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Sport Imagery Interventions

Improving the reporting of sport imagery interventions with TIDieR

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ABSTRACT

Imagery is a popular technique for enhancing learning, performance, and rehabilitation in sport, but mixed evidence exists to its effectiveness. There have been wide variations in the methods used to deliver imagery interventions and the level of detail reported, making it difficult to draw comparisons across studies. Moreover, there have been few efforts to date to replicate the findings of previous intervention studies. The aim of this paper is to articulate the need for standardized reporting of imagery interventions, which can be achieved through application of the Template for Intervention Description and Replication (TIDieR; Hoffmann et al., 2014). The TIDieR is a 12-item checklist to provide fuller, more accurate and standardized reporting so that these future imagery interventions can be more effectively delivered in practice or replicated in research. We use the TIDieR to describe a personalized guided imagery intervention for improving student-athletes' regulatory responses to competitive anxiety. Overall, this paper offers practical and evidence-based guidance for researchers designing imagery interventions and recommendations to enable journal editors and reviewers to make easier judgements about rigor. It may also serve as a pedagogical resource for students and trainee sport psychologists undertaking applied research as part of their training.

1. Introduction

Imagery is a popular technique for enhancing learning, performance, and rehabilitation in sport, but mixed evidence exists to its effectiveness (Simonsmeier et al., 2022; Toth et al., 2020; Zach et al., 2018). A systematic review found wide variations in the methods used to deliver imagery interventions and the level of detail reported, making it difficult to draw comparisons across studies (Cooley et al., 2013). Moreover, there have been few efforts to date to replicate the findings of previous interventions. These issues are not unique to sport imagery interventions and applied sport psychology may therefore benefit from wider discussions on improving the reporting of interventions. Indeed, there have been increased calls for standardized reporting to make it easier for authors to structure the descriptions of their interventions, for reviewers and editors to assess these descriptions, and readers to use this information (Dijkers & Millis, 2020). Having standard reporting practices also aligns with the "open science" agenda, and specifically through open methods, by providing greater detail and specificity in the methodological details (Nosek et al., 2012). There is only limited evidence of open methods in sport psychology to date (Tamminen & Poucher, 2018), despite the many potential benefits of doing so for the discipline. To address these issues, there is a need for fuller, more accurate and standardized reporting of sport imagery interventions.

Standardized reporting of imagery interventions may contribute to closing the know-do (or knowledge to practice) gap that exists for sport and exercise science researchers by communicating interventions in sufficient detail to enable sports psychologists, coaches, and other practitioners to translate these into practice (Leggat et al., 2021). Ely et al. (2021) summed up this under-reporting problem by stating "Far too often, practical details and parameters that are critical to the implementation of an intervention are left ambiguous, leaving the practitioner to 'fill in the blanks' in situations where the information is unclear" (p. 103). Multhaupt & Beuth (2018) have also called for greater detail when reporting imagery interventions, such as providing a break-

Abbreviations: APSQ, Athlete Psychological Strain Questionnaire; BERQ, Behavioral Emotion Regulation Questionnaire; BPS, British Psychological Society; CERQ, Cognitive Emotion Regulation Questionnaire; CONSORT, Consolidated Standards of Reporting Trials; EQUATOR, Enhancing the QUAlity and Transparency Of health Research network; IMI, Intrinsic Motivation Inventory; IVI, Intrusive Visual Imagery; LSRT, Layered stimulus response training; MRC, Medical Research Council; MG-A, Motivational general-arousal; MG-M, Motivational general-mastery imagery; PACING, Personalized Anxiety and perceived Control INtervention through Guided imagery; QSEP, Qualification in Sport and Exercise Psychology; RCT, Randomized control trial; SIQ, Sport Imagery Questionnaire; SIAQ, Sport Imagery Ability Questionnaire; TIDieR, Template for Intervention Description and Replication; Sport MHC-SF, The Sport Mental Health Continuum – Short Form; SPA-R, The Sport Psychology Attitudes–Revised form; TFAI, Three Factor Anxiety Inventory.

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down of the intervention steps, outlining individual adjustments that were made, and providing copies of the imagery scripts[2] used. Sufficient reporting will also help to protect participants from harm because of inadequately planned, ill-defined research activities (Gadaire & Kilmer, 2020). This is an important, yet often overlooked consideration for imagery interventions. Imagery does have the potential to have unintended and deleterious consequences for athletes (Short et al., 2002; Quinton et al., 2016), and the debilitating aspects of imagery can be more powerful and affect outcomes more quickly than facilitative ones (Nordin & Cumming, 2005).

A criticism of past interventions has been the lack of a clearly articulated mechanism to explain imagery's beneficial effects, which is particularly important when the intervention involves multiple components. For example, Multhaupt and Beauth (2018) conducted a systematic review of imagery interventions for the rehabilitation of sport injuries (Multhaupt & Beuth, 2018). Of the 9 imagery interventions reviewed, more than half included relaxation exercises as an additional component either before or during the imagery intervention. Standardized reporting would encourage researchers to identify core vs. adaptable features of the intervention (Gadaire & Kilmer, 2020). The core elements are those that promote the outcomes, or put another way, these elements operate as the mechanism to explain why an intervention is effective (or not). In contrast, elements that are amenable to adaptation are usually those involving contextual considerations and cultural factors (Koehn & Díaz-Ocejo, 2016). Finally, standardized reporting would make it easier to conduct systematic reviews and meta-analyses by ensuring that authors are providing sufficient information for studies to be returned in searches, included in reviews, and support the analyses conducted (Appelbaum et al., 2018; Kazak, 2018). With the volume of sport imagery studies increasing, so too are the systematic reviews and meta-analyses to synthesize and evaluate this research.

To answer the need for standardized reporting, the Enhancing the QUAlity and Transparency Of health Research network (EQUATOR) (Enhancing the QUAlity & Transparency Of health Research (EQUATOR) network, 2022) has developed a user-friendly library of guidelines, templates, and tutorials. One such tool is the Template for Intervention Description and Replication (TIDieR) (Hoffmann et al., 2014). It was created by an international panel of experts in collaboration with the Consolidated Standards of Reporting Trials (CONSORT) planning committee. This panel conducted extensive literature reviews, a two-round Delphi survey of researchers and stakeholders to guide item selection, face-to-face consensus meetings, and pilot testing to inform adaptation of the checklist (see Hoffmann et al. 2014 for more detail). The resulting TIDieR is a 12-point checklist to guide the communication of interventions to ensure issues critical to integrity and adaptation are included, and it is applicable across a broad range of disciplines, areas of research, and evaluation designs. There are few examples of the application of TIDieR to report sport psychology interventions to date, but one exception is Cumming et al. (2022) who used the checklist to provide an overview, rationale, and logic model for the My Strengths Training for Life™ (MST4Life™) program (Cumming et al., 2022). Although not specific to imagery, Cumming et al.'s (2022) use of the TIDieR checklist demonstrated its suitability for systematically reporting a sport psychology intervention (Cumming et al., 2022). With increasing attention on demonstrating rigor in academic research and aligned with the open science agenda, authors reporting imagery interventions should use the TIDieR checklist to improve reporting consistency and the replicability of findings.

