ISSN: 2978-2333

Journal of Sports Psychology and Medicine

SCIENTIFIC Research and Community

Research Article

Open Access

Mindfulness-Acceptance-Commitment Approach with Wheelchair Rugby Athletes: A Preliminary Case Study

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ABSTRACT

Research on sport psychology interventions involving adaptive athletes remains limited, leaving practitioners with relatively little evidence to guide applied practice. This preliminary study explored the use of the Mindfulness-Acceptance-Commitment (MAC) approach with three wheelchair rugby athletes. Participants completed measures of flow, interoceptive awareness, and mindfulness in sport before the intervention, at its midpoint, and after its completion. Following the intervention, semi-structured interviews provided additional insight into participants' experiences. Interview responses and researcher observations were used to contextualize individual patterns in questionnaire scores. The findings suggest the MAC approach may have value for wheelchair rugby athletes however, the small sample and descriptive design warrant cautious interpretation and further investigation.

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Received: October 17, 2026; **Accepted:** October 21, 2026; **Published:** November 02, 2026

Introduction

Adaptive athletes are an underrepresented population in literature investigating sport psychology interventions and population best practices [1-3]. Studies have investigated the differences between adaptive athletes and nondisabled athletes and other authors have written about the unique considerations for this population [4-12]. Of the limited number of intervention studies, researchers have explored self-talk and imagery and collective efficacy with wheelchair basketball athletes. Similarly, evaluated a psychological skills training program with a single, elite athlete competing in disabled water-skiing, and studied the effects of an eight-week mindfulness intervention and its effect on salivary cortisol levels prior to competition [13-16].

Research has shown mindfulness-based interventions to be effective in improving performance in athletes [17]. Other studies have found mindfulness-based interventions to be efficacious with several different populations, across various domains [18-23]. Additionally, mindfulness-based interventions have been shown to have potential ancillary benefits outside of increased levels of mindful behaviors such as reduced incidence of injury, increased acceptance of emotional experiences, and improved skill acquisition in novices [18,21-23].

Additionally, research has begun to link mindfulness with flow, which is a state believed to produce improved performance [24]. Csikszentmihalyi describes flow as being in a state of optimal performance that occurs when a balance between the challenges and perceived capabilities is achieved [25]. While in this state, the performer is fully engaged with the present moment. Other terms have been used interchangeably with flow such as being "in a zone" or "in the groove" [25]. In a study included in Gardner and Moore athletes who participated in the MAC approach reported greater overall flow experiences than athletes who participated in a traditional psychological skills training program [26]. Schwanhausser supported these findings in a case study investigating the MAC approach with an elite adolescent swimmer [27]. The participant reported increased experiences of flow after the intervention. Zhang found that individuals who participated in a MAC approach modified for a Chinese population had higher flow scores than those who were in the control group. These studies investigating the MAC approach suggest that this program may be an avenue to increase the frequency of flow experiences [18].

Another concept related to mindfulness is interoceptive awareness, described as an individual's ability to distinguish different conditions in the body. Interoceptive awareness has been conceptualized using other terms such as somatic awareness and body awareness by researchers [28]. This relates to athletes using wheelchairs as it is likely that these athletes have experienced some type of spinal cord injury [29]. Outside of injuries and complications related to sport participation, these athletes have concerns related to the injury as well as long-term wheelchair usage. Researchers have found that individuals using wheelchairs who experienced spinal cord injury tend to experience chronic pain [30,31]. Studies of interoceptive awareness have explored mind-body therapies, such as mindfulness-based interventions, and recent studies have begun to explore the potential ability to improve interoceptive attentional styles with pain [32]. These findings suggest that mindfulness-based interventions may help improve interoceptive awareness of wheelchair athletes. Such improvements could influence how athletes respond to chronic

pain and potentially support sport participation.

