

CLINICAL FEATURE
ORIGINAL RESEARCH

Epidemiology of symptoms of common mental disorders among elite Gaelic athletes: a prospective cohort study

Vincent Gouttebarga^{a,b,c,d}, Johannes L. Tol^{a,e} and Gino M. M. J. Kerkhoffs^{a,b,c}

^aAcademic Center for Evidence based Sports medicine (ACES), Academic Medical Center, Amsterdam, The Netherlands; ^bAmsterdam Collaboration on Health & Safety in Sports (ACHSS), Academic Medical Center, VU University Medical Center, Amsterdam, The Netherlands; ^cDepartment of Orthopaedic Surgery, Academic Medical Center, Amsterdam, The Netherlands; ^dWorld Players' Union (FIFPro), Players' Services, Hoofddorp, The Netherlands; ^eSports Physician Group, OLVG, Amsterdam, The Netherlands

ABSTRACT

Objective: Scientific knowledge about symptoms of common mental disorders among elite Gaelic athletes is lacking. Consequently, this study aimed to (i) determine the prevalence, comorbidity and 6-month incidence of symptoms of common mental disorders (distress, anxiety/depression, sleep disturbance, adverse alcohol use) among elite Gaelic athletes and (ii) evaluate their association with potential stressors (severe musculoskeletal injuries, surgeries, recent life events, career dissatisfaction).

Methods: An observational prospective cohort study by means of questionnaires was conducted over six months among elite Gaelic athletes (N=204). Using validated questionnaires to assess symptoms of common mental disorders as well as several stressors, an electronic questionnaire was set up and distributed by the Gaelic Players' Association.

Results: Prevalence ranged from 23% for adverse alcohol use to 48% for anxiety/depression. Around 24% of the participants reported at baseline two symptoms. Six-month incidence ranged from 11% for sleep disturbance to 21% for anxiety/depression. Severe musculoskeletal injury, surgery, recent life events and career dissatisfaction led to an increased risk for common mental disorders.

Conclusion: Our findings indicate that raising the self-awareness of all stakeholders in Gaelic sports about common mental disorders should be prioritized, as well as the evidence-based development and application of adequate preventive and supportive measures.

ARTICLE HISTORY

Received 16 January 2016
Accepted 29 April 2016
Published online
16 May 2016

KEYWORDS

Sports; distress; anxiety; depression; sleep disturbance; adverse alcohol use

Introduction

Symptoms of distress (overstressed), anxiety, depression, or adverse substance use – typically referred as symptoms of common mental disorders (CMD) – have been recently under investigation at an exponential rate due to their serious consequences for quality of life and functioning.[1–4] Being often comorbid, symptoms of CMD are more frequently reported in young adults (aged 16–34 years) than at any other stage of the lifespan.[2–4] By contrast to the large amount of musculoskeletal injury surveillance studies, epidemiological studies on symptoms of CMD among the young population of elite athletes are scarce.[5]

Recent cross-sectional studies among Australian and French elite, Olympic athletes have shown a prevalence of symptoms of CMD in the range of 17–45%.[6,7] Comparable relatively high prevalence of CMD was found among male professional footballers, ranging from 9% for adverse alcohol use and 10% for distress to 23% for sleep disturbance and 38% for anxiety/depression.[8–10] In these studies, symptoms of CMD were shown to be associated with several stressors among which severe musculoskeletal injuries, surgeries, life events, and career dissatisfaction.[8–10]

Gaelic sports, including Gaelic football and hurling, are the most popular field sports in Ireland in terms of supporter

attendances at elite intercounty level. Both traditional sports are also recognized internationally with competitions in the United Kingdom, Europe, North America, and Oceania. Being typically played over a 6-month season, Gaelic football and hurling can be described as high-intensity, high-velocity, multidirectional, player-to-player contact field sports requiring endurance, speed, strength, and agility.[11] In elite Gaelic sports, most of the epidemiological studies recorded the occurrence of musculoskeletal injuries.[12–15] At present time, scientific knowledge about the extent of symptoms of CMD among elite Gaelic athletes remains lacking. Such a lack of evidence seems peculiar because the scientific literature has shown that competitive athletes such as elite Gaelic athletes might be confronted during their career with more than 600 distinct stressors that could induce symptoms of CMD, for instance injuries, surgeries, life events, and life dissatisfaction.[16] In addition, previous studies have shown that symptoms of CMD are prevalent among elite athletes and that those are associated with injuries, surgeries, life events, and life dissatisfaction.[7–10] Consequently, and analogously to elite athletes from other sports disciplines, we hypothesize that symptoms of CMD occur among elite Gaelic athletes and potentially associated with stressors such as severe musculoskeletal injuries, surgeries, life events, and career dissatisfaction.