The aim of this paper is to demonstrate how the TIDieR checklist (Hoffmann et al., 2014) can be used to report a protocol for a new imagery intervention to reduce trait cognitive and physiological competitive anxiety and improve regulatory responses (e.g., perceived control) and trait sport confidence. We used the TIDieR to describe the rationale, logic model, and content of a planned personalized, sport psychologist-led guided imagery intervention for competitive student-athletes, as well as outline how this intervention would be implemented and evaluated in the future. Overall, this paper offers practical and evidence-based guidance for researchers designing imagery interventions and recommendations to enable journal editors and reviewers to make easier judgements about rigor. It would also be a useful pedagogical resource for students and trainee sport psychologists who are undertaking applied research as part of their training.

2. Method

2.1. TIDIER intervention description

The following section is organized around the 12-items of the TIDieR. As journal page/word limits may reduce the possibility for authors to provide detailed descriptions of each TIDieR element within the text, we provide the checklist of items and examples of how these elements can also be reported in a table (Supplementary Table 1). We also return to these practical considerations in the discussion. Authors and reviewers can also download the complete checklist as a Word version from the EQUATOR Network website (www.equator-network.org/reporting-guidelines/tidier/) (Enhancing the QUAlity & Transparency Of health Research (EQUATOR) network, 2022).

2.1.1. Item 1: brief name/description

The Personalized Anxiety and perceived Control INtervention through Guided imagery (PACING), a personalized, sport psychologist-led intervention for competitive student-athletes.

2.1.2. Item 2: rationale, theory and aim

2.1.2.1. Rationale and theoretical framework. PACING is being developed to help student-athletes whose levels of trait competitive anxiety are negatively impacting their performance and well-being. Trait competitive anxiety is a predisposition to evaluating competition situations as threatening, which in turn, leads to state anxiety in response to the situation (Mellalieu et al., 2006). It is conceptualized as a multidimensional construct, most recently represented as dimensions of cognitive anxiety (with subcomponents of worry, private self-focus, and public self-focus), physiological anxiety (with subcomponents of autonomic hyperactivity and somatic tension), and a regulatory dimension reflecting the adaptiveness of the anxiety response (with a subcomponent of perceived control) (Cheng & Hardy, 2016; Cheng et al., 2009; Jones et al., 2019). Effective psychological techniques for enhancing this adaptive capacity as well as addressing the components of cognitive anxiety and physiological anxiety are important for athletes to develop because difficulties in managing these reactions to competing will negatively impact athletes' performance (Hanton & Jones, 1997; Hanton & Connaughton, 2002; Fletcher et al., 2006), as well as increase their risk of musculoskeletal injury (Cagle et al., 2017) and burnout (Cho et al., 2019).

Imagery is a psychological technique that can help athletes to regulate anxiety responses to competition in at least four different ways: (a) reducing the intensity of anxiety symptoms experienced (Ong & Chua, 2021); (b) enhancing perceived control over symptoms (Wadey & Hanton, 2008); (c) elevating or protecting self-confidence as a buffer against negative anxiety symptoms and to promote facilitative interpretations of symptoms (Cumming et al., 2007; Hanton et al., 2004; Neil et al., 2006); and (d) reappraising the situation as a challenge rather than a threat or pressure (Hale & Whitehouse, 1998). Research has found that guided imagery scripts that pair feeling confident and other positive cognitions (motivational general-mastery imagery; MG-M) with experiencing high intensity anxiety symptoms (motivational general-arousal imagery; MG-A) in response to competing elicit feelings of confidence and perceptions that these symptoms are helpful towards an upcoming

[2] Scripts are a form of guided imagery to ensure correct and meaningful imagery use and maximize potential benefits (Williams et al., 2013).

performance (Cumming et al., 2007; Williams et al., 2010). Combining imagery for MG-M and MG-A functions was termed coping imagery within this previous research.

PACING extends this notion of coping imagery further by also incorporating emotion regulation strategies. Not all of athletes' imagery will be voluntary and deliberate, and these spontaneous images can be intrusive[3] and may impede performance and well-being. Murphy et al. (2008) explained that spontaneous imagery may bypass known volitional imagery processes including generating, inspecting, transforming, and maintaining images to achieve its intended function(s) (e.g., skill learning, goal achievement, arousal regulation) (Murphy et al., 2008; Cumming & Eaves, 2018). Parker et al. (2015) found that 13.4% of athletes in their sample experienced higher levels of trait intrusive visual imagery (Parker et al., 2015). In a follow-up study, intrusive imagery predicted negative affect (Parker et al., 2017). Although this research indicates that athletes do experience intrusive images, it is not yet clear who are more vulnerable to doing so. Outside of sport, however, it is well established that individuals with high trait anxiety will experience involuntary debilitative mental images in response to anxiety-provoking situations (Chiupka et al., 2012; Moscovitch et al., 2011). These debilitative images can lead to further anxiety and impair performance (Hirsch et al., 2003; Hirsch et al., 2004; Stopa & Jenkins, 2007).

Another relevant consideration for high trait anxious individuals is that they will be more likely to use maladaptive emotion regulation strategies (e.g., suppression) in response to these negative images (Moscovitch et al., 2013). It is therefore important to provide them with opportunities to develop adaptive emotion regulation strategies, both cognitive and behavioral in nature, which will enable them to cope in stressful situations. These strategies could be developed through imagery rehearsal (Shafir et al., 2013) and enable athletes to respond in a cognitive or behavioral way to emotion-eliciting events by attempting to modify the magnitude and/or type of their emotional experience or the event itself (Aldao & Nolen-Hoeksema, 2010; Kraaij & Garnefski, 2019). A cognitive emotion regulation strategy is reappraisal (i.e., changing one's thinking about a stressful situation), which helps individuals to effectively regulate affect and physiological arousal and is associated with enhanced experience of positive emotions, reduced experience of negative emotion, and better interpersonal functioning and well-being. Previously, researchers have found that reappraisal predicts athletes' ability to generate a range of sport images, including those affective and mastery in nature (Anuar, Cumming & Williams, 2017). It is also positively correlated with mental well-being in student-athletes, and therefore, could be beneficial for managing stress in sport (Bird et al., 2021). A behavioral emotion regulation strategy is seeking social support (i.e., actively sharing emotions and asking for support and advice to cope with the stressful event) (Kraaij & Garnefski, 2019). In sport, social support has been negatively associated with indicators of ill-being (e.g., global burnout, emotional/physical exhaustion) and positively associated with indicators of well-being (e.g., life satisfaction) across the athletic season (DeFreese & Smith, 2014).

