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5   Exploring Imagery as a Technique for Promoting Physical Activity in Older Adults

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21   Abstract

22   Exercise imagery can be beneficial for insufficiently active people as a means to promote

23   physical activity (PA) engagement and positive psychological states. The present study

24   explored imagery use in physically active and insufficiently active older adults. The revised

25   applied model of deliberate imagery use (RAMDIU) was used as a framework to explain

26   when, where, why, what, and how older adults image and explored whether the "who"

27   component of the model (older adults/ PA status) interacts with these different components.

28   37 (Mage = 64, SD = 5.2; 17 females) participants representing a range of PA levels took part

29   in one of seven focus groups. Thematic analysis provided support for RAMDIU, with

30   motivation, memory, and planning identified as the most common imagery functions, and

31   scenery and reward images as the most commonly reported imagery content. Although some

32   similarities exist, older adults tend to use imagery for unique functions compared to younger

33   counterparts (e.g., to improve memory). Understanding the use of imagery in older adults

34   will help to tailor PA interventions for promoting healthy ageing in this population.

35   **Key words:** exercise imagery; content; function; motivation; revised applied model

Exploring Imagery as a Technique for Promoting Physical Activity in Older

Adults

Physical activity (PA) improves the quality of life of older adults by reducing the risk of certain diseases associated with morbidity and mortality, such as cardiovascular diseases, diabetes, and cancer, as well as promoting psychological well-being (Reiner, Niermann, Jekauc, & Woll, 2013). Despite the significant health benefits of PA, more than 60% of the worldwide adult population are not sufficiently active (World Health Organization [WHO], 2003). According to the UK's Department of Health (2013), a large proportion of older adults are not reaching the minimum recommended amount of PA (i.e., 150 minutes of moderate-intensity PA per week or 75 minutes of vigorous-intensity PA per week), with PA rates generally lowering with increased age (Pate et al., 1995).

In light of the percentage of insufficiently active older adults, there is a need for suitable interventions to target this age group. A potential technique for promoting PA behaviour is mental imagery, which involves the representation of an experience in one's mind without the presence of an actual stimulus and includes one or more senses (Moran, 2004). Within PA and exercise settings, imagery refers to engaging in images such as being physically active, enjoying the workout, and achieving certain fitness outcomes from the exercise behaviour (Hall, 1995). Hall (1995) was one of the first advocates of exercise imagery suggesting that it may have a positive impact on motivation to exercise. This assertion has been supported by more recent evidence that images of a lean and healthy body as well as feelings of energy and relief can boost motivation to be physically active (Cumming, 2008).

Before an exercise imagery intervention can be effective for promoting PA in older adults, it is important to first understand how it is used within this targeted population. A model for guiding research and practical application of exercise imagery is the revised

61   applied model of deliberate imagery use (RAMDIU; Cumming & Williams, 2013), which is a

62   recent extension of the applied model of imagery use originally developed by Martin, Moritz,

63   and Hall (1999). The RAMDIU focuses on deliberate imagery (i.e., with a specific purpose

64   in mind) as opposed to spontaneous or unintentional images that individuals can experience

65   (e.g., day dreams). The model applies to a variety of individuals (e.g., athletes, exercisers,

66   dancers, rehabilitation patients) and is composed of the interacting components of "why",

67   "what", "how", "who", "when", and "where," that are thought to explain whether imagery

68   will facilitate the desired outcome(s).

69   A major component of the model is the function of imagery use, which corresponds

70   to "why" exercisers use imagery. Consistent with Paivio's (1985) 2 (cognitive/motivational)

71   x 2 (general/specific) conceptual framework, mental imagery serves similar functions for

72   exercisers as it does for the athletes (Hall, 1995; Munroe-Chandler, & Gammage, 2005).

73   Cognitive reasons refer to improving skills (specific), or strategies and routines (general),

74   while motivational reasons refer to functions such as, but not limited to, achieving certain

75   goals (specific), increasing confidence (general), or arousal-stress reduction (general).

76   However, depending on the context of imagery use, the functions of imagery extend beyond

77   those proposed by Paivio (1985). Thus, regular exercisers may use imagery to achieve a

78   variety of outcomes such as to improve their skills, to improve how they look, to increase

79   self-confidence, and achieve positive psychological outcomes (Gammage, Hall, & Rodgers,

80   2000 ; Hausenblas, Hall, Rodgers, & Munroe, 1999).

81   Another component of RAMDIU refers to the types of images exercisers use (i.e.,

82   "what"). According to Hausenblas et al., (1999) exercise imagery is classified in three

83   distinct types: 1) appearance imagery, which involves images of an improved physical

84   appearance such as having a lean, fit, and healthy body; 2) energy imagery, which includes

85   images of feeling energized and relieved from stress; and 3) technique imagery, which

86   includes images of learning and completing exercise tasks correctly. This simple

87   classification expanded to include other types of exercise imagery such as self-efficacy

88   images and health-related images (Giacobbi, Hausenblas, & Penfield, 2005), relaxation

89   images (Cumming & Stanley, 2009), exercise routine images (Giacobbi, Tuccitto, Buman, &

90   Munroe-Chandler, 2010), enjoyment images (Stanley & Cumming, 2010), and goal images

91   (Chan & Cameron, 2012). Consequently, exercisers use a variety of imagery content.

