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Mindfulness traits as potential inhibitor of irrational performance beliefs and intolerance of uncertainty amongst elite female basketball players

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Abstract Dispositional mindfulness promotes adaptive responses to pressure situations and reduce anxiety and emotional distress, which are common manifestations in sport. The aim of this study was to investigate the role of mindfulness characteristics in the display of irrational performance beliefs and intolerance of uncertainty amongst a sample of elite female basketball players ($N = 67$, $M_{age} = 25.73$ years, $SD = 4.4$). An online Qualtrics survey containing demographic items, the Mindfulness Attention Awareness Scale, Irrational Performance Beliefs Inventory, and Intolerance of Uncertainty Scale was used to collect the study data, which were analysed using SPSS. The results from both Pearson correlation coefficient and simple linear regression analyses indicated that higher levels of dispositional mindfulness are significantly related to elite female basketball players having fewer irrational beliefs about their performance and being more tolerant of uncertain situations in their sport. One-way analysis of variance further indicated a significant difference between low, average, and high mindfulness groups, with Tukey's post-hoc analyses confirming that participants with high mindfulness displayed significantly fewer rigid, extreme, self-defeating performance beliefs in sport, and were less prone to impulsive reactions to uncertain circumstances compared to participants with low mindfulness. Sport psychology practitioners are encouraged to consider the integration of mindfulness assessment and training protocols with traditional cognitive behaviour modification approaches to counter female basketball players' display of distorted beliefs in sport and adverse reactions to ambiguous experiences.

Introduction

Mindfulness is regarded as a quality that permits the self-regulation of attentional awareness to present-moment experiences in a non-judgmental and accepting manner.[1] The literature on mindfulness has grown exponentially over

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the years, which led Western conceptualisations to draw a clear distinction between dispositional mindfulness (DM) and state mindfulness (i.e., a momentary condition). Contrary to transient mindfulness states, DM depicts the inherent capacity and tendency (cognition, emotion, or behavioural) to purposefully attend to present-moment experiences in a non-reactive and unbiased manner,[2] which most people exhibit to a certain extent.[3] However, evidence indicates large inter-and intraindividual variability in peoples' mindfulness capabilities (i.e., frequency and quality of this capacity)[4] as the degree of DM is influenced by informal practice (e.g., performing regular activities mindfully), genetic, and developmental differences.[5] Notwithstanding individual differences in mindfulness proficiencies, the ability to invoke mindfulness seemingly can be developed through various meditation practices that originate from ancient Buddhist traditions such as Vipassana or 'insight' meditation, which involves the intentional focusing of one's attention on the breath while merely observing arising thoughts, sensations, or feelings.[6]

In sport, mindfulness interventions are effectively utilised to improve sustained and selective attention,[7] attenuate mental fatigue,[8] combat athlete burnout,[9] and choking under pressure.[10] Methodical approaches such as the Mindfulness Acceptance Commitment-based approach or Mindful Sports Performance Enhancement are also used to promote flow states[11] and to cultivate a sense of well-being and thriving.[12,13] The use of mindfulness interventions to improve athletes' cognitive functioning (reaction time) is also noted in literature.[14] The usefulness of mindfulness practices in sport can be explicated from integrative and neurobiological perspectives grounded on improvements in individuals' orientation relating to intentions, attention regulation, emotion regulation, reconsolidation, pro-sociality, non-attachment, and decentring. For instance, Vago and Silbersweig's[15] S-ART framework (*Self*-awareness, -regulation, & -transcendence) infers that systematic mindfulness practice cultivates meta-awareness (self-awareness) that promotes one's ability to alter responses and impulses (self-regulation). This in turn enables a transcendence of self-focused needs or personal biases that paves the way for pro-social behaviours (self-transcendence). Indeed, Birrer and colleagues[5] substantiate that mindfulness qualities permit a present-moment focus, non-attachment, and less rumination that facilitate performance, personal development/communication, psychological adjustment and coping with setbacks in sport. Linking up with this, Tingaz[16] confirms that the mindfulness dimension of having a non-judging awareness of present moment experiences mediates the influence cognitive flexibility has on student athletes' exhibition of more rational beliefs in sport.