PACING is also underpinned by Lang's (1977, 1979) bioinformational theory of emotional imagery (Lang, 1977; Lang, 1979). This theory explained how athletes can use imagery to change their emotional reactions to the competitive environment by first provoking the stimulus situation in a vivid, emotional image, then modifying these reactions by either revising/strengthening the athletes' response and/or meaning of the response to this stimulus situation. Stimulus information consists of sensory details of the situation to be imaged (e.g., visual and auditory cues), including aspects of the competition location/venue, equipment, opposition/officials, weather, and sounds. Response information is the athletes' emotional (e.g., excitement, fear) and physiological (e.g., heat rate, sweating, and muscular tension) response to the situation, whereas meaning information explains how the response to the stimulus is interpreted by the person (e.g., facilitative or debilitative to performance) (Cumming et al., 2017). In other words, an imagery intervention would enable athletes to replace their typical reactions to competition with more adaptive regulatory responses (i.e., perceived control), which in turn would lead to reductions in their cognitive and physiological anxiety).

2.1.2.2. Aims and logic model. PACING aims to provide a theoretically grounded and personalized guided imagery intervention for improving trait competitive anxiety responses in student-athletes. To explain how this multi-component intervention is intended to work, we developed a logic model (Fig. 1) that aligns its target population, assumptions (and potential influencing factors), inputs, activities, implementation evaluation, outputs, and outcomes (Kaplan & Garrett, 2005).

1. The *target population* is competitive student-athletes aged 18 and over, enrolled in full-time education at the tertiary level, and currently training and competing at a regional level or above in the UK (see Table 1 for inclusion and exclusion criteria). This population will often have injuries, but this will not preclude them from the intervention unless the severity of the injury means they are not able to train and compete. They may have previously been exposed to imagery and sport psychology more generally (e.g., workshops, reading/apps, own natural learning experiences).
2. Based on past research, it is *assumed* that competitive student-athletes will be willing to participate in an imagery intervention and open to receiving a sport psychology intervention (e.g., they will display positive attitudes towards sport psychology and/or report positive past experiences) (Martin et al., 2002). They are unlikely to be using imagery systematically or have experienced either developing and/or using their own personalized script but will likely have at least a moderate ability to image and would benefit from targeted training to improve imagery ability and/or reduce the occurrences of intrusive debilitative imagery (Quinton et al., 2019). Specifically, student-athletes will likely have a moderate imagery ability on some or all five dimensions commonly reported in sport and exercise science literature: controllability, ease, vividness, accuracy, and duration (Cumming & Eaves, 2018). Of relevance to PACING will be controllability[4], vividness[5], and ease. PACING student-athletes with high trait competitive anxiety and low perceived control may initially find it difficult to generate vivid and controllable images relating to perceiving anxiety as facilitative, thus a gradual approach through layered stimulus response training[6] (LSRT) will be used (see item 4). Student-athletes are also expected to score at least 4 (i.e., "neutral") on each item of the Sport Imagery Ability Questionnaire (i.e., ease of imaging) (Williams & Cumming, 2011). Researchers have found that this population scores highest for MG-A ability (Quinton et al., 2018; Williams & Cumming, 2012; Williams & Cumming, 2015), and a greater ability to image MG-M and MG-A content is linked to lower and more facilitative competitive anxiety, greater confidence, and greater ability to see stress in a more positive light (Quinton et al., 2018; Williams & Cumming, 2015).

[3] Parker et al. (2015) defined intrusive imagery as "visual, vivid, difficult to control, and capable of triggering strong physiological and emotional reactions" (p. 35) (Parker et al., 2015).

[4] Controllability is "the ease and accuracy with which an image can be transformed or manipulated, reflecting an individual's ability to influence imagery content" (Cumming & Eaves, 2018) (p.380).

[5] Vividness is the clarity with which individuals can incorporate image details, which is relevant to PACING as clinical psychology literature has demonstrated a link between higher anxiety and poorer vividness of positive images (Morina et al., 2011).

[6] LSRT is an evidence-based approach for helping individuals to generate and control their imagery experience by adding different elements of the image (i.e., stimulus, response, and meaning propositions) in progressive layers. This training involves athletes participating in cycles of imaging, reflecting on their image, and then adding a new layer of detail to their image (Cumming et al., 2017)

