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The need for adventure sports (AS) coaches to use effective judgement and to make sound decisions has been the topic of significant research in the last few years (Collins & Collins, 2012, 2013, 2015, 2016, 2021; Collins et al., 2015; Mees et al., 2020). Such research has made important contributions to understanding what decision-making (DM) is and its application in the AS domain. It has also demonstrated that DM is a critical skill for enabling AS coaches to manage the risks that are present in their operating environment whilst optimizing these for client benefit (Collins & Collins, 2013). Critically though, we would suggest that little, if any, attention has been given to *how* we evaluate if an individual possesses such a critical skill when they qualify as an AS coach. Accordingly, this position paper will attempt to illuminate the importance of assessment of DM in AS coaches; illustrate the role of expertise in underpinning effective DM in AS coaches; critically discuss the range of DM paradigms that can be applied and, developing an understanding of how AS coach educators may better identify valid evidence to make decisions about a prospective AS coach's DM. In conclusion, we identify areas of further exploration on the topic of evaluating DM in AS.

The Importance of Decision-Making in Adventure Sports Coaches

The AS operating environment is hyper-dynamic, highly complex and uncertain, often involving significant risk (Collins & Collins, 2013). Therefore, all AS practitioners must be able to make effective decisions to maintain their and their clients' safety throughout. Furthermore, for AS coaches, the need is even greater, as they may be responsible for practitioners who are unaware of the risks that they face (Collins & Collins, 2013). Consequently, this need for coaches to employ sound DM has been identified across research in this domain and has been proven essential to ensure coaches are able to manage the significant risks that are present in their operating environment (Collins & Collins, 2013, 2015, 2016; Collins et al., 2015, Mees et al., 2020).

The AS domain is subdivided into differing disciplines, (e.g., mountaineering, paddlesport, mountain biking). Due to the varied demands placed upon coaches across these disciplines (Cristian, et al., 2020) there are subtle differences in how the qualification levels within the coaching hierarchy are structured resulting in many, and often conflicting, naming conventions for coaches and leaders used in the different AS domains. For clarity we shall use the following naming conventions: Practitioner(s) - participants in AS with no inference to their ability or expertise; Coach(es) - those who by virtue of their stated competence lead or coach others in an AS activity; Prospective Coach(es) (PC) - those who are in the process of gaining a statement of competence to lead or coach others in an AS activity; and, Coach Educator(s) (CE) – those AS coaches who, are authorized by their respective NGB to qualify PCs as Coaches.

Although the interdisciplinary differences remain, there is a good deal more coherence in policy and practice across AS worldwide. From a policy perspective in the UK, the 1993 Adventure Activities Licensing Service (AALS) Legislation (The Activity Center's (Young Persons' Safety) Act, 1995) clearly stipulates the requirement for competent individuals (Adventure Activities Licensing Authority, 2013a,b) and a clear understanding and management of risk; both of which identify DM as a key enabler. The Health and Safety Executive (2021), specifies competence as a person's ability to apply their training, skills and experience to perform safely. Moreover, the Health and Safety Executive (HSE) Chair, Judith Hackitt states, 'the essence of competence is relevance to the workplace. What matters is that there is a focus on both the risks that occur regularly and those with serious consequences'. This statement accepts the requirement for contextualization of competence to the operating environment. Given the complexity and potential hostility of the AS operating environment, we would suggest that the quality of DM for AS Coaches, by virtue of their role, is critical in ensuring safety.

DM is also a fundamental part of the coach's toolbox, critical for allowing practitioners to experience risk in the AS domain (Collins & Collins, 2015). Further contextualization of the importance of DM in AS is highlighted by Gill (2010, p. 13), who states: 'people take, and expect, a

balanced approach to decision-making; one that takes into account a range of factors, of which reducing adverse outcomes is but one'. This reinforces the need for effective DM as a coach, balancing the need for practitioner learning and experiential gain from their exposure to appropriate risk, against the actual possibility of bodily harm.

The Recognition of Decision-Making Competence by National Governing Bodies

This necessity for effective DM is reflected by National Governing Bodies (NGB), as their syllabi outline the need for coaches to possess DM competence as an integral part of a coach's discipline competency (e.g., British Canoeing, 2016; Mountain Training, 2020). Consequently, such domain competency would appear to be aimed at meeting the requirements of the HSE, who state, through AALS that, the competence of a coach can be established typically by one of three methods; external qualifications with an appropriate syllabus, (e.g., NGB coaching awards), in–house training leading to a statement of competence, and, assessment of experience leading to a statement of competence (The Activity Center's (Young Persons' Safety) Act, 1995).