Despite mindfulness being positively coupled to athletes' emotional regulation,[17] gratitude and life satisfaction,[18] research aligning mindfulness qualities to causal mechanisms of psychological distress and anxiety such as irrational performance beliefs (IPBs) and intolerance of uncertainty (IU) in elite level sport are yet to be expounded. The latter concepts have gained increasing attention in sport in recent years because of its debilitating effect on mental well-being.[19,20] In this respect, IPBs are characterised as rigid, absolutistic, extreme, and unrealistic views about one's performance that cause unhealthy feelings and maladaptive behaviours such as depression and worthlessness.[21] For example, "I want to be successful and, therefore, I must perform well, otherwise I'm a failure,".[22] On the contrary, "I truly wish to succeed and gain approval, if I don't, then I'll could try harder," is an example of 'healthier' and more rational feelings of disappointment that could be helpful in propelling athletes' efforts towards succeeding.[23]

The premise of rational vs. irrational beliefs about an activating event and the resultant emotional response of a person lies at the heart of Albert Ellis's Rational Emotive Behaviour Therapy (REBT). Ellis[24] concedes that it is not activating events that cause a person's anguish, but the constructed view the person takes about the activating events. Ellis adds that irrational beliefs characterised by demandingness (primary irrational belief) and awfulizing, low frustration tolerance, and self/other depreciation (three secondary beliefs) are the root cause of people's suffering and maladaptive responses.[24] REBT practitioners, therefore, aim to dispute, challenge, and alter clients' illogical beliefs for more rational beliefs that would promote adaptive responses to activating events. In sport, IPBs are noted to contribute to the perception of threat during competition,[25] performance deterioration,[21] burnout,[26] mental and physical ill-health.[27]

IU refers to a person's dispositional tendency to hold a negative set of beliefs about uncertain situations and its implications that result in an encompassing dysfunctional response.[28] IU consists of two dimensions, namely prospective IU (adverse cognitions & emotions about anticipated uncertainty) and inhibitory IU (behavioural paralysis & avoidance in response to uncertainty).[29] Though uncertainty is a regular occurrence of everyday life, people with an elevated level of IU are predisposed to suffer from an intensified degree of panic, anxiety, distress, and obsessive-compulsive inclinations.[30,31] Uncertainty about performance outcomes that could potentially include failure, injury, aggression, victimisation, or deselection are customary in sport and can serve as a strong precursor to participants' challenge and threat perceptions.[32] This notion is buttressed by The Theory of Challenge or Threat States in Athletes, which explains that distress in performance situations is likely to emanate from uncertainty (demand appraisal) that is accompanied by a sense of incongruency (primary appraisal) and perceived lack of personal resources.[33]

Given the rising concerns over mental health in sport, rationalised approaches within the broader cognitive behaviour therapy frameworks such as REBT,[34] acceptance commitment therapy,[35] and cognitive therapy[36] are progressively adopted in contemporary sport psychology practice. However, to certain extents, these approaches incorporate acceptance commitment principles and exposure training that are prominent features of mindfulness.[37] Despite the overlapping features in these distinct approaches, links between cognitive mechanisms and inherent qualities in the form of dispositional mindfulness, IPBs, and IU are yet to be confirmed in sport, especially in a concentrated team sport context such as in elite-level basketball.

Playing basketball professionally entails several factors that can contribute to heightened levels of uncertainty, which could prompt the onset of psychological distress and maladaptive behaviour. For example, uncertainty about the renewal of one's contract, taking up a contract in a foreign

country with different customs, team selection, the coach's philosophy, and expectations et cetera. Nevertheless, recent evidence suggests that the COVID-19 pandemic has negatively affected female professional athletes disproportionately more than their male counterparts in terms of changes to training regimes, limiting career prospects (i.e., shorter or no availability of contracts), and lack of financial compensation.[38] This notion is substantiated by the qualitative views obtained from elite female athletes regarding the state of women's sports pre-and post the COVID-19 pandemic, which further highlight the ongoing presence of structural and symbolic inequalities between male and female sports.[39]

Consequently, female athletes are in general noted to be more susceptible to increased anxiety, mental ill-health,[40] and irrational mindsets in comparison to their male equivalents,[19] with emerging findings suggesting promising receptivity amongst players for the use of mindfulness and acceptance-based interventions in a basketball context.[41]

Based on the latter findings and the plea for more research findings on homogenous and sport-specific samples that would benefit practitioners and other role players in similar contexts,[42] this study aims to address the following research question: What role does dispositional mindfulness qualities (DM) play in elite-level female basketball players' display of IPBs and IU? It is hypothesised that i) DM will inversely relate to female basketball players' IPBs and IU, and ii) players scoring high in DM will exhibit significantly lower levels of IPBs and IU than players scoring low in DM.