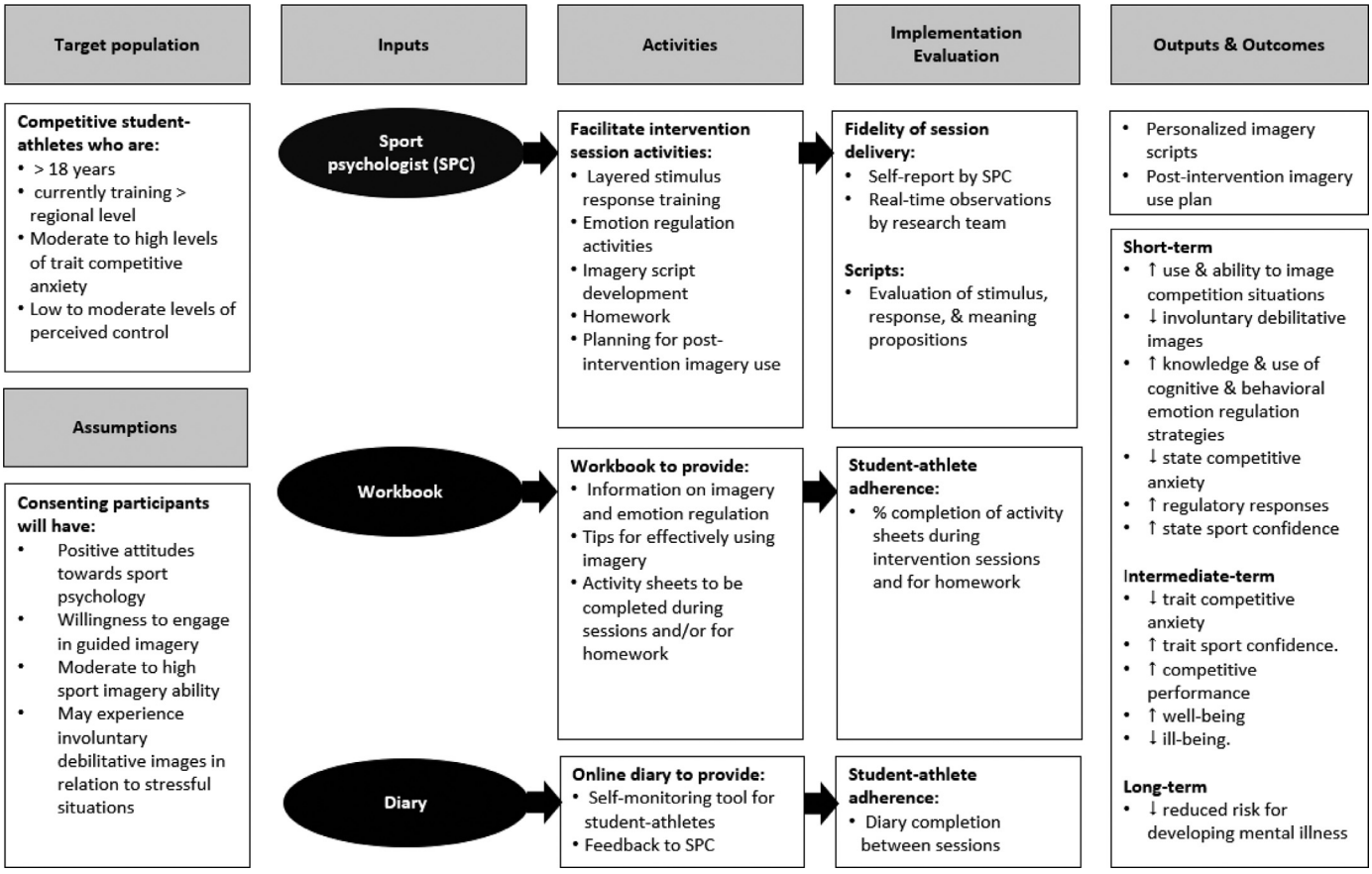

Fig. 1. Logic model of Personalized Anxiety and perceived Control INtervention through Guided imagery (PACING).

Table 1
Inclusion and exclusion criteria for PACING feasibility study.

Inclusion criteria	Exclusion criteria
• Any gender • Aged ≥ 18 years • Enrolled full-time in tertiary education in the UK • Competing ≥ regional level • Currently in pre-season or competitive season of training year • TFAI cognitive and performance anxiety dimensions average score ≥ 3 • TFAI regulatory dimension average score ≤ 3 • Provide written informed consent to participate	• Currently in off-season/transition phase of training year • Retired/no longer training & competing • Injury precludes training and competing • Clinical diagnosis of mental illness

Note: TFAI = Three Factor Anxiety Inventory; The TFAI employs a 5-point Likert-type scale, with 1 = *totally disagree* and 5 = *totally agree*.

Furthermore, greater MG-M imagery ability may act as a buffer against the effects of negative images (e.g., debilitative anxiety) (Quinton et al., 2019). Therefore, ability to image (ease, vividness, and controllability) MG-M and MG-A content will be incorporated gradually throughout PACING to achieve the outcomes stated in the logic model. Moreover, student-athletes' sociodemographic data, attitudes towards sport psychology, imagery ability, and perceptions about the intervention as being acceptable, interesting, and enjoyable will all be assessed as part of a process and outcome evaluation as potential influencing factors (see Table 2 and Section 2.2 for details).

3. The planned work describes the *inputs and activities* (see Table 3 and TIDier item 4 for details) that would enable student-athletes to reduce their trait competitive anxiety and enhance their perceived control.
4. Because an intervention may not always be delivered as intended, the plan for implementation evaluation covers the specific strategies for assessing fidelity for the different activities (see TIDieR item 11 and Section 2.2).
5. The individual level *outputs* of PACING (e.g., attendance and engagement of intervention sessions, development of personalized imagery script) are hypothesized to be direct products of its inputs and activities and will lead to beneficial *outcomes*. In the short to intermediate term, engaging in systematic and guided imagery practice would initially reduce *state* competition anxiety and improve regulatory response. Repeated experiences of reduced state competition anxiety

Table 2
Variables and time of outcome and process evaluation measurements in the PACING feasibility study.

Variable	Online pre-study screening	Baseline(week 0)	T1(week 6)	T2(week 18)
Sociodemographic data	X			
Current injury status	X			
Current/previous history of mental illness	X			
Trait competitive anxiety				
Trait version of Three Factor Anxiety Inventory Questionnaire (TFAI) (Cheng et al., 2009; Jones et al., 2019)	X			
Attitudes about sport psychology consulting				
The Sport Psychology Attitudes–Revised form (SPA-R) (Martin et al., 2002)	X			
Imagery use and ability				
Intrusive Visual Imagery (IVI) (McCarthy-Jones et al., 2012)				
Sport Imagery Questionnaire (SIQ) (Hall et al., 1998)		X	X	X
Sport Imagery Ability Questionnaire (SIAQ) (Williams & Cumming, 2011)		X	X	X
Emotion regulation strategies				
Behavioral Emotion Regulation Questionnaire (BERQ) (Kraaij & Garnefski, 2019)		X	X	X
Cognitive Emotion Regulation Questionnaire (CERQ) (Garnefski et al., 2001)		X	X	X
Performance				
Performance Satisfaction (Pensgaard & Duda, 2003)		X	X	X
Mental health & well-being				
Athlete Psychological Strain Questionnaire (APSQ) (Rice et al., 2020)		X	X	X
The Sport Mental Health Continuum – Short Form (Sport MHC-SF) (Foster & Chow, 2019)		X	X	X
Acceptability of intervention				
Interest/Enjoyment subscale of the Intrinsic Motivation Inventory (IMI) (Ryan, 1982)			X	
Treatment Acceptability and Preferences measure (Sidani et al., 2009), adapted for PACING			X	

and better perceived control would enable student-athletes to gradually modify their general tendencies to experiencing *trait* competition anxiety. Participating student-athletes will increase their imagery use and knowledge and use of adaptive cognitive and behavioral emotional regulation strategies, improve their ability to easily generate vivid and controllable images, and reduce the frequency of intrusive debilitative images in relation to competitive situations. Over the intermediate to longer term, these improvements will likely benefit student-athletes' competitive performance, well-being, and overall personal development. For example, they may transfer what they learnt from this intervention to other parts of their life when they experience anxiety-provoking situations (e.g., giving a speech in class, taking their driving test). A further longer-term outcome may be a reduced risk for developing mental illness because of improving participating student-athletes' emotion regulation skills (i.e., protective factor) via imagery rehearsal.