When making a competence statement, HSE require that an assessment is undertaken (Adventure Activities Licensing Authority, 2013a,b). This, combined with NGBs establishing DM as a key competency for AS coaches, means we must accept that effective DM forms at least an important part of the legal requirement of AS Coach competency. Consequently, given the research, evidence and emphasis on DM in NGB coach qualifications, we must assume that a summative evaluation of a PC's DM efficacy is required.

Experience as a Prerequisite of Effective Decision Making in Adventure Sports

The proven emphasis on the importance of experience as a necessity for developing DM expertise and its adaption by experts is well supported (Collins & Collins, 2015; Klein, 1993, 2008; Kahneman & Klein, 2009; Martindale & Collins, 2005; Mees et al., 2020; Taleb, 2010). Given the exposure required to gain such experience, it can be assumed that higher-level coaches are more likely to have gained sufficient exposure to complex and demanding situations, allowing them to demonstrate more effective DM strategies (cf. Kahneman & Klein, 2009). Typically, the opposite can be said for less qualified

Coaches. Furthermore, the scarcity of experience of environments with adequate cues in low-level coaches presents an increased risk of poor DM, due to their potential lack of exposure to DM cues from which to learn (Kahneman & Klein, 2009). In particular, there is a marked difference between higher- and lower-level coaches' cognitive agility and their adaptive expertise within the operational environment, which is reflected in the coach's DM prowess (Mees et al., 2019).

The Requirement to Evidence Experience

Some NGBs require a minimum number of logged events to ensure a candidate has the opportunity to develop some experience. Notably, however, this is a *minimum* expectation for entry as a coach and certainly not the gold standard (Mountain Training, 2020). Indeed, candidates are strongly recommended to gain much more experience than the prescribed minimum prior to assessment. This need to evidence logged events can be supplemented by the requirement to have an already qualified sponsor and mentor throughout the PC's progression to assessment. Such an approach could be seen as a positive effort to further encourage review and reflection to gain more authentic experiential evidence (Collins & Collins, 2015, 2021). Unfortunately, however, these mentors and sponsors do not form part of the actual assessment of the PC and, whilst they may add more validity and authenticity to the gained experiential episodes documented in the logbook, they do not necessarily demonstrate that the PC has the ability for effective DM in their operating environment (Curcin et al., 2014). Conversely, some NGBs require no validation of a PC's experiential journey, a simple set of logged events will suffice (British Canoeing, 2020). This may present far less educational authenticity and cannot be simply assumed to provide sufficient evidence of gained experience due to inaccurate or incomplete descriptions or the candidate's attempt to appear more knowledgeable or experienced than they actually are (Stoszkowski et al., 2020). Indeed, Curcin et al.'s (2014) Ofqual report specifies that such historic assessments, whilst useful, *must* be authenticated by the assessor: something that may be impractical for an assessor to achieve unless there is further supporting evidence to substantiate the log. Recent recommendations (Ofqual, 2020) will require NGBs with Ofqual awards to introduce more robust assessment scrutiny and audit procedures to increase assessment validity. This Centre

Assessment Standards Scrutiny (CASS) process will require all assessments to be valid, authentic, current, reliable and sufficient (British Canoeing, 2021). This requirement is, we would suggest, likely to be transposed on top of non-Ofqual awards, such as those for leadership. Harth and Hemker-Cito (2011) go further in highlighting that assessors looking at DM processes may over-estimate the value of evidence, which will impact on reliability of their assessment. However, despite this they state the benefits of including such assessments due to their flexibility and workplace relevance.

Throughout the PC's experiential journey, the value of effective feedback and review is of significant benefit to establish appropriate mental models to allow for factors such as hazard identification and recognition of environmental cues (Richards et al., 2012; Collins & Collins, 2016). However, feedback and lessons learned can be of varied quality (Khaneman & Klein, 2009) such that ad-hoc peer feedback, remembered narratives and narrative fallacies may have a detrimental effect of the quality of any assessment of DM (Taleb, 2010; Khaneman & Klein, 2009). Factors affecting DM are often intricate, and nuanced (Collins & Collins, 2013, 2015). Therefore, it is suggested that given the complexity and dynamism of the operation environment, combined with the nuanced nature of DM (Collins et al., 2015), the CE will require high levels of expertise to evaluate DM in a PC. To do this the CE must recognize and understand relevant cues (Kahneman & Klein, 2009), possess significant adaptive expertise (Mees et al., 2020) as well as having the repertoire of skills available to fully judge the efficacy of DM made (Giblin & Cunliffe, 2020). Therefore, the value of an expert eye in providing feedback on DM and thus enhancing learning through the establishment of alpha (i.e., initial models) and the evolution of beta (i.e., reviewed or subsequent iterations of previous models) shared mental models (SMMs) will be invaluable in developing positive experiential episodes (Richards et al., 2012).