The mindfulness intervention used for the present study was the Mindfulness-Acceptance-Commitment (MAC) approach [26]. The MAC approach was designed to promote the acceptance of internal experiences while focusing on relevant performance cues. Important aspects of the MAC approach are the acceptance of internal processes and a focus on actions and choices in the service of personal performance and life values [26]. To achieve the goals of the MAC approach, a specific protocol is used and tailored to each performer.

The purpose of this preliminary case study was to explore changes in flow, interoceptive awareness, and mindfulness in sport among wheelchair rugby athletes participating in the MAC approach. Quantitative questionnaire scores were examined alongside interviews and researcher observations to provide a more comprehensive account of each participant's experience. This mixed-methods approach offers preliminary insight into the potential applicability of the MAC approach within wheelchair rugby and responds to calls for case studies integrating qualitative and quantitative methods among athletes with physical disabilities [15].

Method

This study used a mixed-methods, multiple-case design to explore participants' experiences with the MAC approach and describe changes in flow, mindfulness in sport, and interoceptive awareness. Questionnaire scores were examined descriptively, and interviews and researcher observations provided context for interpreting individual patterns.

Participants

The final sample comprised three wheelchair rugby athletes (n = 3): two men and one woman. Their mean age was 31 years and they averaged approximately eight years of wheelchair rugby experience.

Procedures and Design

The study employed a mixed-methods design. Before beginning the study, all participants read and signed an approved Institutional Review Board informed consent and were informed about the purpose of the study. The Institutional Review Board approved all recruitment and study procedures. After giving consent, a pseudonym was given to participants to ensure confidentiality. Descriptive information about the participants was collected. The intervention consisted of seven one-hour sessions delivered by the researcher, previously demonstrated to be effective by [26]. The sessions were completed in the following order, with at least five days between each session, per the protocol: (1) psychoeducation, (2) introducing mindfulness and cognitive defusion, (3) introducing values and values-driven behavior, (4) introducing acceptance, (5) enhancing commitment, (6) skill consolidation and poise, and (7) maintaining and enhancing mindfulness, acceptance, and commitment. After each session, the primary investigator recorded notes about the progress of the participants and discussed their cases with the other investigators. To evaluate the efficacy of the MAC approach and establish trends, three questionnaires were administered prior to the start of the protocol, at the midway point (after the third session), and upon completion of the seven sessions.

The Multidimensional Assessment of Interoceptive Awareness (MAIA) was used to evaluate interoceptive awareness [28]. The Mindfulness Inventory for Sport (MIS) was used to measure mindfulness behaviors in the participants' sport [33]. The Dispositional Flow Scale-2 (DFS-2) was used to measure changes in participants' propensity to experience flow [34]. At the end of the protocol, a semi-structured interview was conducted to study and report the participants' experience with the MAC Approach. Afterwards, the researcher transcribed the interviews. The transcripts were sent to participants to review to ensure the accuracy of their reports. Prior to recruitment of participants, a former wheelchair rugby player piloted the questionnaires and interview questions.

Instrumentation

Participant Characteristics: Eight individuals consented to participate. Of the eight, six participants completed the pre-survey. One participant (n = 1) did not complete any sessions, two participants (n = 2) completed the first session and three participants (n = 3) completed participation in the study in its entirety. Players also indicated their player classifications. In wheelchair rugby, players are classified from .5 to 3.5 in .5 increments. Classifications are based on muscle strength testing and sport activity testing performed by certified United States Quad Rugby Association with higher class numbers indicating less severity of impairment and lesser impact on sport specific activities [35].

- Mike was a 31-year-old male wheelchair rugby player with 3.5 years of experience in the sport.
- He was classified as a 0.5 player and reported limited prior experience with mindfulness.
- Frank was a 36-year-old male wheelchair rugby player with 14 years of experience in the sport.
- He was classified as a 3.5 player and reported no prior experience with mindfulness.
- Anne was a 26-year-old female wheelchair rugby player with six years of experience in the sport.
- She was classified as a 0.5 player and reported limited prior experience with mindfulness.