Accordingly, the primary aim of this study was to determine the prevalence, comorbidity, and 6-month incidence of symptoms of CMD (distress, anxiety/depression, sleep disturbance, adverse alcohol use) among elite Gaelic athletes. The secondary aim was to evaluate the association of potential stressors (severe musculoskeletal injuries, surgeries, recent life events, career dissatisfaction) with symptoms of CMD.

Methods

Design

Reported in compliance with the Strengthening the Reporting of Observational Studies in Epidemiology statement, the present study was an observational prospective cohort study with two measurements over a follow-up period of 6 months by means of questionnaires.[17] Ethical approval was provided by the Medical Ethics Review Committee of the Academic Medical Center (Amsterdam, The Netherlands). The present research was conducted in accordance with the Declaration of Helsinki.[18]

Study setting and participants

Participants were elite Gaelic athletes who fulfilled the following inclusion criteria: (1) member as an active senior county level Gaelic footballer or hurler of the Gaelic Players' Association (GPA), which means committing significant time to football/hurling training and competing at the highest football/hurling level in Ireland; (2) age of at least 18 years; (3) male (because of the nature of the sport and in order to allow comparisons with previous studies focusing on male athletes); and (4) able to read and comprehend texts fluently in English.

Sample size

With regard to the primary aim of the study, sample size calculation indicated that at least 61 participants were needed (power of 80%; confidence interval of 95%; precision of 10%) under the assumption that 1 out of 5 Gaelic athletes might suffer from a mental health condition.[19] Expecting a response rate of around 20% and a loss to follow-up at 50%, we intended to invite at least 620 Gaelic athletes. The responsible researcher provided instructions and random numbers to the GPA in order to select potential participants at random. Then, the GPA invited them between November 2014 and February 2015 to participate in the study, procedures being blinded to the responsible researchers for reasons of privacy and confidentiality.

Dependent variables: symptoms of CMD

Symptoms of distress, anxiety/depression, sleep disturbance, and adverse alcohol use were measured at baseline (previous 4 weeks) and at follow-up (previous 6 months).

Distress

Distress was measured using the Distress Screener (three items scored on a 3-point scale) which is based on the four-

dimensional symptom questionnaire (4DSQ) (e.g. 'Did you recently suffer from worry?').[20,21] The 4DSQ that is Distress Screener has been validated in English (internal consistency: 0.6–0.7; test–retest coefficients: ≥ 0.9 ; criterion-related validity: sensitivity 0.798, specificity 0.726, area under receiver operating characteristic (ROC) curve ≥ 0.79).[20,21] A total score ranging from 0 to 6 was obtained by summing up the answers on the three items, a score of 4 or more indicating the presence of distress.[20,21]

Anxiety/depression

The 12-item General Health Questionnaire (GHQ-12) was used to assess psychological symptoms related to anxiety/depression (e.g. 'Have you recently felt under strain?').[22] The GHQ-12 has been validated in English (internal consistency: 0.7–0.9; criterion-related validity: sensitivity 0.763, specificity 0.834, area under ROC curve ≥ 0.83).[22,23] Based on the traditional scoring system, a total score ranging from 0 to 12 was calculated by summing up the answers on the 12 items, with a score of 3 or more indicating signs of anxiety/depression (area under curve = 0.88).[22,23]

Sleep disturbance

Based on the PROMIS (short form), sleep disturbance was assessed through four single questions (e.g. 'Did you recently have some problem to sleep?') scored on a 5-point scale (from 'not at all' to 'very much').[24,25] The PROMIS has been validated in English (internal consistency: >0.9 ; construct validity: product-moment correlations ≥ 0.96) (for detailed information, see www.nihpromis.org). A total score ranging from 1 to 20 is obtained by summing up the answers to the four questions, a score of 13 or more indicating the presence of sleep disturbance.[24,25]

Adverse alcohol use

Level of alcohol consumption was detected using the 3-item AUDIT-C (e.g. 'How many standard drinks containing alcohol do you have on a typical day?').[26] The AUDIT-C has been validated in English (test–retest coefficients: 0.6–0.9; criterion-related validity: sensitivity 0.826, specificity 0.813, area under ROC curve 0.70–0.97).[26,27] A total score ranging from 0 to 12 was obtained by summing up the answers on the three items, a score of 5 or more indicating the presence of adverse alcohol use.[26]

Independent variables: stressors

Number of severe musculoskeletal injuries, number of surgeries, number of recent life events and career dissatisfaction were measured at baseline and at follow-up.