What is More Important in the Assessment of Effective Decision Making? Decision Outcome or Decision-Making Behaviors

The literature makes it clear that for any given combination of personal, cultural and technical factors within a highly complex operation environment, there is never a single *right* answer (Davis & Kahan, 2007). Moreover, when considering the possibility that a positive result may be down to pure luck

rather than judgement (Giblin & Cunliffe, 2020; Taleb, 2010), making an authentic and valid assessment becomes more difficult. So much so that we would suggest that, at times, a CE may never be wholly sure that the outcome of a PC's decision is fully attributable to the decision maker and not overly influenced by many complex factors, such as the decisions and actions of others (Kahneman, 2011). All this makes evaluating DM a significant challenge.

In light of such complexity, to understand how best to evaluate decisions made by PCs we would suggest considering *how* a PCs' behaviors facilitate their DM across their AS discipline rather than focusing assessment on any specific decision *outcomes* (Davis & Kahan, 2007; Giblin & Cunliffe, 2020; Kahneman, 2011). To do this it is important to consider how forethought may be a more useful insight into effective DM than foresight. This in turn will allow us to illustrate how a more expertise-oriented approach may be more suitable to evaluate DM in PCs than a competency-based assessment.

Focusing on a PC's ability to make *correct decisions* in such a complex and hyper-dynamic operational environment would require the PC to possess the ability to predict the future (Kahneman & Tversky, 1973). This is a capacity for foresight – which the Cambridge English Dictionary (n.d.) describes as 'the ability to judge correctly what is going to happen in the future and plan your actions based on this knowledge' – which implies prophecy and intuition. Instead, we would suggest, the best any human could summon would be forethought – 'the good judgment to consider the near future in your present actions' (Cambridge English Dictionary, n.d.) – suggesting planning and consideration.

It is contended, therefore, that none of the HSE's (Hackitt, 2021) competencies can be aimed at the ability of a PC to demonstrate only the *right decision* on assessment – which would require foresight – but rather are aligned with the PC's knowledge and skill to be able to demonstrate appropriate DM behaviors – requiring forethought. This subtle shift in focus aligns with what Collins et al. (2015) suggest is a more expertise-based, rather than a competency-based, approach to DM, which is illustrated in Figure 1. Here we have developed Collins & Collins' (2012) model to illustrate how DM and expertise apply to the whole range of competencies within AS and how those competencies are sub-skills that form the whole (Collins & Collins, 2012; Collins et al., 2015). This

suggests that any evaluation of DM focuses on those methods and approaches which underpin the PC's ability to employ appropriate forethought for effective DM rather than the de-facto success of any decision made (Giblin & Cunliffe, 2020). Accepting that a more expertise-oriented approach may be the most appropriate method to evaluate DM in AS PCs, we next explore DM paradigms applicable to AS and how they may be effectively utilized in the AS domain.

(Insert Figure 1. Near here)

Decision Making Paradigms that can be Applied to Adventure Sports

Several DM paradigms could be applied to the AS domain. These span a continuum from the rationally analytical (Classical Decision Making [CDM] and Type 2 thinking) to the fully intuitive (Naturalistic Decision Making [NDM] and Type 1 thinking) (Abraham & Collins, 2015). These DM paradigms are often felt to be in opposition, although much of the underlying research would suggest that this is not so (Davis & Kahan, 2007; Kahneman & Klein, 2009). Such a black and white interpretation may possibly be due to the perceived utility of the DM paradigms in differing situations, such as planning compared to in-action, as well as the individual's natural preference and experience of one particular paradigm (Davis & Kahan, 2007). Indeed, several DM models recognize the use of both rational-analytical and intuitive paradigms, especially in non-linear and complex environments. One of these is Recognition Primed Decision Making (RPD) which has a proven track record in a wide range of applications, including highly complex and dynamic environments such as the Military and Emergency Services (Klein, 1993, 2008). RPD has three distinct levels. The first seeks to establish an initial match. This is an intuitive and automatic comparison between environmental cues. The next level is diagnosis. Occurring when cues mismatch, leading to mental simulation based on expert knowledge. Then finally, evaluation. This is required when cues are recognized but no solution is forthcoming. This requires a more thorough, mental simulation of options and imagined outcomes to establish a course of action. Despite RPD's extensive use in varied roles, and numerous studies demonstrating its efficacy (Klein, 2008; Klein, 1998; Lipshitz et al., 2001), it is suggested that its