Dispositional Flow Scale-2: The Dispositional Flow Scale-2 was designed to measure the frequency of flow experiences in general [34]. This scale has nine subscales: Challenge-Skill Balance, Action-Awareness Merging, Clear Goals, Unambiguous Feedback, Concentration on the Task at Hand, Sense of Control, Loss of Self Consciousness, Transformation of Time, and Autotelic Experience.

Multidimensional Assessment of Interoceptive Awareness (MAIA): Interoceptive awareness was measured using the Multidimensional Assessment of Interoceptive Awareness (MAIA) [32]. The MAIA is a self-report questionnaire comprising 32 items. The assessment contains eight subscales that measure different methods of attending to interoceptive body sensations. The subscales of the assessment are noticing, not-distracting, not-worrying, attention regulation, emotional awareness, self-regulation, body-listening, and trusting.

Mindfulness Inventory for Sport (MIS): The MIS was developed to assess mindfulness in sport settings, as previously developed instruments were used in clinical settings and were designed to assess mindfulness in daily life [33]. The inventory has 15 items with three subscales: Awareness, Refocusing, and Non-Judgmental Thinking.

Semi-Structured Interviews: Semi-structured interviews were conducted with the participants following the conclusion of the intervention. This format was chosen for the study because the researcher could tailor interview questions to focus on areas

and topics of interest while retaining a focus on the research questions. The semi-structured interview involved an opening statement and predetermined general questions designed to elicit a conversation about the participants' experiences. Supplementary probing questions were designed to draw additional information not discussed during the interview.

Data Analysis

To describe changes in flow, interoceptive awareness, and mindfulness in sport, participants' scores on the DFS-2, MAIA, and MIS were plotted at pretest, midpoint, and posttest. The resulting graphs were examined for individual patterns over time. Consistent with case study methodology interview transcripts and researcher observations were used to develop a description of each participant's experience [36]. The researcher then identified recurring themes and considered how these themes informed the interpretation of the quantitative findings.

Participant 1: Mike

Results

Dispositional Flow Scale-2. Figures 1 and 2 plot the scores of Mike on the Dispositional Flow Scale-2 (DFS-2). Figure 1 shows Mike's global score, which reflects the individual's general tendency to experience flow. There was a slight increase in the score, from 122 at pretest to 124 at the midpoint. Mike had a global score of 138 at posttest. Figure 2 displays Mike's scores on the DFS-2 subscales. During the intervention, Mike's scores on the subscales of Action-Awareness Merging, Clear Goals, Unambiguous Feedback, Sense of Control, and Transformation of Time increased from pretest to posttest. The other subscales remained stable.

