 that have previously been noted in type I yips, a finding that serves to strengthen the notion
5 that LMS and type I yips are, in fact, similar disorders.

6 Regarding parental expectations and parental criticism, no significant differences were
7 found between the LMS group and the LMS control group, neither were any significant
8 differences found in parental expectations between the type I yips group, and their matched
9 controls. Our findings suggest that these constructs of perfectionism might not be antecedents
10 of type I yips/LMS. Moreover, these findings lend further support to the idea that parental
11 expectations and parental criticism might not be core components of perfectionism (Stoeber &
12 Otto, 2006). Individuals might be striving to meet parental expectations and avoid parental
13 criticism, regardless of whether type I yips/LMS is experienced, a common characteristic of
14 an elite sport environment. Furthermore, parental expectation is commonly associated with
15 the perception of needing to achieve unrealistically high-levels of success, facilitating a need
16 for continuous self-evaluation of performance (Frost et al., 1990). Future research might
17 consider whether they should be included in assessment of perfectionism in sport.

18 Although differences were found for most aspects of perfectionism between the type I
19 yips/LMS groups, and their respective control groups, mean scores appear relatively low in
20 comparison to previous research using the FMPS to assess perfectionistic tendencies in sport
21 and mainstream psychology (see Table 1) (e.g., Sapieja, Dunn & Holt, 2011). One reason for
22 this might be the use of a non-context specific inventory to measure perfectionism. Indeed,
23 mean scores generated using generic measures of perfectionism tend to be lower than with
24 domain specific measures (e.g., Dunn, Gotwals & Causgrove Dunn, 2005). As such, reported
25 levels of anxiety and obsessive thinking, might not be entirely reflective of individual

1 perfectionistic tendencies in relation to the domain. While we believe the FMPS adequately
2 met the purposes of the current study, it is recommended that future studies adopt a sport
3 specific measure of perfectionism in order to quantify individual differences in perfectionism
4 in sport more fully (e.g., Gotwals, Dunn, Causgrove Dunn, & Gamache, 2010).

5 Rumination scores were found to be significantly higher in the type I yips/LMS
6 groups than in their respective matched control groups, suggesting that rumination is an
7 important aspect of the experience of both type I yips and LMS. This might, in part, explain
8 the way in which the frequency and intensity of type I yips and LMS tends to escalate.
9 Specifically, rumination is thought to involve conscious thoughts, images and/or memories
10 revolving around the causes, symptoms, and consequences of a significant emotional
11 experience that recur without intention (Nolen-Hoeksema, 2000). Traditionally seen as a
12 vulnerability factor of depression (Nolen-Hoeksema, Wisco & Lyubornirsky, 2008),
13 rumination is typified by an increase in negative affect coupled with a decrease in positive
14 affect, causing severity of anxiety-related symptoms and associated disorders to escalate
15 (McLaughlin, Borkovec & Sibrava, 2007). A proportion of individuals who experience a
16 single occurrence of a performance breakdown, characteristic of type I yips/LMS, will
17 subsequently suffer the debilitating longevity of the disorders (Roberts et al., 2013). However,
18 for this proportion of individuals the escalating effect is frequently career destroying.
19 Generally ruminators will appraise an event, and their ability to cope with that event as
20 negative, as well as experiencing recurrent negative feelings, emotions, and behaviours
21 associated with it. Based upon the findings of the present study, a possible difference between
22 those who do and those who do not experience the yips/LMS is in the frequency of
23 ruminative thought patterns and dwelling on the negative aspects of a single experience in a
24 repetitive uncontrolled manner, coupled with intense negative self-appraisal relating to
25 inability to perform. Indeed, rumination has been linked to dispositional self-criticism, a

1 predominant vulnerability factor in perfectionism (Masters, 1992). Research exploring
2 rumination and perfectionism among sufferers of the anxiety-based disorder PTSD, has
3 demonstrated that rumination mediates the relationship between perfectionism and PTSD, and
4 potentially has a role in maintaining ensuing symptoms (Michael, Halligan, Clark & Ehlers,
5 2007). Given the reported association between rumination, obsessional thinking, anxiety, and
6 type I yips/LMS (Roberts et al., 2013; Rotheram et al., 2007; 2012), one or more of these
7 factors might also be associated with the way in which perfectionism relates to these
8 disorders.