reliance on high levels of experience may preclude lower-level coaches and PCs, and as such may not be ideal for use as a single model to be employed across the educational hierarchy.

The Use of Professional Judgement and Decision Making in the Decision Making of Adventure Sports Coaches.

DM in AS applies across the entire AS domain and throughout the whole continuum of any coaching / led event (Collins & Collins, 2015). Furthermore, it can be suggested from the discussion earlier that no one DM paradigm can always be successfully applied. Rather, a more nuanced and adaptive approach may be required. First proposed by Martindale & Collins (2005), Professional Judgement and Decision Making (PJDM**)** is inclusive of all DM paradigms, ultimately allowing the coach to employ the optimal DM methodology, given the coach's or practitioner's preferred style, the operating environment and time constraints. Furthermore, it seeks to encourage a deeper philosophical understanding of the professional facets of the coach's role (Abraham & Collins, 2015).

PJDM lends itself more readily to those DM models that have potential to be applied at multiple stages of the process, minimizing the need for coaches to use a single DM model at all stages. Furthermore, a significant amount of research has been completed on the use of PJDM within AS and its encompassing of these diverse DM paradigms reflects the more natural application of DM by coaches (Collins & Collins, 2015, 2016). The utilization of differing DM paradigms at different stages of a coaching event, may even enhance contrasting DM methods at another stage. For example, CDM style approaches fit more easily into pre- and post-activity learning and DM, where time constraints may be lessened allowing more time for Type 2 cognition. This can maximize the opportunity for techniques, such as pre-and post-mortems (Kahneman, 2011), red teaming (Ministry of Defense, 2013) and assumption-based planning (Dewar et al., 1993), all having proven benefits for the development of NDM in dynamic and complex environments (Davis & Kahan, 2007).

In addition, by utilizing multi-model DM strategies, PCs have the potential to further develop mental models (Richards et al., 2012; Davis & Kahan, 2007) and so enhance NDM approaches, with Mees et al. (2020) suggesting that the significant and skillful usage of PJDM in elite coaches allows

for a reduction in cognitive load when most needed – in the task. Thus, the symbiotic approach to DM paradigms acceptable within the PJDM approach allows for a more nuanced and tailored coaching style. This may be seen to be especially true when PCs are mentored by more experienced CEs (Richards et al., 2012).

Understanding How Coach Educators Make Decisions about a Prospective Coach's Decision Making

Collins and Collins (2013, p. 72) state 'the exact nature of this decision-making process should form the basis of coaching practice and coach education in this complex and dynamic field'. This idea can also be applied to decisions made about a PC's DM. Indeed, once qualified it could be argued that the future decisions of the PC will be born from the decision to qualify them. The importance of DM in these operating environments is amplified by the legal requirement for competency and constrained by the difficulties faced by coaches in gaining commensurate experience. Furthermore, the inclination for both CEs and PCs to employ unrestrained naturalistic decisions, combined with the psychological limitations created by biases, present a seemingly insurmountable level of difficulty in assessing a PCs DM ability. This difficulty is highlighted by Tversky and Kahneman (1974) who define the inability of humans to predict outcomes as the illusion of validity – a cognitive bias. Reflecting on this, competency-based DM assessment, begs the question; how do we know that the coaches we are qualifying will have the expertise to make appropriate decisions in the future?