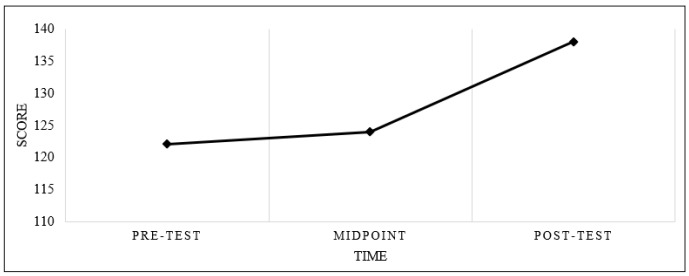


Figure 1: Mike DFS-2 Global Scores

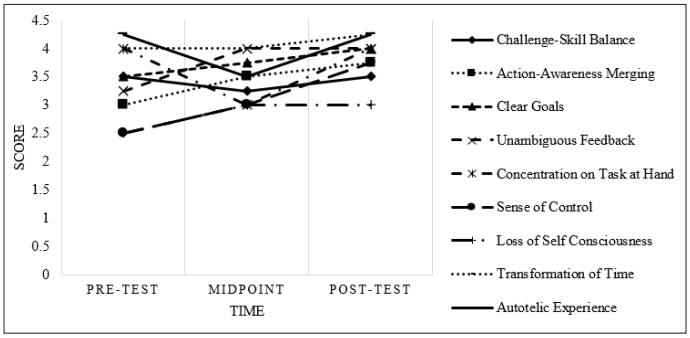


Figure 2: Mike DFS-2 Subscale Scores

Multidimensional Assessment of Interoceptive Awareness. Figure 3 displays Mike's scores on the subscales of the Multidimensional Assessment of Interoceptive Awareness. During the intervention, the scores on the subscales of Not-Worrying, Attention Regulation, Body-Listening, and Trusting increased. The subscales Noticing, Not-Distracting, and Emotional Regulation decreased from pretest to posttest. The subscale of Self-Regulation remained the same.

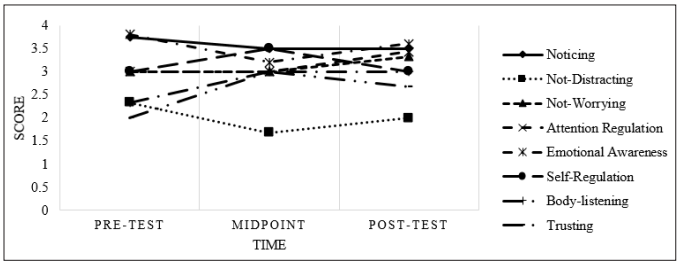


Figure 3: Mike MAIA Subscale Scores

Mindfulness Inventory for Sport. Figure 4 displays Mike's scores on the Mindfulness Inventory for Sport. Awareness scores decreased at the midpoint but increased above pretest levels at posttest. The scores of Refocusing increased at midpoint but decreased below midpoint levels at posttest. Nonjudgmental Thinking scores remained relatively stable throughout the intervention.

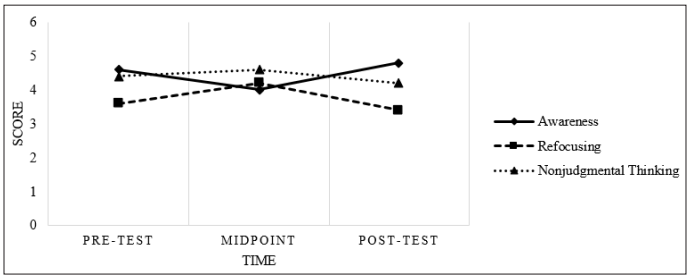


Figure 4: Mike MIS Subscale Scores

Discussion

Participant 1: Mike

Mike, a 31-year-old male 0.5 wheelchair rugby player with 3.5 years of wheelchair rugby experience, was formerly a soccer athlete, prior to his spinal cord injury. Over the course of the intervention, Mike would contrast some of his experiences in rugby with his previous athletic experiences. When reflecting on his knowledge about rugby, Mike referenced that he is still learning the sport and trying to improve. This was supported by consistent observed conversations between Mike and the coach about tactics prior to the start of practice, looking for insight from an experienced player on the team that fulfills a similar role for the team, and cutting film to study different techniques and strategies.

Mike demonstrated increases in his overall DFS-2 score and several flow-related subscales, including Clear Goals, Action-Awareness Merging, Unambiguous Feedback, and Sense of Control. As a relatively inexperienced wheelchair rugby player, these improvements may partly reflect his developing understanding of the sport and his role on the team rather than the intervention alone. However, Mike emphasized the value of identifying personal goals and committing to values-driven behaviors, suggesting that the MAC Approach may have contributed to greater goal clarity.

Despite his increased DFS-2 scores, Mike did not report experiencing more flow during practice. He attributed this partly to frequent interruptions from coaches and teammates, which may have limited opportunities for sustained engagement. This distinction highlights the importance of considering the training environment when interpreting changes in flow-related measures.