Severe musculoskeletal injuries

The total number of severe musculoskeletal injuries during a Gaelic sports career (e.g., 'How many severe injuries have you had so far during your Gaelic sports career?') was examined through a single question. In our study, severe injury was defined as an injury that involved the musculoskeletal system (bone, joint, ligament, muscles, tendons) and occurred during team activities and led to either training or match absence for

more than 28 days (definition being clearly stated to the participants).[28] The total number of severe injuries was subsequently transformed as a dichotomous variable (not severely injured and exposed to severe injuries).

Surgeries

The total number of surgeries undergone during a Gaelic sports career was scored through a single question (e.g. 'How many surgeries have you had so far during your Gaelic sports career?'). The total number of surgeries was subsequently transformed as a dichotomous variable (no surgery and exposed to surgery).

Recent life events

Based on the validated Social Athletic Readjustment Rating Scale, the occurrence of life events (e.g. 'Death of spouse', 'Change in financial state') in the previous 6 months was explored by 13 single questions (yes or no).[29] Score was calculated by summing up the life events occurred in the previous 6 months and the sum score was also subsequently transformed as a dichotomous variable (no life event or exposed to recent life events).

Career dissatisfaction

Gaelic sports career dissatisfaction was explored through the validated Greenhaus scale (e.g. 'I am satisfied with the success I have achieved in my career') (five items on a 5-point scale).[30] A total score (5–25) was obtained by summing up the answers to the five items and this sum score was also subsequently transformed as a dichotomous variable: 5–12 as being dissatisfied with Gaelic sports career and 13–25 as being satisfied.[30]

Procedures

Based on the independent and dependent variables included in the study, a baseline and follow-up electronic anonymous English questionnaire was created (FluidSurveys™), including the following descriptive variables: age, height, mass, duration of Gaelic sports career, and dual career. Each questionnaire took about 15–20 min to complete. Information about the study was sent via email to potential participants by the GPA. Participants interested in the study, gave their informed consent and were given access to the baseline–online questionnaire which they were asked to complete within 2 weeks. After completion of the baseline questionnaire, participants could give their informed consent for the follow-up questionnaire and leave their email address. At 6-month follow-up, participants were invited by email to complete the second questionnaire within 2 weeks. Reminders at baseline and follow-up were sent after 2 and 4 weeks. The responses of the questionnaires were depersonalized for reasons of privacy and confidentiality. Once completed, the electronic questionnaires were saved automatically on a secured electronic server that only the principal investigator could access. Athletes participated voluntarily in the study and did not receive any reward for their participation.

Statistical methods

All data analyses were performed using the statistical software IBM SPSS Statistics 23.0 for Windows. Descriptive data analyses (mean, standard deviation, frequency, range) were performed with the descriptive and independent variables measured at baseline. To explore whether loss to follow-up was selective, we compared baseline characteristics (age, height, mass, duration of Gaelic sports career) of nonresponders and responders at follow-up by means of independent *T*-tests.[19]

The prevalence, comorbidity, and 6-month incidence of symptoms of CMD were calculated, using either the Wald method (prevalence: sample size of more than 150 persons) or the adjusted Wald method (incidence: sample size of 150 persons or less) for 95% confidence intervals (95% CI).[19] Prevalence (expressed as a percentage) was calculated as the proportion of the number of participants with a given symptom of CMD at baseline relative to the total number of participants at baseline.[19] Comorbidity (expressed as a percentage) of symptoms of CMD (two, three, or four symptoms) was calculated as the proportion of the number of participants with two, three, or four given symptoms of CMD at baseline relative to the total number of participants at baseline.[19] Incidence (expressed as a percentage) was calculated as the proportion of the number of participants with a newly given symptom of CMD during the 6-month follow-up relative to the total number of players without the given symptom of CMD at baseline.[19]

The relative risks (RR) and related 95% CI were calculated to explore the strength of the association between the onset of symptoms of CMD (dichotomous dependent variable) during the 6-month follow-up and potential baseline stressors: (1) severe musculoskeletal injuries (dichotomous independent variable), (2) surgeries (dichotomous independent variable), (3) recent life events (dichotomous independent variable), and (4) career dissatisfaction (dichotomous independent variable).[19]

Results

Participants

From the 650 members contacted for the study by the GPA (325 hurlers, 325 footballers), 204 (52% hurlers, 48% footballers) completed the baseline questionnaire and 446 did not respond to the invitation (response rate of 31%). From these 204 participants at baseline, 156 gave their written informed consent and their email addresses for the follow-up questionnaire. After the follow-up period of 6 months, a total of 108 players had completed the follow-up questionnaire (follow-up rate of 69%). The flowchart of the recruitment of the participants is presented in [Figure 1](#). The mean age of the 202 participants at baseline was 25 years old (SD = 4; range 18–39) and they had played in Gaelic sports for 5 years on average. Around 68% were having another job aside their Gaelic sports career. During their Gaelic sports career, 80% of the participants reported to have experienced one or more severe injuries and 67% have experienced one or more life events in the 6 months prior baseline measurement. At