Ensuring an Evaluation of a Prospective Coach's Decision Making is Valid

Taking a closer look at what is expected of the educational norms, with regard to assessment validity, may offer insight into a more appropriate method for evaluating the PC's DM ability. Moss et al. (2006), suggest assessment should support professionals in making interpretations, decisions and actions that enhance students learning, they also go on to explain that educational validity refers to how accurate those interpretations, decisions and actions are. To make an effective decision, the AS coach will need to initiate several critical factors in their DM. Such factors include utilizing pedagogical agility, analyzing information, recognizing environmental cues, and then selecting or

creating the most appropriate tools to complete the task (Mees et al., 2020). Establishing an evaluation of all these factors against a decision's outcome would not, therefore, represent an educationally valid method (Moss et al., 2006). A more appropriate form of assessment may be to use a more hermeneutically oriented evaluation (Solloway & Brooks, 2004; Schwandt, 2007) to ensure validity. Moss et al. (2006, p. 130) suggest seeking 'to understand the "whole" body of evidence in light of its parts and the parts in light of the whole'. Consequently, this allows the evaluation of expertise and DM across a domain whilst acknowledging those sub-sets of skills that also contribute to the whole (Mees et al., 2020). Such an approach to evaluating DM links seamlessly with the development of a wider philosophical understanding of the professional aspects of coaching and so fits within the PJDM approach (Collins et al., 2015).

Developing a more hermeneutically interpretive (Solloway & Brooks, 2004; Schwandt, 2007) style of assessment would require the development of more specific educational validity theories for AS. Doing so may further improve the professional credibility of the AS coaching profession. This would also meet the HSE's (and others internationally) intent to align assessment and workplace relevance (Hackitt, n.d.).

Educational Validity Theories in Adventure Sports

From the discourse above, the assessment of DM purely against a successful outcome is misaligned, and as such would fail to meet those educational validity criteria highlighted by Moss et al. (2006). More appropriate would be a hermeneutic expertise-based approach to evaluate DM effectiveness in a PC. As Collins et al. (2015, p. 2) state, 'it has been acknowledged that learning from "recipe-like" experiences of expert practitioners (i.e., what they did) is limited unless considered in tandem with why they did it'. Moreover, Collins et al. (2015, p. 4) establish that:

> Emphasis on whether or not an individual is competent patently neglects the essential subtleties of executional decision making, and emphasis on the <u>*what*</u> instead of the *why* represents satisfaction of a minimum rather than the far more desirable expert standard.

In the context of PC assessment, the reproduction of the *what* (competence-based assessment) would fail to acknowledge the *why* (expertise related). Moreover, both must be considered as parts of the whole from a hermeneutic standpoint. Moss et al. (2006, p. 109) resonate Collins et al.'s (2015) sentiments when they propose that Educational Validity Theories (EVT), define how effective a candidate's understanding, decision or performance is, and the basis, thinking or evidence, upon which this decision is made. Moss et al. (2006), go on to propose that and EVTs will further enhance more sound judgements.

This, we suggest, could be summarized into three levels (see Table 1.).

(Insert Table 1. near here)

Assessment in AS should support the use of EVTs to evaluate those decisions a PC makes (Moss et al., 2006). This would represent an epistemological and philosophical stance, further enhancing the justification of knowledge claims, and thus, offers reinforcement to PJDM as a philosophy of science (Moss et al., 2006; Collins et al., 2015). It is, therefore, proposed that an evaluation of a PC's DM should consist of two inter-related parts, viewed across the whole of the relevant AS domain. For example, the CE views how the PC's individual competencies are varied and applied whilst, concurrently establishing that the PC's DM behaviors follow appropriate pathways to reach acceptable results. This should be achieved by utilizing pre-, in-, and post-action evaluation of the DM behaviors, with regard to the *what* and *why* evidence in order to develop a hermeneutic evaluation of performance. Analysis and evaluation of the PC's DM behaviors in such a complex and dynamic operating environment may be further enhanced by using decision support tools.

The Use of Decision Support Tools by Coaches in Adventure Sports

Decision Support Tools (DST) have been summarized as the range of computer-based tools created to enhance sound decision-making, where the computer element is a necessity for processing complex and vast amounts of data (Wong-Parodi et al., 2020). Where the use of a computer-based system is inappropriate or where data complexity is manageable, such as by an AS coach in an appropriate operating environment, we would suggest that a cognitively processed tool to support DM would also

constitute a DST. Such cognitive DSTs have been incorporated into military decision support systems as well as being utilized as stand-alone DSTs (Davis & Kahan, 2007). Of note is the use of CDM-style DM schematics, red teaming and elements of assumption-based planning (Dewar, 1993). Furthermore, Davis & Kahan (2007) highlight the key requisite attributes of DSTs: Assuring that risks and risk mitigation are managed whilst allowing multiple mechanisms for doing so, providing CDM preferred decision makers with the support that highlights risks and mitigation pre- and during- action and ensuring NDM preferred decision-makers develop plans whilst identifying potential issues to be overcome and contingency plans. Finally, in both cases, deal with all relevant factors, objective or subjective.