Mike also demonstrated increased awareness on the MIS and improvements in Attention Regulation, Body-Listening, and Trusting on the MAIA. Although his Refocusing score did not improve from pretest to posttest, he identified refocusing as a particularly valuable component of the intervention. During his

postintervention interview, he described feeling better equipped to accept distractions and redirect his attention to relevant performance cues. Together, these findings suggest potential benefits in attentional awareness and goal-directed behavior, although the contribution of the intervention cannot be isolated from his continued sport experience.

Participant 2: Frank

Results

Dispositional Flow Scale-2. Figures 5 and 6 plot the scores of Frank on the Dispositional Flow Scale-2 (DFS-2). Figure 5 shows Frank's global score, which reflects the individual's general tendency to experience flow. There was a slight increase in the score, from 116 at pretest to 118 at the midpoint. Frank had a global score of 133 at posttest. Figure 6 displays Frank's scores on the DFS-2 subscales. During the intervention, Frank's scores on the subscales of Clear Goals, Concentration on Task at Hand, Sense of Control, Transformation of Time, and Autotelic Experience increased from pretest to posttest. Unambiguous Feedback decreased from pretest to posttest. The other subscales remained stable.

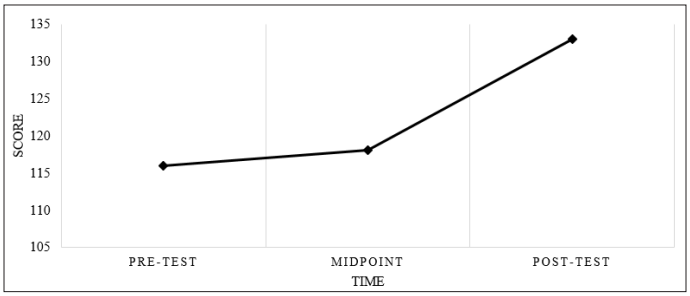


Figure 5: Frank DFS-2 Global Scores

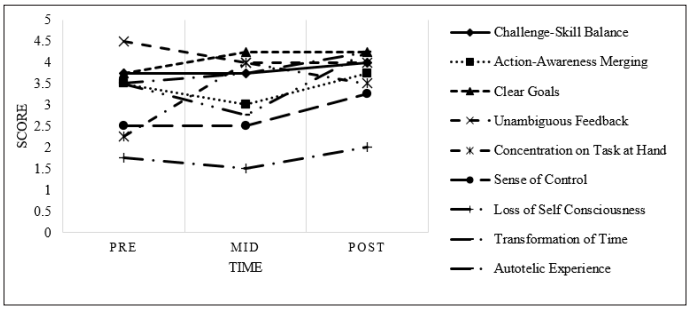


Figure 6: Frank DFS-2 Subscale Scores

Multidimensional Assessment of Interoceptive Awareness. Figure 7 displays Frank's scores on the subscales of the Multidimensional Assessment of Interoceptive Awareness. During the intervention, the scores on the subscales of Attention Regulation, Self-Regulation, and Trusting increased. The subscales Not-Distracting and Not-Worrying decreased. The subscales of Noticing, Emotional Awareness, and Body-Listening remained the same.

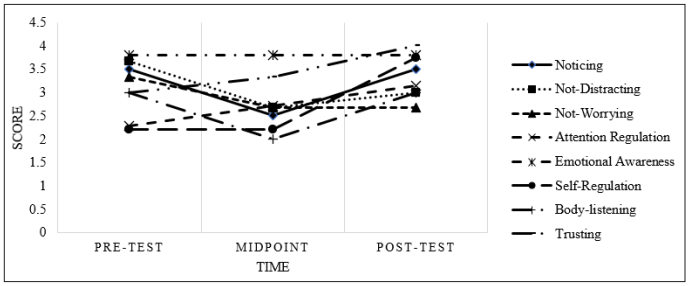


Figure 7: Frank MAIA Subscale Scores

Mindfulness Inventory for Sport. Figure 8 displays Frank's scores on the Mindfulness Inventory for Sport. Awareness scores decreased at the midpoint but returned to pretest levels at posttest. The scores of Refocusing remained stable at midpoint but increased at posttest. Nonjudgmental Thinking scores decreased throughout the intervention.