Confirming the utility of DM as potential inhibitor of IPBs and IU could broaden understanding on the relevance of mindfulness assessment and training in women's basketball to cultivate enduring qualities that can act as a buffer against causal mechanisms of distress and other prevailing mental health issues. More specifically, verifying mindfulness traits as potential inhibitor of IPBs and IU in elite-level basketball would augment current views on the utility of mindfulness and acceptance-based interventions as a viable means to alleviate primary determinants of mental ill-health in sport.[13] Findings might also increase impetus amongst sport psychology practitioners to consider Ellis's[43] call for more integrative approaches (e.g., mindfulness-based cognitive therapy) when dealing with clients' maladaptive tendencies that negatively impact on their mental health.

Methods

Design and procedures

A cross-section correlational research design was adopted whereby a study participation invitation containing a link to an online Qualtrics survey was distributed electronically to a convenient sample of female basketball players via social media messaging during tournaments. Coaches and team managers were also requested to share the study invitation with elite-level basketball players in their respective squads and social groups (snowball sampling). The web link to the survey opened with an information sheet that outlined the nature and requirements of the study. The participants' anonymity and confidentiality were ensured whereafter they had to provide informed consent agreeing their voluntary and non-remunerated participation to access to the survey items. Ethics approval for this investigation was obtained from *University's research ethics approval system (Ref: 29359).

Participants

An international sample of sixty-seven elite female basketball players aged between 18 and 36 years participated in this study. The term 'elite' in this study represents senior level basketball players competing at a semi-/professional level. The participants hailed from Canada (7.5 %), France (7.5 %), Germany (44.8 %), Luxembourg (1.5 %), Poland (1.5 %), Spain (3 %), Sweden (13.4 %), Switzerland (1.5 %), UK (16.5 %) and the US (1.5 %) of which the majority played basketball professionally (67.2 %) with 2–4 years' experience competing at a national team level (22.4 %). Table 1 below presents a summary of the participants' demographics and sport-related characteristics.

Measures

The online survey prompted participants' demographic information and responses to:

The Mindfulness Attention Awareness Scale (MAAS)[44] is a 15-item questionnaire that assess core characteristics of dispositional mindfulness namely attention to, awareness of, and day-to-day experiences on a 6-point Likert-scale ranging from "almost always" (1) to "almost never" (6). Responses to the items of this scale are summated into a total score with a higher score reflecting greater mindfulness tendencies (total scores can range from 15 to 90). Example items from the MAAS are: "I could be experiencing some emotion and not be conscious of it until sometime later," "I forget a person's name almost as soon as I've been told it for the first time." Brown and Ryan[44] have revealed good internal consistency ($\alpha \geq 0.82$) as well as a good 4-week test–retest reliability (interclass $r = 0.81$) for the MAAS, which has been widely utilised in research on different athlete samples.[45]

Table 1 Sample demographics and sport-related characteristics.

Demographic information		Female basketball players
Mean age in years (*SD*)		25.73 (*SD* = 4.4)
Status	Professional	67.2 %
	Semi-professional	32.8 %
Years' experience at current level	0–1 year	11.9 %
	2–4 years	38.8 %
	5–7 years	23.9 %
	8+ years	25.4 %
Years competing at National team level	No experience	44.8 %
	1 year	1.5 %
	2–4 years	22.4 %
	5–7 years	11.9 %
	+8 years	19.4 %