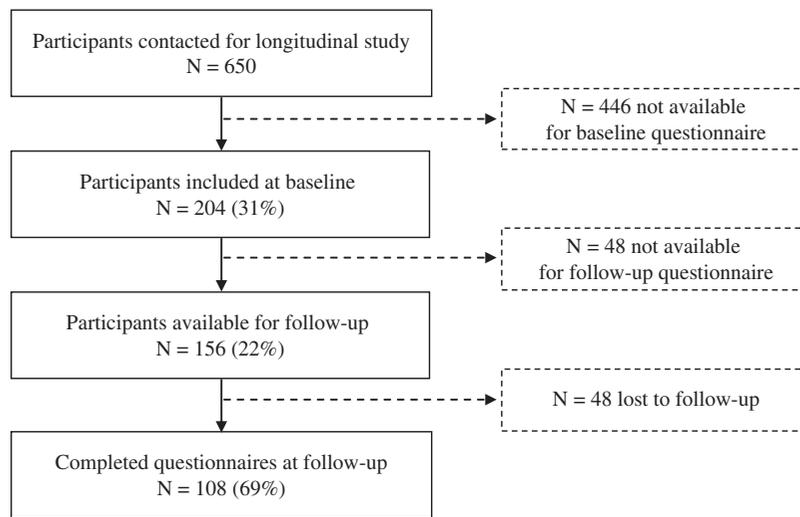


Figure 1. Flowchart of the recruitment and follow-up of elite Gaelic athletes.

Table 1. Characteristics and stressors at baseline among elite Gaelic athletes ($N = 204$).

Age (in years; mean \pm SD)	25 \pm 4
Height (in cm; mean \pm SD)	181 \pm 10
Mass (in kg; mean \pm SD)	83 \pm 9
Duration elite Gaelic sports career (in years; mean \pm SD)	5 \pm 4
Gaelic sport (%; hurlers/footballers)	51/49
Job aside Gaelic sports career (%)	68
Working hours per week (mean)	36
Severe musculoskeletal injuries (%)	
0 severe injury	20
1 or 2 severe injuries	43
3 or more severe injuries	37
Surgeries (%)	
0 surgery	57
1 or 2 surgeries	34
3 or more surgeries	9
Recent life events (%)	
0 life event	40
1 or 2 life events	46
3 or more life events	14
Dissatisfied with Gaelic sports career (%)	27

N: Number of participants; SD: standard deviation; cm: centimeters; kg: kilograms; %: percentage.

baseline, 27% of the participant reported to be dissatisfied about their Gaelic sports career. Baseline characteristics of the group of responders at follow-up were not statistically different ($p > 0.05$) than those from the group of participants lost to follow-up. Characteristics of the participants as well as the occurrence of stressors are presented in Table 1.

Prevalence, incidence, and comorbidity of symptoms of CMD

The prevalence of symptoms of CMD among elite Gaelic athletes ranged from 23% for adverse alcohol use to 48% for anxiety/depression. At baseline, around 24% of the elite Gaelic athletes reported two symptoms of CMD, 16% reported three symptoms of CMD, and almost 8% reported four symptoms of CMD. The incidence of symptoms of CMD among elite Gaelic athletes over the follow-up period of 6 months ranged from 11% for sleep disturbance to 21% for anxiety/depression.

Table 2. Prevalence (%), comorbidity (%), and 6-month incidence (%) of symptoms of common mental disorders among elite Gaelic athletes.

	<i>N</i>	Prevalence (95% CI)	<i>N</i>	Incidence (95% CI)
Distress	72/188	38.3 (31.4–45.3)	10/71	14.1 (7.6–24.2)
Anxiety/Depression	87/182	47.8 (40.6–55.1)	12/58	20.7 (12.1–33.4)
Sleep disturbance	62/188	33.0 (26.3–39.7)	8/72	11.1 (5.5–20.7)
Adverse alcohol use	41/177	23.2 (17.0–29.4)	14/80	17.5 (10.6–27.4)
Comorbidity				
2 symptoms of CMD	42/177	23.7 (17.5–30.0)		
3 symptoms of CMD	29/177	16.4 (10.9–21.8)		
4 symptoms of CMD	14/177	7.9 (3.9–11.9)		

N: Number of participants with a given symptom of CMD/total number of participants; %: percentage; CI: confidence of interval; CMD: common mental disorders.