These attributes support a PJDM emphasis on cross-DM paradigm thinking (Abraham & Collins, 2015), by ensuring that the whole continuum of DM styles is catered for in a non-prescriptive way. Furthermore, effective hermeneutic EVT (Moss et al., 2006) is achieved by DSTs focusing the coach's attention on the *why* of DM and developing methods of understanding how to make more sound interpretations, decisions and actions. Given the highlighted benefits of utilizing DSTs and effective EVTs inside the bounds of PJDM as methods of evaluating DM within AS, we now explore the merits of Collins and Collins' (2021) 'Big 5' approach as a potential example of evaluating DM within AS and consider other relevant benefits of this method as an approach to making expertise-oriented assessments of DM in AS.

The Use of Collins & Collins (2021) 'Big 5' Approach as an Exemplar Educational Validity Theory and Decision Support Tool

The 'Big 5' is a recently developed approach proposed by Collins and Collins (2021) which compliments the PJDM approach. The 'Big 5' offers a series of cognitive steps that provide an incrementally focused lens on performance in AS and wider coach DM (Collins & Collins, 2021). The process requires users to consider a range of graduated questions which, through their increasing complexity and depth, cause structured reflection on the nature of their PJDM processes (Collins & Collins, 2021). Initial pilot studies have shown promising results across a range of high-level coaches,

acknowledging a positive impact on communities of practice, SMMs and DM (Collins & Collins, 2021). In addition, candidates developed more accurate memory reinstatement of events. Additionally, by enhancing situational awareness at all levels (Endsley, 1988), through clarified perception, candidates demonstrated more detailed and enhanced comprehension, followed by projection of future outcomes. Moreover, candidates acknowledged the approach's adaptability to their role and personal coaching styles. As such, aligning with both the PJDM approach (Collins et al., 2015) and Davis and Kahan's (2007) requisite attributes for DSTs. In particular, the use of these incremental cognitive lenses links seamlessly with the concepts of the EVT and the DST, by allowing the CE to focus on the problems and practices in the moment and the practices across the whole task (Moss et al., 2006). The modified question structure used in Collins & Collins (2021) study is reproduced in Table 2. with comparative EVT and DST facets.

When viewed against the domain of educational assessment, we can easily translate the progressive nature of the 'Big 5' (Collins & Collins, 2021) questions into those key characteristics Moss et al. (2006) determine as essential for quality EVTs. By analyzing Table 2, we can determine those 'Big 5' Questions (Collins & Collins, 2021) that are CR, where the coach reflects and analyses the event and its causality, such as what led to what and why. This rational process relates to CDM and explores risk mitigation factors. CP involves the coach playing out the schema of causality in their cognitive present, developing intuitive possibilities against possible hurdles, and engaging Type 1 thought, constrained by Type 2 considerations.

Finally, the most focused lenses require future-oriented thought purposed to develop possible scenarios growing from actual events, then a 'pre-mortem' style analysis of future possibilities (Kahneman, 2011). This could be summarized as a series of 'adaptive cognitive lenses', requiring focus on those varying factors which underpin effective DM. This, we propose, demonstrates the usefulness of the 'Big 5' (Collins & Collins, 2021) approach in providing enhanced educational validity and its value as a DST. The process of utilizing such a whole-domain expertise methodology may prove a useful method for evaluating the DM of PC (Collins & Collins, 2021).

(Insert Table 2. near here)

Further considerations of the Big 5 approach.

By allowing individuals to create their own understanding of the DM phenomena experienced, the 'Big 5' approach creates relativist ownership of the pedagogical process and greater personal engagement (Baghramian & Carter, 2020). As such, it can be seen as a reflexive tool that is phenomenologically constructivist in nature (Allen, 1994; Wilkinson et al., 2020). By constraining the memory reinstatement of recalled events with cognitive lenses, the user is forced to challenge any cognitive bias through methods typical of those utilized within 'design thinking' (Leidtka, 2014). Indeed, the 'Big 5' questions (Collins & Collins, 2021) used bear alignment to the Darden Business School 4 Question Model (Leidtka & Ogilvie, 2011). The Darden model offers a simple formula linked to the reduction of cognitive biases (Leidtka, 2014), and as such may minimize the risks of under-utilized Type 2 thinking, especially in settings more aligned with the NDM paradigm.