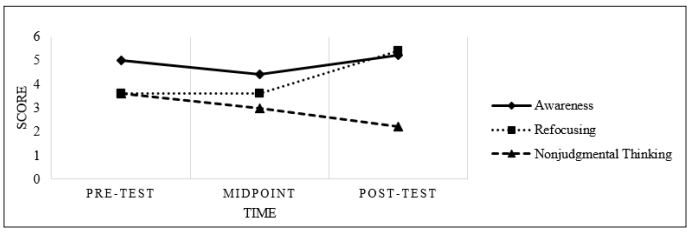


Figure 8: Frank MIS Subscale Scores

Discussion

Frank demonstrated increases in his overall DFS-2 score and several flow-related subscales, including Clear Goals, Concentration on the Task at Hand, and Autotelic Experience. Although these changes may reflect benefits associated with the MAC Approach, they may also be related to his recent return to consistent rugby participation and adjustment to a new team. His increased Autotelic Experience score may reflect renewed enjoyment of the sport, while his decreased Unambiguous Feedback score may be associated with learning his role and adapting to new teammates.

Frank also demonstrated improvements in Refocusing on the MIS and Attention Regulation and Self-Regulation on the MAIA. These changes may be related to his increased scores in concentration-related aspects of flow. However, decreases in Nonjudgmental Thinking and certain interoceptive awareness subscales suggest that the intervention's effects were not uniform. Frank's limited prior mindfulness experience may have influenced how he evaluated these behaviors as his understanding developed.

An important consideration was Frank's reported difficulty completing traditional meditation exercises because of challenges remaining still, which he associated with his ADHD. He responded more positively to interactive, sport-specific exercises, suggesting that the delivery of mindfulness interventions may need to be adapted to individual preferences and needs. Despite these challenges, Frank reported meaningful improvements in emotional regulation and communication, particularly outside rugby. During his postintervention interview, he described feeling calmer and less stressed, suggesting that the MAC Approach may have benefits extending beyond sport performance.

Participant 3: Anne

Results

Dispositional Flow Scale-2. Figures 9 and 10 plot the scores of Anne on the Dispositional Flow Scale-2 (DFS-2). Figure 9 shows Anne's global score, which reflects the individual's general tendency to experience flow. There was an increase in the score, from 138 at pretest to 162 at the midpoint. Anne had a global score of 150 at posttest. Figure 10 displays Anne's scores on the DFS-2 subscales. During the intervention, Anne's scores on the subscales of Challenge-Skill Balance, Unambiguous Feedback, Sense of Control, Loss of Self-Consciousness and Autotelic Experience increased from pretest to posttest. The subscales of Concentration on Task at Hand and Transformation of Time decreased. The subscales of Action-Awareness Merging and Clear Goals remained stable [37-39].