The prevalence, comorbidity, and 6-month incidence (and related 95% CI) of symptoms of CMD are presented in Table 2.

Association between stressors and symptoms of CMD

Severe musculoskeletal injury, surgery, recent life events, and career dissatisfaction led to an increased risk for distress, anxiety/depression, sleep disturbance, and adverse alcohol use but these associations were not all statistically significant. All associations (RR) between stressors and symptoms of CMD are presented in Table 3.

Discussion

The main findings of our study were that: (1) prevalence of symptoms of CMD among elite Gaelic athletes ranged from 23% for adverse alcohol use to 48% for anxiety/depression; (2) comorbidity of two or more symptoms of CMD reached 48% among elite Gaelic athletes; (3) 6-month incidence of symptoms of CMD among elite Gaelic athletes ranged from 11% for sleep disturbance to 21% for anxiety/depression; and (4) elite Gaelic athletes who had sustained one or more severe musculoskeletal injury during their career were two to nearly four times more likely ($p < 0.05$) to report symptoms of distress, sleep disturbance, or adverse alcohol behavior than male

Table 3. Associations (relative risk and 95% CI) of severe musculoskeletal injuries, surgeries, recent life events, and career dissatisfaction with 6-month incidence of symptoms of common mental disorders among elite Gaelic athletes.

		Distress	Anxiety/Depression	Sleep disturbance	Adverse alcohol use
Severe injury	No	1.0	1.0	1.0	1.0
	≥1	3.4 (1.1–10.4)*	3.1 (1.2–8.2)*	1.1 (0.2–5.9)	1.7 (0.6–4.8)
Surgeries	No	1.0	1.0	1.0	1.0
	≥1	2.3 (0.5–10.1)	3.1 (0.7–12.7)	1.1 (0.3–4.3)	1.2 (0.4–3.3)
Recent life events	No	1.0	1.0	1.0	1.0
	≥1	2.1 (0.7–6.50)	1.0 (0.4–3.0)	2.6 (0.7–10.1)	1.2 (0.4–4.1)
Career Dissatisfaction	No	1.0	1.0	1.0	1.0
	Yes	5.8 (1.4–24.1)*	2.2 (0.5–10.6)	2.9 (0.6–13.9)	2.5 (0.7–8.8)

* $p < 0.05$.

professional footballers who had not suffered from severe musculoskeletal injuries during their career.

Perspective of our findings

To date, scientific knowledge about the extent of symptoms of CMD among elite Gaelic athletes remains lacking and thus, comparison with similar studies in this particular population cannot be made. In other sport disciplines, several studies have recently evaluated the mental health of elite athletes. In 2011, a cross-sectional study involving more than 2000 young and adult French elite athletes showed that 17% of them reported having encountered mental problems in the past.[7] Gulliver et al. [6] explored the prevalence of symptoms of general psychological distress and CMD among Australian elite athletes and reported that 45% experienced symptoms of at least one mental health problem like anxiety, depression, or distress.[6] The findings in this study are in line with the prevalence of symptoms of CMD we found in our study among elite Gaelic athletes but because of the use of different scales to measure dependent variables, valid comparisons remain difficult to make.

From 2013 to 2015, the World Players' Union (FIFPro) – representing more than 65,000 footballers worldwide – conducted both a cross-sectional and a longitudinal study about symptoms of CMD among around 750 professional footballers recruited in 17 countries.[9,10,31] Prevalence of symptoms of CMD among professional footballers were 10–15% for distress, 26–38% for anxiety/depression, 23% for sleep disturbance, and 9–19% for adverse alcohol use which is lower than the prevalence rates we found in our study among elite Gaelic athletes.[9,10] The 12-month incidence of symptoms of CMD among professional footballers ranged from 12% for distress to 37% for anxiety/depression.[31] The 6-month incidence in our study among elite Gaelic athletes was lower, which is not surprising because of the shorter follow-up period (6 vs. 12 months). *Ad-hoc* analysis of the time course of two or more symptoms of CMD at baseline showed that 58% persisted at 6-month follow-up. This addresses the issue of stability of symptoms of CMD in some elite Gaelic athletes.

Among other (general) populations using the same scales than ours, prevalence of anxiety/depression ranged from 13% to 19% in Australia (general population), from 17% to 21% in Denmark (practice population), and from 17% to 25% in the Netherlands (general and practice population, young male employees).[3,32,33] Prevalence of distress in both young

and older working populations was reported to range from 5% to 18%.[32] These lower percentages suggest that symptoms of CMD might be more prevalent among elite Gaelic athletes footballers than in these general populations.