2.1.3. Item 3: what materials used

Participating student-athletes will receive a workbook, audio recorded imagery scripts, and an online diary. The workbook will be given to them following baseline assessment and will include definitions of mental imagery and emotion regulation, and a brief description of where, when, why, and how imagery and emotion regulation strategies are used by athletes to enhance their well-being and performance. It will include tips on how to generate clear, vivid, and controllable images such as incorporating physical aspects into their imagery (e.g., wearing competition sport kit, holding sport instrument) and relevant sensory modalities (e.g., visual, kinesthetic, tactile) as well as to use their preferred visual imagery perspective (internal visual imagery or external visual imagery) (Holmes & Collins, 2001; Wakefield et al., 2013). The workbook will also contain activities to complete during sessions as well as for homework, which will provide the bases of their personalized imagery scripts. An important aspect of the intervention will be to equip athletes with the knowledge of how to develop their own imagery scripts via these worksheets, thereby promoting sustainability of its effects. The imagery scripts will be audio recorded for each athlete using a microphone, edited, and converted into an audio file with sound editing software. The athletes will be able to choose as to whether the script is recorded in their own voice or that of another person (e.g., the sport psychologist who delivers the intervention) (Williams et al., 2013a). To further promote sustainability, the student-athletes will be given the audio files to playback on their preferred device (e.g., mobile phone or tablet) and using their own earphones. In addition, they will be asked to record their imagery use with an online diary to be completed as homework between intervention sessions (see Table 3 and Supplementary Fig. 1). The online diary will serve as a self-management technique for student-athletes, but also as a source of ongoing feedback and evaluation during the intervention for the sport psychologist delivering their sessions.

The sport psychologists who deliver PACING will receive a full day workshop and a training manual on developing personalized guided imagery scripts and delivering LSRT. In addition to the information booklet and worksheets to be given to the student-athletes, these training materials will provide the sport psychologists with a lay summary of the theoretical background of PACING (see item 2.1.2.1), a checklist for imagery script development (Williams et al., 2013a), activities for introducing behavioral and cognitive emotion regulation strategies, guidelines for how to develop imagery ability through LSRT (Cumming et al., 2017), commonly reported barriers on imagery use from athletes and practitioners and how to overcome them, and how to effectively evaluate imagery use (Cumming et al., 2017; Williams et al., 2013a).

2.1.4. Item 4: what procedures, activities, and/or processes used

The core components of PACING will be LSRT, a personalized imagery script, and homework. LSRT (Cumming et al., 2017; Williams et al., 2013) will be used to progressively develop the student-athletes' ability to image (i.e., ease, vividness, and controllability) coping content (i.e., MG-M and MG-A) (for more information on LSRT procedures, see (Cumming et al., 2017)). PACING will follow Williams et al. (2013a)'s checklist for the 5Ws to include for effective imagery script development: (a) who will use the script (competitive student-athletes); (b) where and when the script will be used (before training and competition in associated locations); (c) why (improve imagery ability, improve confidence, reduce anxiety intensity and perceive symptoms as more facilitative); and (d) what the script will include (MG-M and MG-A content) (Williams et al., 2013a). The script will initially be developed by asking the student-athletes to write about a recent competition that reflects their typical reactions to this type of stressful situation (i.e., emotion disclosure writing exercise) (Konig et al., 2014). They will then be asked

Table 3
Session activities for PACING.

Session	Topic	Activities
1	Introduction session	• Imagery activity: introduce LSRT (ease). • Emotion regulation activity: introduce connection between thoughts, emotions, and behaviors. • Homework: Start diary to monitor LSRT practice.
2	Perspective taking session	• Imagery activity: reflect and develop next imagery layer (LSRT; ease and vividness). • Emotion regulation activity: write emotion disclosure of past anxiety-eliciting competition situation. • Script development: introduce imagery scripts, identify & elaborate on stimulus, response, & meaning propositions in disclosure. • Homework: Continue LSRT practice; Start to log spontaneous facilitative & debilitative images in diary.
3	Behavioral emotion regulation (actively approaching & seeking social support)	• Imagery activity: Reflect and develop next imagery layer (LSRT; ease and vividness). • Emotion regulation activity: introduce positive behavioral emotion regulation strategies (actively approaching and seeking social support), rescript disclosure to include positive behavioral emotion strategies, notice how responses to anxiety-provoking situation change with new behaviors. • Script development: update stimulus & response propositions. • Homework: Continue LSRT practice & logging spontaneous images; Start daily rehearsal using audio recording of imagery script & logging ease, vividness, & controllability of imaging scripts & cognitive & emotional responses to script.
4	Cognitive emotion regulation (cognitive reappraisal)	• Imagery activity: Reflect and develop next imagery layer (LSRT; ease, vividness, and controllability) • Emotion regulation activity: introduce cognitive reappraisal, rescript to think about the situation in a more positive way (cognitive reappraisal), notice how responses change to new appraisal of anxiety-eliciting competition situation. • Script development: update response & meaning propositions. • Homework: Continue LSRT practice, daily rehearsal of updated imagery script, logging spontaneous images, ease, vividness, & controllability of imaging scripts, & cognitive & emotional responses to script.
5	Wrap-up session	• Review of LSRT and emotion regulation strategies. • Plan for future use of imagery, including LSRT, updating imagery script, & developing new scripts for other stressful situations.

Note: LSRT = layered stimulus response training

to identify stimulus, response, and meaning propositions in their script, which will be updated in each session in line with the evolving LSRT and emotion regulation activities. For example, they will be taught how to rescript their original imagery of an anxiety-provoking competitive situation by changing: (a) how they respond to the situation by using cognitive and/or behavioral emotion regulation strategies (e.g., actively approaching, seeking social support); and/or (b) the meaning of either the situation or their response to the situation in more positive ways (e.g., reappraisal). In other words, the LSRT and script development will be linked to emotion regulation activities throughout the intervention.