The sport version of the Irrational Performance Beliefs Inventory (iPBI)[46] contains 20 items that are rated on a 5-point-Likert-scale from "strongly disagree" (1) to "strongly agree" (5). The higher a participant scores on this scale, the higher this individual's tendency for practicing irrational beliefs pertaining to performance in sports (total scores can range from 20 to 100). According to the authors, the iPBI enables the measurement of four core irrational beliefs as proposed by REBT.[24] While the factor 'demands' (PIB) describes the tendency to demand success, fair treatment, and respect (e.g., "I have to be respected by the members of my team"), 'awfulizing' (AWF) is characterized by the tendency to consider adverse events as awful or terrible (e.g., "It would be awful if my position in my team was not secure"). The factor 'Low frustration tolerance' (LFT) measures the belief that one could not stand or tolerate adversity (e.g., "I can't stand not reaching my goals"), whereas 'depreciation' (DEP) describes the belief that one event reflects the person as a whole (e.g., "If I face setbacks it goes to show how stupid I am"). The four subscales demonstrated good internal consistency with Cronbach alpha values ranging from 0.79 (*PIB*) to 0.87 (*DEP*).[46]

The Intolerance of Uncertainty Scale (IUS)[47] includes 27 items relating to the idea that uncertainty is unacceptable and reflects badly on a person, leading to frustration, stress, and the inability to act.[28] Participants report their responses to items on a 5-point Likert-scale that range from "not at all characteristic of me" (1) to "entirely characteristic of me" (5). A higher mean score suggests a higher intolerance of uncertainty (total scores can range from 27 to 135). Example items of the statements describing how people may react to the uncertainties of life are "Being uncertain means that I lack confidence," "I always want to know what the future has in store for me." The English version of the IUS revealed excellent internal consistency ($\alpha = 0.94$) with a re-test reliability of $r = 0.74$ after 5 weeks[28] and has been utilised in research on athlete samples.[20,48]

Data analyses

Upon inspection, 15 participants' data showed a survey completion rate of below 90 % and were consequently removed from further analyse. A priori G*Power calculation (with a medium effect size of $f^2 = 0.15$, an alpha of 0.05, a power of 80 %, and 1 predictor) indicated that our remaining sample size of 67 exceeded the minimum required sample ($N = 55$) by 12.18 %. Guided by the conceptions of Lakens,[49] we have chosen a medium effect size for power calculation due to the novelty of this study topic (uncertainty over the true effect size), limited resources available to recruit a large sample of elite-level female basketball players during the COVID-19 pandemic, and potential to detect both smaller and larger effect that allows for sensitivity analysis to further explore the robustness of the study findings to different effect sizes. Using SPSS version 26, missing data analyses (Little's MCAR test) revealed that the values missing (<1 %) on the IUS ($\chi^2 = 50.26$, $df = 52$, $p > .05$) and iPBI ($\chi^2 = 62.57$, $df = 52$, $p > .05$) appeared to be missing at random. The missing values were replaced using the expectation maximisation function in SPSS, which is a recommended method when missing data is low and there are no significant patterns in missingness.[50] In addition to this, values that were identified as extreme outliers (<1 %) through boxplots and *Z*-scores (greater than ± 3.29) were subjected to 'winsorization'.[51] Further analysis revealed the data to be normally distributed (Shapiro–Wilk values >0.05). McDonald's omega (ω) values suggested that the employed scales yielded adequate/good internal consistency reliability in the current sample with scores ranging between 0.80 and 0.93 in the current sample except for the 'demands' and 'awfulizing' subscales of the iPBI, which revealed a low internal reliability value (0.48 & 0.65 respectively). While the internal consistency of these two sub-scales were lower than desired, previous research has shown that the sub-scale has good construct validity and is useful for measuring the construct of interest.[46] For this reason, these two sub-scales were included for further analyses to build on previous research[16] and provide a more nuanced understanding of the interaction with players' MAAS and IU in the context of elite-level women's basketball. A Pearson correlation co-efficient analysis was then performed to identify associations between the variables. After confirming the required assumptions for a linear regression model, the influence of DM on composite IPBs and IU scores were computed. To further test the potential contribution of DM, we then split the participants into an equal representation of low, moderate, and high mindfulness groups that allowed for one-way ANOVA analyses to detect any differences in the groups' levels of IPBs and IU.