In our study, the occurrence of stressors such as severe musculoskeletal injury, surgery, recent life events, and career dissatisfaction among elite Gaelic athletes led to an increased risk for symptoms of CMD. However, statistically associations were found only for severe musculoskeletal injury, career dissatisfaction, distress, and anxiety/depression: elite Gaelic athletes exposed to severe musculoskeletal injuries with an absence of more than 28 days were three times more likely ($p < 0.05$) to report distress and anxiety/depression than elite Gaelic athletes unexposed to these stressors. As suggested by other authors, we cannot exclude that the occurrence of musculoskeletal injuries could be explained by psychological factors such as somatic and psychic trait anxiety.[34,35] In our study, elite Gaelic athletes that were unsatisfied with their sport career were almost six times more likely to report distress than elite Gaelic athletes that were satisfied with their sport career. These associations with all stressors included in our study are in line with previous studies conducted among professional footballers.

Methodological considerations

Several limitations and strengths of the present study should be discussed. Enrolling participants, collecting follow-up data on every participant, and avoiding loss to follow-up remain challenging for all observational prospective studies. Despite the fact that elite Gaelic athletes were actively informed about the study and invited to participate by their GPA, a response rate of 31% was reached, which concurs with response rates obtained with professional footballers.[9,10] As the recruitment procedures were blinded to the researchers for privacy and confidentiality reasons, nonresponse analysis could not be performed. After the follow-up period of 6 months, a follow-up rate of 69% was secured. In survey research, epidemiologists have suggested several acceptable follow-up rates, from 50% as adequate to 70% as very good or 80% as required.[36] Consequently, the 69% follow-up rate in our study seems to be acceptable. In addition, baseline characteristics from the group of responders at follow-up did not differ from the group of participants lost to follow-up.

Our outcome measures were assessed with validated scales relying on a recall period from 1 to 6 months. At follow-up, information about the mental health status of the participants

was retrieved over the previous 6 months, while a monthly survey over 6 months might potentially have generated more valid data. In addition, the retrospective recall of feelings or unpleasant experiences such as severe musculoskeletal injury, surgery, or life events might be questionable. Denial and repression are well known as defense mechanism for influencing retrospective recall: denial refers to the deny of admitting that something unpleasant has occurred, while repression acts to keep information out of conscious awareness.[37] As severe injuries have been seen as life events for any athlete, we believe that professional that is elite athletes can remember quite precisely the number of severe musculoskeletal injuries or surgeries they suffered.[29] Consequently, one might assume that participants were able to recall all the severe injuries or surgeries during their sport career.

A last potential limitation worth mentioning is the assessment of our outcome measures through self-report. We are well aware that a clinical instrument offers a more valid diagnostic to a given pathology. However, the choice for self-reported instruments to assess symptoms of CMD remains the most feasible one in a population of professional that is elite athletes. In addition, validated instruments that reflect the patient's perspective about their health status – Patient Reported Outcome Measures – are known to assess the aspects that matter most to patients and to enable important clinical questions to be answered.[38]

The principal strengths of our study are the longitudinal design, the relative large cohort of elite athletes being investigated, and the first evaluation of the occurrence of CMD in this unique cohort. In elite Gaelic football and hurling (as in other professional sports), symptoms of CMD remain a kind of taboo and difficult to investigate. In our study, we secured the participation of more than 200 elite Gaelic athletes, which is a representative sample as indicated by our preliminary sample size calculation. The prospective cohort study allows the establishment of a causal relationship between stressors and the outcome measures under study.[19]

Practical implications

In contrast to physical health, mental health still remains a taboo subject among athletes.[5] This study should contribute to raising the self-awareness of all stakeholders in elite Gaelic football and hurling but also in professional that is elite sports. Providing members of the GPA with thorough information about CMD should be seen as a minimum standard. Also, a previous qualitative study among young elite athletes has indicated that stigma and the lack of mental health literacy about CMD were the most important perceived barriers to seeking help for CMD. Consequently, raising the self-awareness about CMD that might occur during the career of elite Gaelic athletes should be empowered.[39]

Gathering scientific evidence about the extent of mental health problems and its associated risk factors are crucial steps before proposing adequate preventive and supportive measures aiming to protect athlete's health and safety.[40] Based among others on the information collected through our empirical research, early identification of Gaelic athletes at risk for symptoms of CMD might be feasible, as well as the

early application of supportive measures. Especially internet-based interventions relying on a self-management approach seem to be relevant in professional that is elite sports: online interventions that can facilitate mental health help-seeking showed promise for decreasing stigma for CMD among elite athletes and for increasing their knowledge of these health conditions.[41] Such a self-management approach could enable athletes to engage activities that protect and promote their mental health and to monitor and manage their symptoms of CMD and their impacts on functioning, emotions, and interpersonal relationships.[42] With regard to the association of severe musculoskeletal injuries and surgeries with symptoms of CMD, a multidisciplinary approach is justified for the medical care and support of elite Gaelic athletes. After severe injury and/or surgery, the medical team of the athlete should be aware of the potential occurrence of symptoms of CMD and properly prepared for any treatment.