The 'Big 5' approach, when utilized to evaluate the DM of a PC, involves relativist thinking and a deep appreciation of the cognitive complexity through establishing SMMs (Wilkinson et al., 2020). Wherein by proposing the 'Big 5' questions and attempting to understand the PC's answer, coaches must use a conceptualization of the PC's own interpretation of the phenomena, 'based on the [inferred] meaning of the description and on their knowledge' (Johnson-Laird, 2010, p. 18244). This is then measured on how it corresponds to the coach's own experience of the event. As such the coach may find it fruitful to engage in their own 'Big 5' analysis about the assessment they are conducting, thus establishing their DM within a stronger epistemological chain (Collins & Collins, 2021; Collins et al., 2014; Grecic & Collins, 2013). Moreover, the continued use of such a reflexively looped approach may further assist in the development of both alpha and beta SMMs (Richards et al., 2012), and thus enhance 'on task' DM and adaptive expertise (Mees et al., 2020).

The Application of Decision Support Tools to Current Practice

An AS CE can employ the 'Big 5' (Collins & Collins, 2021) approach as a tool for enquiry, providing insight into the DM behaviors a PC is able to effectively deploy when making decisions. Its inherent

flexibility would allow incorporation into pre-, during-, and post-activity analysis. Moreover, its apparent utility as a DST means that this single approach may be more readily inculcated into the hierarchical organizational structures of NGBs. Indeed, this DST and similar may have extended use beyond the coaching paradigm. Allowing AS practitioners to utilize this style of DST may eventually see a bottom-up development of improved DM awareness and thus allow expertise progression to be optimized, enhancing SMMs of DSTs across the coaching community. Furthermore, utilizing such DSTs with practitioners early in their AS journey may amount to 'sowing the seeds' of effective DM such that in later years the PC may already ultimately possess the frameworks for those mental models they will employ as coaches (Richards et al., 2012). By already possessing these alpha SMMs, the PC's ability to work with higher levels of cognitive complexity may be enhanced (Wilkinson et al., 2020; Johnson-Laird, 2010). To comply with Ofqual's CASS requirements for authentic and sufficient evidence may also present significant problems for a competency-based approach, especially for DM assessment where evidence needs to show complex and nuanced judgements in near real-time. Behavioral evidence may, we suggest, be more appropriate.

On a broader note, it is proposed that well-constructed DSTs, which offer high levels of educational validity, can, where employed simply, be offered to all levels of AS practitioners. This, we suggest, would create a DM theme cross-cutting through the hierarchies of AS practitioners, where these tools will in time become cultural norms. Thus, enhancing the AS community of practice. The (Collins & Collins, 2021) 'Big 5' approach appears to be a sound example of such, although there is likely merit in investigating further iterations of educationally valid DSTs, utilizing Design Theory methods. One such example would be the 'Communication; Line of sight; Avoidance; Position of most usefulness' set of prompts commonly utilized by paddlers.

Conclusion and Recommendations for Future Enquiry

DM is a critical part of the AS coach's expertise due to its impact on safety, effective coaching and ensuring legal compliance. When examining how AS Coaches are assessed we can see that there is currently little educational validity in the evaluation of DM within AS, due, in part, to the current focus

on competence-oriented assessment methods. We contend that further attention should be given to the complexities of evaluating DM in AS coaches, in particular, to develop an expertise-oriented approach to DM evaluation. Due to the varied environment of AS and the complex demands on the AS coach, we can see that no one DM paradigm could be considered to be a 'best fit', rather the PJDM approach to DM presents a more nuanced and applicable model, which is already found to have significant application within AS. The 'Big 5' approach is promoted as having significant potential to develop DM within the domain of PJDM in AS and the authors' call for further consideration of its merits is echoed. Moreover, it is suggested that due to its exemplary DST and hermeneutic EVT characteristics it allows for a more effective pathway toward evaluating DM within AS, in particular, for those who seek to qualify as AS coaches. As such, other DSTs should be investigated to understand their educational validity as methods of evaluating AS coach DM. Further study in Design Thinking methodologies to create alternate DSTs with improved educational validity, that align with the PJDM domain, would also be encouraged.