To encourage student-athletes' to deliberately practice their imagery, homework activity will be suggested after each session (Table 3). A key component of the homework will be to complete the online diary, which will contain imagery manipulation checks to ensure participants can image as intended (Quinton et al., 2019), as well as serve as a source of feedback to the sport psychologist. The homework will advance in complexity, for example, starting with monitoring the ease of LSRT practice. Session 2 will then ask the student-athletes to log spontaneous facilitative and debilitative images. Imagery meaning reporting has typically been neglected (for exceptions see (Nordin & Cumming, 2005; Cumming et al., 2006)), but is particularly important to include as positive content is not always perceived as facilitative and negative content not always debilitative (Quinton et al., 2016). Finally, the athletes will also be asked to report cognitive and emotional responses to the script. The example diary sheets in Supplementary Fig. 1 include manipulation checks based on those commonly used in the literature (Quinton et al., 2016; Cumming et al., 2007; Williams et al., 2010; Quinton et al., 2019). Personalization details and updates to the LSRT and script will be in-

formed by these online diary entries as well as baseline assessment and session worksheets.

2.1.5. Item 5: expertise and background of program facilitators

The Sport Psychologist(s) who deliver PACING will be, at minimum, trainees who have completed Stage 1 and enrolled in Stage 2 of the British Psychological Society's (BPS) Qualification in Sport and Exercise Psychology (QSEP) or equivalent.

2.1.6. Item 6 & 8: how, when and how much

PACING will be delivered face-to-face in small groups of up to 6 student-athletes who are in their pre-competition/early part of competitive phase of training. It will consist of weekly 1 h sessions delivered over 5 consecutive weeks, scheduled at the group's convenience outside of regular training and competitions. Between intervention sessions, the student-athletes will be asked to complete homework including practicing different layers of their LSRT, rehearsing the audio-recorded script, and completing their online imagery diary (see Table 3 and Item 4, Section 2.1.4.).

2.1.7. Item 7: where

The intervention setting for PACING is a large University in the West Midlands (UK). Adhering to principles of PETTLEP (Holmes & Collins, 2001; Wakefield & Smith, 2012), sessions will take place face-to-face in locations that are consistent with the student-athletes' training or competition location (e.g., sports hall). In the case of COVID-19 restrictions, sessions can be moved online, whereby normal precautions will be taken to ensure the psychological safety of the athletes for online settings (Townsend et al., 2020).

2.1.8. Item 9: tailoring

All participants will receive the same core components of the intervention, but PACING will take a person-centered approach that is flexible to student-athletes' needs (e.g., evening sessions for student-athlete parents or those with caring responsibilities). PACING will be personalized by asking athletes to identify scenarios that will be the bases of LSRT, written emotion disclosure, and imagery rescripting activities (Cumming et al., 2017; Williams et al., 2013a; Cumming & Williams, 2013). The baseline assessment of trait competitive anxiety will be used to prompt student-athletes' typical responses to competitive situations (i.e., individual patterns of worry, private/public self-focus, somatic tension, and autonomic hyperactivity) whereas feedback from diary logs including manipulation checks will be used to inform subsequent sessions to ensure imagery remains meaningful throughout PACING and has the intended facilitative effect (Quinton et al., 2019).

2.1.9. Item 10 & 12: modifications, adherence and fidelity

Because this paper describes a protocol of an intervention that has not yet taken place, items 10 and 12 are not relevant.

2.1.10. Item 11: strategies to assess, improve and maintain fidelity

Fidelity of intervention delivery will be assessed by asking the sport psychologist(s) to complete a checklist following each session to determine both the number of sessions, and proportion of intervention components within each session, delivered to participants (i.e., intervention fidelity rate) as well as to rate participants' engagement in sessions from 1 (*not at all engaged*) to 10 (*fully engaged*) (Cumming et al., 2022). Similar to Tidmarsh et al. (Tidmarsh et al., 2022), the checklist will also include open-ended questions that will enable the sport psychologists to report any barriers/enablers to delivering PACING as intended and they will also have opportunities to discuss fidelity of implementation in the end of study interviews. The self-reported checklists will be supplemented by real-time observations of session delivery by members of the research team. Between 20 and 40% of sessions will be observed aligned with recommendations made by Schlosser (2002) using a checklist that mirrors those used by the sport psychologist(s) (Schlosser, 2002). If more than one sport psychologist delivers the intervention, this will enable us to determine how consistently they deliver PACING as intended and address any additional training needs (e.g., via booster sessions). A selection of recorded imagery scripts will also be evaluated for the inclusion of stimulus, response, and meaning propositions. The student-athletes will therefore be asked to provide their consent for sessions to be observed as well as members of the research team to listen to their imagery scripts for fidelity monitoring purposes. The proportion of completed activity sheets and online diary entries will also be reported. Finally, the post-intervention questionnaire will ask student-athletes to rate their enjoyment and satisfaction with the intervention by completing the Interest/Enjoyment subscale of the Intrinsic Motivation Inventory (IMI) (Ryan, 1982).

2.2. Protocol of feasibility study

The logic model will be initially evaluated in a future study investigating the feasibility and acceptability of PACING within the target population over a 4-month period in a university sport setting. The feasibility study will be quasi-experimental and used to determine whether the intervention is suitable for a full randomized control trial (RCT) and address uncertainties to do with intervention delivery (e.g., acceptability, fidelity) and evaluation procedures (e.g., what sample size would be needed). More specifically, its aims will be to: (1) evaluate participant recruitment and retention as well as engagement with the intervention; (2) determine the number of intervention sessions delivered and completed (adherence); (3) assess the fidelity of the intervention delivered by the sport psychologists; and (4) estimate the efficacy of the intervention on imagery use, imagery ability, emotion regulation strategy use, competitive anxiety, performance, and well-being. Ethical approval will be obtained from the Human Research Ethics Committee of the University of Birmingham, and the feasibility study will be conducted according to the Declaration of Helsinki.

Prospective participants will be recruited through university sport clubs and teams and be asked to provide their online consent prior to completing an online screening questionnaire to assess their suitability for the intervention. Information collected in this questionnaire will also be used to capture potential influencing factors; for example, attitudes about sport psychology consulting will be measured using the Sport Psychology Attitudes-Revised form (SPA-R) (Martin et al., 2002). Participants who satisfy the inclusion/exclusion criteria (Table 1) will receive a written invitation to join the study. If they accept, they will be invited to schedule a baseline assessment session (week 0) with a member of the research team, including obtaining written informed consent.