Conclusions

A relative high prevalence and incidence of symptoms of CMD was found among elite Gaelic athletes. The occurrence of symptoms of CMD was associated with severe musculoskeletal injuries, surgeries, recent life events, and sport career dissatisfaction. Raising the self-awareness of all stakeholders in Gaelic football and hurling about CMD should be prioritized, as well as the evidence-based development and application of adequate preventive and supportive measures aiming to protect athlete's mental health and empower their quality of life.

Acknowledgement

The authors would like to thank the Gaelic Players' Association (GPA) for their support in the study. We are grateful to all the elite Gaelic athletes who participated in the study.

Declaration of interests

The authors have no relevant affiliations or financial involvement with any organization or entity with a financial interest in or financial conflict with the subject matter or materials discussed in the manuscript. This includes employment, consultancies, honoraria, stock ownership or options, expert testimony, grants or patents received or pending, or royalties.

References

1. American Psychiatric Association. Diagnostic and statistical manual of mental disorders. 5th ed. Washington (DC): American Psychiatric Press; 2013.
2. King M, Nazareth I, Levy G, et al. Prevalence of common mental disorders in general practice attendees across Europe. *Br J Psychiatry*. 2008;192:362–367.
3. Korten A, Henderson S. The Australian national survey of mental health and well-being. *Br J Psychiatry*. 2000;177:325–330.
4. Krueger RF, Caspi A, Moffitt TE, et al. The structure and stability of common mental disorders (DSM-III-R): a longitudinal – epidemiological study. *J Abnorm Psychol*. 1998;107:216–227.
5. Bauman NJ. The stigma of mental health in athletes: are mental toughness and mental health seen as contradictory in elite sport? *Br J Sports Med*. 2015. doi:10.1136/bjsports-2015-095570.
6. Gulliver A, Griffiths KM, Mackinnon A, et al. The mental health of Australian elite athletes. *J Sci Med Sport*. 2015;18:255–261.