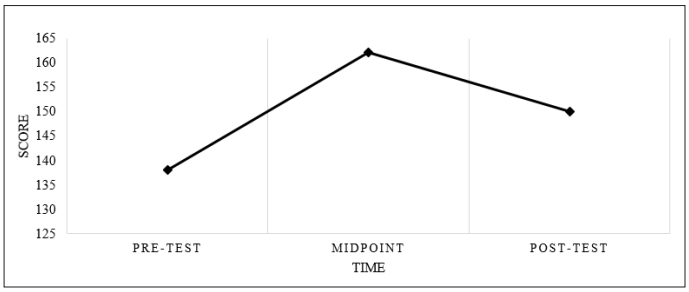


Figure 9: Anne DFS-2 Global Scores

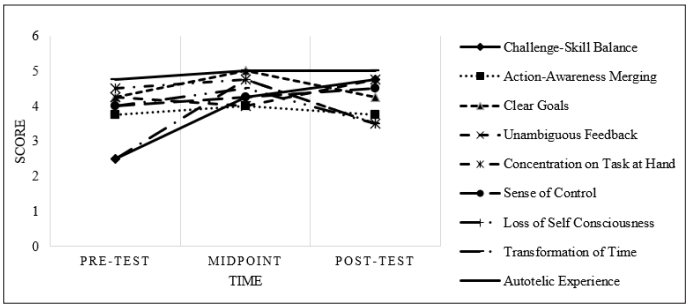


Figure 10: Anne DFS-2 Subscale Scores

Multidimensional Assessment of Interoceptive Awareness. Figure 11 displays Anne's scores on the subscales of the Multidimensional Assessment of Interoceptive Awareness. During the intervention, the scores on the subscales of Self-Regulation and Trusting increased. The subscales Noticing, Not-Distracting, Not-Worrying, Attention Regulation, and Emotional Regulation decreased. The subscale of Body-Listening remained the same.

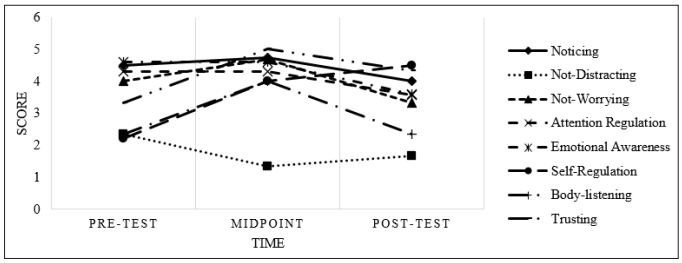


Figure 11: Anne MAIA Subscale Scores

Mindfulness Inventory for Sport. Figure 12 displays Anne's scores on the Mindfulness Inventory for Sport. Awareness scores decreased from pretest levels at posttest. The scores of Refocusing increased at midpoint and remained stable at posttest. Nonjudgmental Thinking scores increased at midpoint and returned to pretest levels at posttest.

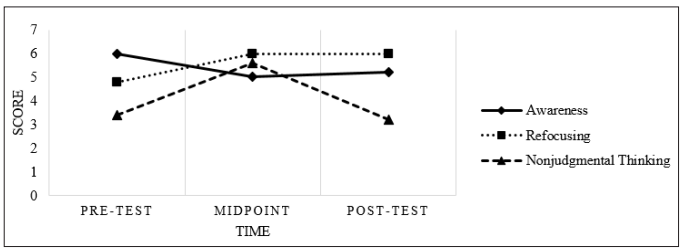


Figure 12: Anne MIS Subscale Scores

Discussion

Anne's scores on the different instruments and their respective subscales appear inconsistent at first glance and some of the results seem to be contradictory or at odds with one another. For example, the DFS-2 subscales of Loss of Self-Consciousness, Action-Awareness Merging, and Transformation of Time are related as they reflect an improved absorption in the task and decrease attention to the self [25]. In Anne's case one subscale increased, another decreased, and another returned to pretest levels at posttest. Making the situation even more contradictory is that Anne was highly engaged with the intervention from the outset. This is evidenced by her not only completing all of the between-session exercises, but also recording her experiences in a journal and bringing it to sessions to help her recount her experiences.

When visually inspecting the different figures, a common trend is visible. Many of the score's spike at the midpoint assessment and then either drop or level out. When looking at the scores from pretest to midpoint, all of the subscales of the DFS-2 increased. On the MAIA, five of the subscales increased, two remained at pretest levels, and one decreased. On the MIS, two of the subscales increased and one scale decreased. The contrast between the trends of scores from pretest to midpoint and the trends of scores from midpoint and posttest suggest that something occurred between the midpoint and posttest. Upon closer examination of the dates of the sessions, there was a greater continuity of sessions from pretest to midpoint. There were no cancellations of sessions during this phase. From midpoint to posttest there was greater interruption of sessions. Sessions with Anne occurred on Sundays before practice. From midpoint to posttest, three sessions had to be postponed because the practice facility was closed on Mother's Day, Father's Day, and for Memorial Day Weekend. This created a less conducive environment for development of the skills taught during the intervention. The inconsistent and contradictory scores suggest these interruptions disrupted Anne's experience of the program.