9 To our knowledge, this is the first study to demonstrate elevated levels of
10 reinvestment in those that suffer with LMS, adding to the growing literature reporting self-
11 consciousness and reinvestment as components of type I yips (Bawden & Maynard, 2001).
12 Given the high-levels of reinvestment reported by both the yips and LMS groups, it might be
13 that an individual's propensity to reinvest in their actions, combined with perfectionistic
14 tendencies, and prolonged ruminative thought patterns, result in skill-based problems
15 becoming ingrained. In contrast, it is feasible to suggest that someone without this profile
16 might just pass off the initial experience as a one-off and be more able to keep things in
17 perspective. However, this is confounded by recent research, which suggests that conscious
18 cognitive activity plays a key role in facilitating further improvement in performance (Toner
19 & Moran, 2014). The precise mechanism by which reinvestment, rumination, and
20 perfectionism interact is unclear therefore future research should therefore address the causal
21 relationship between perfectionism, rumination, reinvestment, and type I yips/LMS.

22 The link between the experience of traumatic life-events and psychological disorders
23 is by no means a new phenomenon (Zilberg, Weiss & Horowitz, 1982), and the current study
24 suggests a similar link exists with type I yips/LMS. To date, research has indicated that a
25 range of trauma-related (e.g., perceived threat), and personal (e.g., obsessive thought patterns)

1 factors affect an individual's response to a significant event (Zuckerman, 1999). Research has
2 also found that individuals suffering from type I yips report a history of significant life-events
3 (Rotheram et al., 2007). Furthermore, individuals with high-levels of perfectionism are known
4 to be more susceptible to the negative consequences of significant life-events (Hewitt, Flett &
5 Ediger, 1996). To our knowledge, this is the first study of its kind to report both unhealthy
6 perfectionism, and high-level stress response among the same group of individuals.
7 Specifically, sufferers of type I yips and LMS who have unhealthy profiles of perfectionism,
8 appraise their worst performance experience as more stressful than non-perfectionist types. It
9 is possible that the combination of these two components are a precipitating factor in the
10 development of type I yips/LMS. However, due to the inclusion of other variables in this
11 study, further research should be conducted to confirm this. Nonetheless, athletes meeting the
12 criteria for unhealthy perfectionism, coupled with a high-perceived stress response, should be
13 supported to ensure effective processing of traumatic events (i.e., performance breakdown).

14 This study has demonstrated that levels of perfectionism, rumination, and
15 reinvestment are greater in individuals experiencing type I yips and LMS, than in matched
16 control groups. Furthermore, those suffering the yips/LMS report higher levels of stress
17 response than their non-suffering counterparts. Whilst the study design prevents us from
18 being able to determine causality, we favour the explanation that perfectionism, rumination,
19 and reinvestment increase the likelihood of experiencing type I yips/LMS. Thus, it is
20 recommended that future research develops interventions directed towards reducing the
21 maladaptive effects of identified personality traits, and supporting individualised debriefs
22 following traumatic experience. Based upon the current findings, assessing perfectionistic
23 tendencies, ruminative responses, and reinvestment, might help to identify those athletes most
24 at risk so that interventions can be targeted accordingly.

25

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1 Table Caption

2 *Table 1. Means (M) and Standard Deviations (SD) for Group x Dependent Variable.*

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1 Table 1. Means (*M*) and Standard Deviations (*SD*) for Group *x* Dependent Variable

	LMS (<i>M</i> ± <i>SD</i>)	yips (<i>M</i> ± <i>SD</i>)	LMS control (<i>M</i> ± <i>SD</i>)	yips control (<i>M</i> ± <i>SD</i>)
Rumination	62.73 ± 12.42	52.07 ± 10.02	37.6 ± 8.85	37.93 ± 11.14
Reinvestment	13.20 ± 1.66	14.00 ± 1.07	8.40 ± 1.35	8.13 ± 1.19
Perfectionism	117.87 ± 7.81	111.80 ± 6.29	67.80 ± 7.86	67.27 ± 8.23
Concern over mistakes	31.00 ± 1.93	29.33 ± 2.87	13.87 ± 3.00	15.733 ± 3.92
Doubts about action	12.33 ± 2.13	11.73 ± 2.49	5.93 ± 1.53	6.87 ± 1.19
Parental expectations	13.07 ± 1.67	11.93 ± 1.67	12.13 ± 2.45	10.60 ± 2.80
Parental concern	11.07 ± 2.76	10.00 ± 1.85	8.27 ± 3.20	6.33 ± 2.44
Personal standards	26.93 ± 3.69	26.13 ± 4.24	13.93 ± 3.81	14.67 ± 2.26
Organisation	23.47 ± 1.85	22.67 ± 1.35	13.00 ± 2.70	13.07 ± 2.34
IES	56.53 ± 9.26	48.87 ± 12.28	30.2 ± 8.45	20.8 ± 7.84

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