7. Schaal K, Tafflet M, Nassif H, et al. Psychological balance in high level athletes: gender-based differences and sport-specific patterns. *PLoS One*. 2011;6:e19007.
8. Gouttebauge V, Aoki H, Ekstrand J, et al. Are severe joint and muscle injuries related to symptoms of common mental disorders among male European professional footballers? *Knee Surg Sports Traumatol Arthrosc*. 2015 Aug 2. doi:10.1007/s00167-015-3729-y.
9. Gouttebauge V, Aoki H, Kerkhoffs G. Symptoms of common mental disorders in male professional footballers – prevalence and determinants. *J Hum Kinet*. 2015;49:277–286.
10. Gouttebauge V, Frings-Dresen MHW, Sluiter JK. Mental and psychosocial health among current and former professional footballers. *Occup Med*. 2015;65:190–196.
11. McIntyre MC. A comparison of the physiological profiles of elite gaelic footballers, hurlers, and soccer players. *Br J Sports Med*. 2005;39:437–439.
12. Blake C, O'Malley E, Gissane C, et al. Epidemiology of injuries in hurling: a prospective study 2007–2011. *BMJ Open*. 2014;4:e005059.
13. Murphy JC, Gissane C, Blake C. Injury in elite county-level hurling: a prospective study. *Br J Sports Med*. 2012;46:138–142.
14. Murphy JC, O'Malley E, Gissane C, et al. Incidence of injury in Gaelic football: a 4-year prospective study. *Am J Sports Med*. 2012;40:2113–2120.
15. Wilson F, Caffrey S, King E, et al. A 6-month prospective study of injury in Gaelic football. *Br J Sports Med*. 2007;41:317–321.
16. Arnold R, Fletcher D. A research synthesis and taxonomic classification of the organizational stressors encountered by sport performers. *J Sport Exerc Psychol*. 2012;34:397–429.
17. Vandembroucke JP, von Elm E, Altman DG, et al. Strengthening the reporting of observational studies in epidemiology (STROBE). *Epidemiology*. 2007;18:805–835.
18. World Medical Association. World Medical Association declaration of Helsinki: ethical principles for medical research involving human subjects. *JAMA*. 2013;310:191–194.
19. Woodward M. *Epidemiology: study design and data analysis*. Boca Raton (FL): CRC Press; 2013.
20. Braam C, van Oostrom SH, Terluin B, et al. Validation of a distress screener. *J Occup Rehab*. 2009;19:231–237.
21. Terluin B, Van Marwijk HWJ, Adèr HJ, et al. The four-dimensional symptom questionnaire (4DSQ): a validation study of a multidimensional self-report questionnaire to assess distress, depression, anxiety and somatization. *BMC Psychiatry*. 2006;6:34.
22. Goldberg DP, Gater R, Sartorius N, et al. The validity of two versions of the GHQ in the WHO study of mental illness in general health care. *Psychol Med*. 1997;27:191–197.
23. Salama-Younes M, Montazeri A, Ismail A, et al. Factor structure and internal consistency of the 12-item general health questionnaire (GHQ-12) and the subjective vitality scale (VS), and the relationship between them: a study from France. *Health Qual Life Outcomes*. 2009;7:22.
24. Buysse DJ, Yu L, Moul DE, et al. Development and validation of patient-reported outcome measures for sleep disturbance and sleep-related impairments. *Sleep*. 2010;33:781–792.
25. Yu L, Buysse DJ, Germain A, et al. Development of short forms from the PROMIS sleep disturbance and sleep-related impairment item banks. *Behav Sleep Med*. 2011;28:6–24.
26. Dawson DA, Grant BF, Stinson FS, et al. Effectiveness of the derived alcohol use disorders identification test (AUDIT-C) in screening for alcohol use disorders and risk drinking in the general population. *Alcohol Clin Exp Res*. 2005;29:844–854.
27. De Menezes-Gaya C, Waldo Zuardi A, Loureiro SR, et al. Alcohol use disorders identification test (AUDIT): an updated systematic review of psychometric properties. *Psychol Neurosci*. 2009;2:83–97.
28. Fuller CW, Ekstrand J, Junge A, et al. Consensus statement on injury definitions and data collection procedures in studies of football (soccer) injuries. *Br J Sports Med*. 2006;40:193–201.
29. Bramwell ST, Masuda M, Wagner NN, et al. Psychosocial factors in athletic injuries: development and application of the social and athletic readjustment rating scale (SARRS). *J Hum Stress*. 1975;1:6–20.
30. Greenhaus JH, Parasuraman S, Wormley WM. Effects of race on organizational experiences, job performance evaluations, and career outcomes. *Acad Manage J*. 1990;33:64–86.
31. Gouttebauge V, Aoki H, Verhagen E, et al. A twelve-months prospective cohort study of symptoms of common mental disorders among European professional footballers. *Clin Journal Sport Med*. Forthcoming 2016.
32. Bültmann U, Kant I, Kasl SV. Fatigue and psychological distress in the working population psychometrics, prevalence, and correlates. *J Psychosom Res*. 2002;52:445–452.
33. Verhaak PF, Hoeymans N, Garssen AA, et al. Mental health in the Dutch population and in general practice: 1987–2001. *Br J Gen Pract*. 2005;59:770–775.
34. Johnson U, Ivarsson A. Psychological predictors of sport injuries among junior soccer players. *Scand J Med Sci Sports*. 2011;21:129–136.
35. Ivarsson A, Johnson U, Podlog L. Psychological predictors of injury occurrence: a prospective investigation of professional Swedish soccer players. *J Sport Rehabil*. 2013;22:19–26.
36. Kristman V, Manno M, Côté P. Loss to follow-up in cohort studies: how much is too much? *Eur J Epidemiol*. 2004;19:751–760.
37. Jacobson E. Denial and repression. *J Am Psycho Assoc*. 1957;5:61–92.
38. Davis JC, Bryan S. Patient reported outcome measures (PROMs) have arrived in sports and exercise medicine: why do they matter? *Br J Sports Med*. 2015;49:1545–1546.
39. Gulliver A, Griffiths KM, Christensen H. Barriers and facilitators to mental health help-seeking for young elite athletes: a qualitative study. *BMC Psychiatry*. 2012;12:157.
40. Van Mechelen W, Hlobil H, Kemper H. Incidence, severity, etiology and prevention of sports injuries. *Sports Med*. 1992;14:82–99.
41. Gulliver A, Griffiths KM, Christensen H, et al. Internet-based interventions to promote mental health help-seeking in elite athletes: an exploratory randomized controlled trial. *J Med Internet Res*. 2012;14:e69.
42. Barlow J, Wright C, Sheasby J, et al. Self-management approaches for people with chronic conditions: a review. *Patient Educ Couns*. 2002;48:177–187.