Results

The participants reported a modest level of DM ($M = 56.45$, $SD = 10.98$) while exhibiting a fair amount of IPBs in sport ($M = 70.15$, $SD = 9.59$) and IU ($M = 61.85$, $SD = 15.32$) (Note that a moderate range = 48–66 for total DM, 46–75 for total IPBs, & 54–80 for total IU). Low frustration tolerance ($M = 20.42$, $SD = +2.51$) was the highest reported subscale on the iPBI (Table 2).

Correlation co-efficient results (Table 2) revealed significant inverse associations between DM and players' IPBs ($r = -0.31$, $p < .05$) and IU ($r = -0.55$, $p < .01$) scores, while their IU and IPBs were positively associated ($r = 0.35$, $p < .01$). Out of the four iPBI subscales, only awfulizing ($r = -0.32$, $p < .01$) and depreciation ($r = -0.41$, $p < .01$) ended up being significantly and negatively associated with DM. The noted significant associations had an effect size ranging from medium (0.3) to large (>0.5). Significant positive associations were observed between the four different iPBI subscales. Simple linear regression analyses exposed DM to be a significant negative predictor (F (1, 65) = 6.760, $p = .012$) of participants' exhibition of IPBs ($\beta = -0.307$, $p = .012$) that accounted for 9.4 % of variance in this variable. DM also revealed to be a significant negative predictor F (1, 65) = 28.232, $p < .001$) of participants' display of IU ($\beta = -0.550$, $p < .001$) that accounted for 30.3 % of the variance in this variable (Table 3).

Finally, one-way ANOVA analyses indicated a significant difference in IPBs (F (2,60) = 3.77, $p = .029$) and IU (F (2,60) = 7.18, $p = .002$) scores between low, average, and high mindfulness groups. With the variables meeting the assumption of equal variance, Tukey's post-hoc analyses confirmed that participants high in DM had significantly lower IPBs ($M = 65.89$, $SD = 8.76$) and IU ($M = 53.58$,

Table 2 Descriptive statistics and correlation between variables.

					Pearson's *r*						
Variable	Min	Max	Mean	SD	1	2	3	4	5	6	7
Total DM	30	79	56.45	10.98	–						
Total IPBs	48	91	70.15	9.54	−0.31*	–					
Demands	13	25	19.15	2.39	−0.13	0.78**	–				
Low frustration tolerance	14	25	20.42	2.51	−0.01	0.74**	0.54**	–			
Awfulizing	11	24	17.85	2.99	−0.32**	0.84**	0.60**	0.46**	–		
Depreciation	6	22	12.76	3.89	−0.41**	0.84**	0.49**	0.45**	0.60**	–	
Total IU	31	93	61.85	15.32	−0.55**	0.35**	0.03	0.08	0.37**	0.51**	–

* $p < .05$
** $p < .01$.

Table 3 Simple linear regression results.

Model	ß	R^2	ΔR^2	*t*	*F*
1	−0.307	0.094	0.080	−2.600	6.760*
2	−0.550	0.303	0.292	−5.313	28.232**

In Model 1, dispositional mindfulness was entered to predict irrational performance beliefs. In Model 2, dispositional mindfulness was entered to predict intolerance of uncertainty.
* $p < .05$.
** $p < .01$.

Table 4 One-way ANOVA results.

					Test of homogeneity of variances		ANOVA	
	DM groups	*N*	*Mean*	*SD*	Levene's statistic	Sig.	F	Sig.
IPBs	High	23	65.89	8.76	1.40	0.25	3.77	0.029
	Average	21	69.48	6.86				
	Low	19	73.48	10.62				
IU	High	23	53.58	12.46	1.47	0.24	7.18	0.002
	Average	21	60.86	16.71				
	Low	19	70.30	13.47				

	Group differences			
	DM groups	*Mean* difference	Sig.	95 % Confidence interval [LL−UL]
IPBs	High−Low	−7.58	0.02	−14.25−0.92
IU	High−Low	−16.73	0.01	−27.42−6.03

SD = 12.46) scores in comparison to participants with low DM (IPBs: *M* = 73.48, *SD* = 10.62; IU: *M* = 70.30, *SD* = 13.47). Omega squared analyses confirmed that the effect size of the differences noted between the high and low DM groups were small ($\omega^2 = 0.03$) for IPBs and medium ($\omega^2 = 0.08$) for IU scores (Table 4).