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Figure 1. *The Relationship Between Collins & Collins (2012) Adventure Sports Competencies, Expertise and Decision Making).*

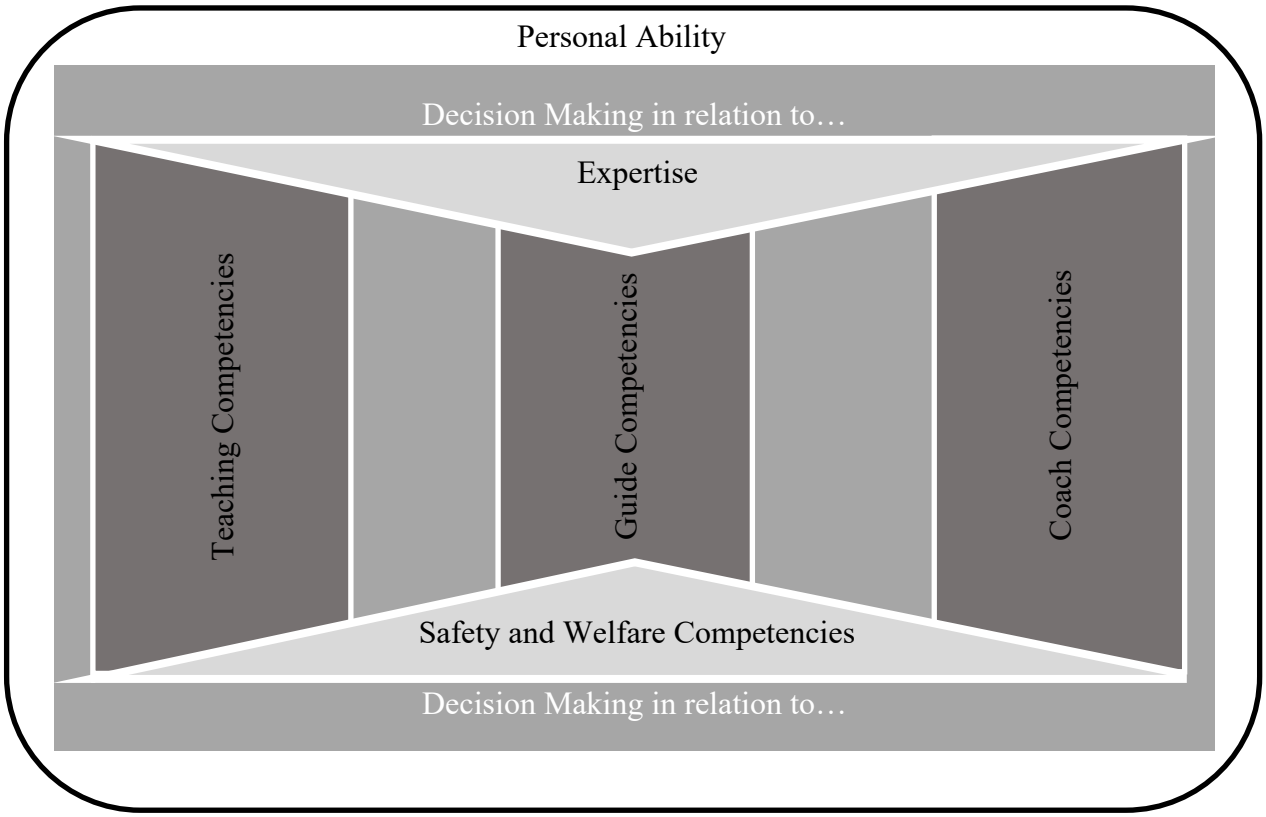

Table 1: *Establishing the Relationship Between Moss et al.'s (2006) EVT Levels and Collins et al.'s (2015) Notion of Competence and Expertise.*

EVT related level.		
1. Guidance.	The w*hat* that constitutes sound action.	Being causal and reflective (CR)
2. Evidence.	Demonstrating Level 1.	Being contributive and in the present (CP).
3. Development.	Of Levels 1 and 2.	Being purposive and future oriented (PF).

Table 2. *Comparison between Collins & Collins (2021)Big 5 Approach and DST Facets and EVT Levels.*

Big 5 Questions (Collins & Collins, 2021)	SA Level	DST related facets.	EVT related Levels. Level 1	Level 2	Level 3
1. What occurred and what did you do?	1	Rational DM style.	CR		
2. Describe how else you could have done this.	2	Assure risk mitigation. Intuitive DM style.		CP	PF
3. What factors made you choose that way?	2	Rational DM style. Hard and soft factors.			
4. What would have caused you to choose one of the alternative ways?	3	Assure risk mitigation. Hard and soft factors. Rational DM style.	CR		PF
5. If (example of a real situation) happened, what would you do?	3	Assure risk mitigation. Intuitive DM style. Hard and soft factors.			