Due to her commitment to the intervention process and adherence to the between-session exercises, it is possible that Anne's scores would have continued trending positively without the cancellations. This is supported by discussions during sessions as well as in the postintervention interview. During the intervention process, Anne recounted ways in which she used the skills being taught in the program both in rugby and in her personal life as well. In both areas, she reported improvements in interpersonal interactions. This utility in both rugby and everyday life was reinforced in her postintervention interview with Anne stating, "Well, it's definitely grown to a daily useful skill, it's something that I can use during rugby and during normal life." he current body of literature as well.

Conclusion

The findings of this preliminary case study suggest that the Mindfulness-Acceptance-Commitment (MAC) Approach may be a promising intervention for wheelchair rugby athletes. Although participants demonstrated varying changes in flow, interoceptive awareness, and mindfulness, all three reported positive experiences with the intervention and perceived improvements in their ability to refocus. These improvements were also reflected in Frank's and Anne's self-report scores. However, the structure of wheelchair rugby, which requires frequent transitions between offensive and defensive roles, may independently support the development of refocusing skills.

Changes in interoceptive awareness were less consistent, although all three participants demonstrated improvements in the Trusting subscale. These mixed findings may reflect the MAC Approach's emphasis on task-focused attention rather than interoceptive awareness specifically. While mindfulness exercises incorporate

awareness of bodily sensations, developing interoceptive awareness is not their primary objective [26]. Thus, additional research is needed to determine whether the MAC Approach can meaningfully improve interoceptive awareness among adaptive athletes.

The timing of the intervention may also have influenced the findings. Conducting the study during the off-season resulted in practice cancellations and fewer opportunities to apply mindfulness skills in sport-specific situations. Consequently, participants may have had limited opportunities to demonstrate changes on the Mindfulness Inventory for Sport (MIS). However, all three reported applying the skills in everyday life, suggesting that the intervention's potential benefits may extend beyond athletic performance.

An important finding of the present study was the discrepancy between participants' self-reported questionnaire scores and subjective experiences with the MAC Approach. For example, although Mike demonstrated a decrease in his Refocusing score, he reported improvements in his ability to manage distractions and redirect his attention to relevant performance cues. Similarly, despite decreases across certain mindfulness and interoceptive awareness subscales, Frank described meaningful improvements in emotional regulation, communication, and stress management. These findings highlight the value of incorporating qualitative data alongside quantitative measures when evaluating sport psychology interventions. Particularly in preliminary case studies with small samples, changes in questionnaire scores may not fully capture participants perceived benefits or the practical application of psychological skills.

Limitations & Future Research

Several limitations should be considered when interpreting these findings. The small sample size and absence of a control group limit generalizability and prevent conclusions about whether observed changes resulted directly from the intervention. Additionally, participant attrition reduced the available data, while off-season scheduling disruptions limited opportunities for consistent practice and application of the psychological skills.

The study also relied exclusively on self-report measures and participant experiences without incorporating objective performance assessments. Future research should include performance-based measures, such as coach evaluations, to better determine whether psychological changes translate into improvements in athletic performance. Additionally, combining sport-specific and general mindfulness measures may provide a more comprehensive understanding of how athletes apply these skills both within and outside sport.

Despite these limitations, the findings provide preliminary support for exploring the MAC Approach with wheelchair rugby athletes. Future studies should examine its effectiveness with larger samples, more consistent intervention schedules, and athletes competing at different levels, including national-team athletes. Further investigation across other adaptive sports would also help establish evidence-based recommendations for delivering mindfulness-based interventions to athletes with physical disabilities.

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