Following the 5 week intervention (week 1 through 5), post-intervention assessments will be taken at 6- (to assess the immediate effects of PACING) and 18- weeks (to assess the retention of intervention effects) post-baseline. A summary of the process and outcome evaluation measures to be used in the online pre-study screening, at baseline, and at both post-intervention timepoints are available in Table 2. After 18 weeks, semi-structured interviews will be conducted with the sport psychologists who delivered the intervention sessions and focus groups will be conducted with participating student-athletes, with the focus of these discussions on acceptability, participants' engagement with, and reactions to the intervention, fidelity of implementation, and what modifications are needed to the intervention and/or evaluation plan prior to a full RCT.

3. Discussion

Reporting the details of an intervention can be challenging and it is often down to the researchers to choose what details to include vs. leave out. Although examples of detailed reporting of imagery interventions exist, there is not a consistent way of doing so, which is a

weakness of the research area that has been pointed out by past systematic reviews and may have potentially hindered past replication efforts (Cooley et al., 2013; Multhaupt & Beuth, 2018). But this information is necessary to enable replication of successful interventions with fidelity and guide future scaling up and out (Cumming et al., 2022). The aim of this paper was to demonstrate how the TIDieR checklist (Hoffmann et al., 2014) can be used to report a new imagery intervention for competitive student-athletes: PACING. By following this checklist, we have outlined the rationale, logic model, and content of PACING in addition to outlining how this intervention would be implemented and evaluated through a future quasi-experimental, 4-month feasibility study. Before discussing the implications of using the TIDieR checklist for researchers, editors, reviewers, and readers, and applied practitioners, we first outline how TIDieR has been a useful tool for planning PACING and to receive feedback on it before implementation and evaluation.

A benefit to using TIDieR as a planning tool is that it enabled us to draw on the underpinning theories (i.e., bioinformational theory and the three-factor hierarchical model of competitive anxiety) together with the extant research to articulate its unique features and proposed mechanisms of actions. For example, while other interventions have targeted student-athletes (e.g., (Ryan 1982, Dubuc-Charbonneau & Durand-Bush 2015, Golby & Wood 2016)), PACING is distinctive by its focus on using LSRT and guided imagery scripts that incorporate MG-A and MG-M imagery (i.e., coping imagery) to improve the use and ability to image easily, vividly, and with controllability in student-athletes with high trait competitive anxiety. The rationale for doing so was based on researchers showing that imagery can improve student-athletes' reactions to anxiety both directly and indirectly (e.g., via enhancing mastery cognitions such as self-confidence and perceived control), and MG-A and MG-M imagery ability are potentially key mechanisms in determining imagery's effectiveness (Quinton et al., 2018; Williams & Cumming, 2012; Williams & Cumming, 2015). That greater MG-M imagery ability may also act as a buffer against the effects of debilitative images (Quinton et al., 2019) is an important consideration when developing an intervention for this population. Student-athletes with high trait competitive anxiety may be particularly prone to experiencing involuntary images of a debilitating nature when faced with a stressful situation, which in turn, may have a quick and detrimental impact on their performance and well-being and lead them to using maladaptive emotional regulation strategies that can have long-term implications for their mental health (Nordin & Cumming, 2005; Chiupka et al., 2012; Moscovitch et al., 2011; Hirsch et al., 2003; Hirsch et al., 2004; Stopa & Jenkins, 2007). For this reason, PACING incorporates cognitive and behavioral emotion regulation strategies within the intervention as well as making use of evidence-based approaches such as written emotion disclosures to support athletes in generating their own scripts (Konig et al., 2014). With sustainability in mind, imagery that is personal and meaningful to the athletes may also increase the likelihood that they will continue to use their new skills in developing (and rescripting when needed) their own imagery scenarios long after the intervention has been completed. Also, by developing an intervention that targets both performance and well-being, PACING fulfills the growing recognition that student-athletes are not immune to mental health problems and would benefit from opportunities to strengthen their wellbeing, regardless of whether they have a mental illness or not (Dubuc-Charbonneau & Durand-Bush, 2015; Golby & Wood, 2016; Gross et al., 2018).

As an intervention under development, PACING will require testing. The next step is a planned feasibility study, and if the results are promising, then a full RCT using a mixed-methods approach to evaluating PACING's outcomes and processes. The outcome evaluation will help to demonstrate whether PACING is effective in achieving its anticipated short-term, intermediate-term, and long-term outcomes whereas the process evaluation tests its assumptions (and influencing factors) about how the intervention works (or not) as depicted in the logic model. Indeed, according to the Medical Research Council's (MRC) process evaluation framework (Moore et al., 2014), it is important to not only test these assumptions but also consider the relationship between implementation, mechanisms, and context in which the intervention is delivered. That is, contextual factors may affect (and be affected by) the intervention being delivered (e.g., how/where the intervention is delivered, fidelity of intervention delivery) and its mechanisms of impact (e.g., how participants respond to the intervention, unexpected consequences). To understand how the intervention is functioning (or not), the planned feasibility study will include both quantitative data (e.g., self-report questionnaires, session attendance) along with qualitative methods (e.g., interviews with sport psychologist(s), focus groups with participating student-athletes). In turn, the results of this initial study will clarify uncertainties around the intervention delivery and evaluation procedures.

3.1. Implications for researchers

Through using the TIDieR checklist to underpin the reporting of imagery interventions, and applied sport psychology interventions more broadly, researchers will be more easily able to plan and conduct their interventions and ensure that necessary information is included in their manuscripts to facilitate the peer review and publication process, whilst aligning with the open science agenda (Nosek et al., 2012; Tamminen & Poucher, 2018). By doing so, researchers will also enhance the likelihood of their work being included in systematic reviews and meta-analyses, drawn on for comparison and replication, and put into practice (Gadaire & Kilmer, 2020).

Adopting TIDieR will also allow researchers to evaluate interventions more consistently. In this paper, we developed a logic model for PACING that aligns the target population, assumptions, inputs, activities, implementation evaluation, output, and outcomes (Kaplan & Garrett, 2005). A logic model informs what resources are needed to realize the intervention's intended outcomes and guides the monitoring and evaluating of the intervention's effectiveness and accountability by understanding its underlying "logic" (Kaplan & Garrett, 2005; Fielden et al., 2007; Cooksy et al., 2001). Through having a logic model, researchers are encouraged to go beyond simply examining cause and effect (e.g., did it work?) to also considering its processes (e.g., why did it work?). We therefore recommend that an intervention's evaluation plan should include data collection and analysis to capture different aspects of the logic model and compare the resulting pattern of relationships found in the data to that articulated by the logic model (Cooksy et al., 2001). Moreover, Fielden et al. (2007) have argued that a logic model should serve as an overarching guide to program implementation without being rigid or prescriptive (Fielden et al., 2007). We will therefore view the PACING logic model in a flexible way and refine it as necessary after each stage of intervention development and evaluation.