Discussion

IPBs along with the IU are a common occurrence in sport that have prompted more intensified therapeutic efforts by practitioners to address the rising concern of mental ill-health in sport.[20] Evidence in clinical practices underscores mindfulness interventions as an efficacious approach to promote awareness and behavioural orientation that permit skilful regulation of mental processes responsible for emotional distress and maladaptive behaviour.[52] Therefore, this study set out to examine the role of DM in relation to the occurrence of IPBs and IU within an elite-level female basketball context. Results support our hypotheses, showing that higher levels of DM are significantly related to elite female basketball players having fewer irrational beliefs about their performance in sport and being more tolerant of negative thoughts and emotions brought on by uncertain circumstances (*H1*: DM will be significantly and inversely related to

female basketball players' IPBs and IU). Not only did our findings further confirm the suppressing influence of DM on the latter variables, but players scoring high in DM also held significantly lower IPBs and IU scores in comparison to players low in DM (*H2*). Overall, these results suggest that players who possess a higher level of trait mindfulness are less inclined to adopt rigid, illogical, and extreme performance beliefs and potentially be more tolerant of uncertain situations in their sport.

This is not surprising as mindfulness is underpinned by a non-judging, non-reactive, and accepting present moment awareness[2] that enables athletes to label internal experiences (cognitions, emotions) more accurately. This in turn permits a more realistic and logical discernment of reality, which minimise the attachment to rigid, extreme, self-defeating beliefs in sport, or impulsive reactions to uncertain circumstances. Concluded from a systematic review of research on mindfulness in sport and physical activity, Rivera et al.[53] confirm that mindfulness cultivates awareness that increases the capacity for improved emotional regulation and thinking patterns, which combat the prevalence of negative mindsets and emotional dysfunction. Respectively, Birrer and colleagues[5] affirm this notion acknowledging that the attitudinal features of mindfulness increase experiential approval that decreases the impact of ironic mental processes (i.e., incessant need to control thoughts or emotions) and adverse cognitions. The awareness facet of mindfulness also paves the way for values clarification that enables athletes to identify incongruences between their personal values and aspirations, which impart a state of self-concordance.[5] Self-concordance denotes a sense of "owning" one's personal goals/striving (instead of "having to" or "must" gain something), which has been linked to more adaptive states and subjective well-being.[54] This is noteworthy, since dysfunctional thought processes and emotions can inadvertently be adopted by elite-level athletes with the ubiquity of 'win-at-all-costs' mantras in a performance-driven environment that are often perpetuated by fans, coaches, sponsors, and fellow athletes.[19]

Interestingly, apart from the total IPBs score, only two secondary irrational beliefs (namely 'awfulizing' & 'depreciation') on the respective scale were significantly and inversely related to DM, whereas 'low frustration tolerance' and 'demands' (primary believe) remained statistically insignificant. This finding can be explained based on the observation that secondary irrational beliefs may potentially offer more proximal causes for maladaptive emotions in sport.[19] This idea links up with Mansell's[25] findings that highlighted the secondary beliefs of 'awfulizing' and 'self-depreciation' as significant correlates of stress states in competition amongst international level athletes. It is also worthy to note that certain IPBs in sport can be used to ignite functional emotional responses that encourage goal-attainment and performance.[27,55] Hence, it can be assumed that players high in DM are able to separate and self-regulate debilitating irrational beliefs while capitalising on other extreme beliefs that potentially propel them towards goal attainment in their sport such as 'demandingness' and 'low frustration tolerance.'

Nevertheless, elite-level athletes are often embattled with uncertainty elicited by opponent's ability and appearance, one's risk of aggravating an old injury or ability to recover after injury, performance outcomes, selection, public scrutiny et cetera.[56] Still, the attitudinal features of mindfulness could empower players to be comfortable with 'not knowing' and be more open and receptive to new or ambiguous experiences, which reduces the anticipation of threat and consequential implications.[35] Mindfulness may also enable players to become more cognisant of the fact that internal processes (i.e., prospective IU) are ephemeral and that uncertainty experiences do not warrant spontaneous or maladaptive reactions (inhibitory IU) that might harm or derail their commitment towards personal goals.[35] This view aligns with the 'non-reactive' feature that underscores mindfulness, which is described by Kabat-Zinn[1] as an enhanced ability to permit one's thoughts and feelings to come and go without reacting or getting carried away by them. Grounded on the theoretical underpinnings of Vago and Silbersweig's[15] S-ART model, it is also believed that DM could subdue players' inclination to impulsively react to uncertainties that are permeated by self-focused needs, personal biases, or past experiences to uphold collective goals/ploys of dependent others, such as fellow team members.