To produce rigorous and effective reporting of interventions that are specific to their discipline, it is recommended that researchers familiarize themselves with Hoffmann et al.'s (2014) TIDieR checklist, item descriptions, and clear examples in addition to other guidelines and toolkits available on the EQUATOR network (Gadaire & Kilmer, 2020; Enhancing the QUAlity & Transparency Of health Research (EQUATOR) network, 2022; Hoffmann et al., 2014)]. It has been recognized that the onus lies with the researcher to be more transparent and comprehensive when describing areas including fidelity and adaptations, meaning that these intentions must be clear from the start of the research planning process (Gadaire & Kilmer, 2020). When developing the TIDieR, Hoffmann et al. (2014) recognized that it may not always be possible to include all of the intervention details in a paper. They suggest that authors indicate that they have reported each item and to state where this information is located. To overcome the potential barrier of article length, we recommend that at a minimum, researchers include the TIDieR checklist as a table in the text or in supplementary materials where possible.

3.2. Implications for editors, reviewers, and readers

More standardized reporting will help editors, reviewers, and readers to more accurately assess an intervention and its' evaluation, facilitating easier judgements about their rigor and potential implications. Hoffmann et al. (Hoffmann et al., 2014) encourage journals to endorse the use of the TIDieR checklist as part of the submission process (e.g., include in the author guidelines) and/or to publish guidelines for how to report interventions in that journal. Published protocols of proposed or ongoing studies (i.e., participant recruitment is not yet completed, and the study has not yet produced results) are becoming prominent in disciplines such as medical research to provide greater transparency to the research process, protect against damaging research practices (e.g., selective presentation of data or analyses), prevent unnecessary duplication of work, and encourage greater collaboration between research groups (Sucksmith, 2015). Applied sport psychology would also stand to benefit in similar ways, with study protocols providing an opportunity to convey more details about the intervention than what is possible in other article types (e.g., paper reporting efficacy/effectiveness of intervention).

Gadaire and Kilmer (2020) also suggested that using the TIDieR checklist, either alone or in conjunction with other relevant statements or checklists such as CONSORT, could have a substantial impact on the peer review and editorial decision process (Gadaire & Kilmer, 2020). That is, the efficiency of the process would be enhanced as reviewers and editors can focus on "higher level" issues and reflections, rather than on concerns related to insufficient reporting. However, Gadaire and Kilmer (2020) raised an important caveat to this point in that using the TIDieR checklist to effectively report an intervention and its' evaluation should not be confused with the effectiveness of the intervention itself (Gadaire & Kilmer, 2020). In other words, a poorly designed imagery intervention that is clearly reported is still not sufficient and does not adhere to rigorous research standards. This point provides further rationale for why interventions should be planned using the TIDieR checklist from the start of the research planning process, rather than trying to map on intervention components retrospectively.

3.3. Implications for applied practitioners

More standardized reporting of imagery interventions through TIDieR will help sports psychologists, coaches, and other practitioners by closing the know-do gap through communicating interventions in sufficient detail to enable translation of research into practice (Leggat et al., 2021). Through encouraging these evidence-based approaches, it will aid practitioners to determine: (a) if interventions are appropriate to suit their clients' needs; (b) whether tailoring is required and/or appropriate; and (c) if the intervention would be feasible within their available resources. In turn, this will encourage the adoption and replication of interventions, and their scaling upwards and outwards (i.e., within the same or different populations, using the same or different delivery mechanisms) to promote their use more widely in practice and subsequently increase the impact of the research.

Through planning interventions and evaluations with TIDieR, any additional training needs (e.g., LSRT, writing effective imagery scripts) for practitioners can also be identified and addressed prior to the intervention (Gadaire & Kilmer, 2020). Specifically in relation to imagery research, this is an important consideration to protect participants from harm due to the potential for imagery to have unintended and debilitative consequences (Short et al., 2002; Quinton et al., 2016). Therefore, this paper may be a useful pedagogical resource particularly for students and trainee sport psychologists who are embarking on applied research as part of their training.

Altogether, these implications and recommendations represent important next steps to advance the ongoing and evolving field of imagery research. In particular, we recommend further and more extensive testing of the new multidimensional anxiety model (Cheng & Hardy, 2016; Cheng et al., 2009; Jones et al., 2019) in combination with TIDieR guidelines for imagery interventions as well as examining the relationship between trait competitive anxiety, intrusive imagery, and emotion regulation strategies in athlete populations. These avenues for future research provide an opportunity to capitalize on an evidence-based approach and ask important theoretical questions that would contribute to the originality, significance, and rigor of imagery research.

4. Conclusions

In conclusion, adoption of the TIDieR checklist will help to address limitations of past sport imagery interventions with fuller, more accurate and standardized reporting, which in turn will benefit authors, reviewers, editors, readers, as well as applied practitioners. This paper makes an original contribution by demonstrating how TIDieR has been used to inform the development of a new theoretically grounded and personalized guided imagery intervention (PACING), including its rationale, aims, and logic model, as well as outlining the protocol for how its feasibility will be tested in future. Having standard reporting practices aligns with the "open science" agenda and the need to promote knowledge translation and close the "know-do" gap, improve replicability efforts, protect participants from harm because of inadequately planned, ill-defined research activities, clarify what are the core vs. adaptable features of an intervention, as well as make it easier to conduct systematic reviews and meta-analyses. Overall, using TIDieR in conjunction with the many other reporting guidelines available on the EQUATOR library of resources (e.g., CONSORT) will serve to improve the quality of imagery interventions as well as increase the impact of this research on its intended beneficiaries. However, it is also important to note that uptake and compliance to TIDieR has been low in other disciplines, also pointing to the need for mechanisms to be put into place to help with its implementation, including the development of journal policies (e.g., endorsing reporting guidelines, encouraging the use of supplementary materials), discipline-specific tutorials for authors, reviewers, and editors, as well as further examples made available (Dijkers & Millis, 2020; Gadaire & Kilmer, 2020; Hoffmann et al., 2014).

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Supplementary materials

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