Whilst a short duration of time may be required to effectively modify a client's rigid, extreme, and illogical beliefs for a more adaptive way of thinking (e.g., mental skills training or REBT), Jensen et al.[57] warns that practitioners are less likely to alter clients' thinking/decisions with new/rational information if they suffer from heightened levels of IU. Therefore, our findings advise that a deeper evaluation and contention of mindfulness tendencies to curb athletes' display of IPBs and to cope with the uncertainties in sport should not be overlooked. Sustaining traditional perceptions on mindfulness, the behavioural orientation cultivated through mindfulness interventions could act as more enduring mechanisms of change, which could assuage elite-level basketball players' instinctive predispositions of ritualistic behaviour, worry, and rumination (common features of IU), especially when beleaguered by additional challenges since the COVID-19 pandemic.[58] In this respect, Kraemer et al.'s[59] systematic review and meta-analysis of qualitative and randomised control trials involving mindfulness interventions sustain improvements on affect intolerance/sensitivity that was maintained at follow-up periods ranging from one to six months post-intervention.

Strengths and limitations of the study

Despite our unique findings advocating the inhibitory potential of mindfulness qualities on the manifestation of IPBs and IU amongst elite female basketball players, this study is not without limitations. The findings of this study are based on self-report data at a specific point in time within 2021 competition season. Although most of the employed measures assessed dispositional tendencies, performance beliefs can fluctuate depending on the stage of the competition and one's proximity to goals. Therefore, research considering the views over multiple points in a competitive season might provide more concrete evidence. In addition, including alternative measures that also assess the acceptance component of mindfulness could further confirm/expand findings on the buffering effect dispositional mindfulness exerts on the variables tested in this study. Considering the

multinational sample recruited in the present investigation, it should be noted that the COVID-19 pandemic is likely to have affected each player and their respective basketball league differently. For example, life in Sweden in the 2021 competition season, a country where no hard lockdown restrictions were imposed, could be quite different from playing in Germany where different levels of restrictions had been imposed during the competition season. Accordingly, each respective league dealt differently with the implementation of hygienic and safety protocols to protect its players from contracting COVID-19. These regional differences along with the limitation of players being mostly from Germany (44.8 %), could have resulted in disparate perceptions of uncertainty amongst players at the time of data collection in 2021. The relatively small sample also did not permit a comparison between semi-professional and professional players, which scholars should consider in future research. Finally, since our findings are derived from a cross-section correlational design, the causal effect of DM on IPBs and IU or the generalisation of findings to high-performance athletes in other sports should not be assumed. Also, caution should, be taken in the interpretation of the correlation findings involving the 'demands' and 'awfulizing' subscales of the iPBI, as the internal consistency of these two subscales were lower than desired.

Despite the noted limitations, the present study offers novel findings on an all-female sample specific to the context of elite-level basketball, which contribute to the growing body of literature in the realm of athlete mental health and well-being.[60] Findings proffer worthy implications for trainers, coaches, and sport psychology practitioners intervening the challenges that are unique to elite female basketball players.

Conclusion

Based on our findings, the integration of mindfulness assessment and training protocols with traditional cognitive behaviour modification approaches is encouraged to enhance/refine psychological support services for longer lasting change as a preventative measure against faulty believe systems and unwary reactions to uncertainty that might undermine mental health in elite-level female basketball players.

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CRediT authorship statement

All authors meet the ICMJE criteria for authorship credit (www.icmje.org/ethical_1author.html) as follows: substantial contributions to conceptualization, data curation, formal analyses, investigation, methodology, project administration, software, validation, visualization, and writing (original draft, review and editing).

Conflicts of interest

We declare no conflict of interest.

Supplementary materials

Supplementary material associated with this article can be found in the online version at doi:10.1016/j.apunsm.2023.100428.

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