92   According to the original model of applied imagery use by Martin et al. (1999), the

93   type of imagery ("what") depends on the motivation of exercisers and what they want to

94   achieve. Consequently, the content of the images (e.g., appearance imagery) should match

95   the purposes for using exercise imagery (e.g., to become leaner). In contrast, RAMDIU

96   proposes that imagery content does not always reflect why individuals image. Indeed, a wide

97   range of images can be used to achieve the same outcome and vice-versa, and this will be

98   partly determined by personal characteristics such as age. Thus, it is important to account for

99   the interaction between "what" and "why" by identifying what types of images serve which

100   functions for older adults.

101   Another important but overlooked component of RAMDIU focuses on "how"

102   individuals experience images. This refers to characteristics of the imagery such as whether

103   it is in real time, duration, viewing angle, agency, and the colours and sensory modalities

104   involved. Middle-aged exercisers seem to use multisensory images, which are either positive

105   or negative in nature and range from deliberate to spontaneous images. In regards to visual

106   perspective, exercisers tend to use both an internal and external perspective with a preference

107   to internal (Kim & Giacobbi, 2009). What is not yet known is "how" older adults image and

108   whether this differs from younger counterparts. Information of this nature will again be

109   useful when creating personalised imagery interventions addressing the needs of older adults.

110   The "who" component of the RAMDIU describes characteristics of the individual

111   such as gender, age, and level of PA that can impact upon the content, function, and

112   characteristics of imagery use (Cumming & Williams, 2013). Given the individual

113   differences, the content and function of imagery is likely to vary not only among individuals

114   of different ages but also amongst older adults themselves. When compared to younger

115   adults, older adults tend to engage in energy imagery the most while they report less

116   appearance imagery but similar amounts of technique imagery (Thøgersen-Ntoumani,

117   Cumming, & Ntoumanis, 2012). Age also interacts with PA levels to explain exercise

118   imagery use; that is, younger and more physically active individuals report the greatest use of

119   exercise imagery (Giacobbi, 2007). Indeed, a robust finding in this area has been that regular

120   exercisers use imagery more often than non-exercisers (Gammage et al., 2000).

121   Despite the popularity of exercise imagery and its apparent effectiveness at increasing

122   or maintaining PA levels (Giacobbi, Hausenblas, Fallon, & Hall, 2003), there has been

123   limited qualitative research that has investigated exercise imagery use in older adults (Kim &

124   Giacobbi, 2009). Understanding more about the use of exercise imagery in this particular

125   population would give an in-depth description of their imagery use and would provide

126   researchers and applied practitioners with information on how to tailor an intervention and

127   effectively address the needs of this group. An original contribution of the present research

128   was the inclusion, for the first time, of participants above 65 years old to examine their

129   functions of exercise imagery use, which might help clarify why PA widely varies in this

130   population.

131   Kim and Giacobbi (2009) were the first to qualitatively examine the imagery use of

132   middle-aged adults. This population used images, such as health outcome images,

133   plan/strategy images, stress level images, and energy images to increase their confidence in

134   achieving their goals, to reduce stress, and to motivate themselves exercise. However, it

135   cannot be assumed that this will generalise to older adults, as they might use different types

136   of imagery relevant to their needs and reflecting their motivation to engage in PA.

137   Another assertion of the RAMDIU is that the timing and location of imagery can

138   define imagery's effectiveness. Previous research has indicated that regular exercisers

139   employ imagery in a variety of settings (e.g., within or away from the exercise setting, in bed,

140   in the car) and at different time points (e.g., prior, during, or after exercise, during the day or

141   at night) (Giacobbi et al., 2003; Kim & Giacobbi, 2009). The reason why imagery is

142   employed and the content of images may differ depending on the situation. For instance, one

143   image might be used before competition for preparation, while the same image might be used

144   during competition for stress-reduction. In regards to "where", the more similar the imagined

145   setting is to the actual setting, the more effective the imagery (Holmes & Collins, 2001).

146   When for instance imagery is employed to learn how to use exercise equipment at the gym,

147   the imagined setting should include the gym and the specific equipment. To date, there is no

148   research on where and when older adult exercisers image and whether this is similar to

149   younger aged exercisers.

150   Due to the scant amount of research surrounding imagery use with older adults, this

151   study was the first to provide a comprehensive understanding of imagery use in this

152   population. Using a qualitative approach, underpinned by the conceptual framework of

153   RAMDIU, the primary aim was to explore the main components of imagery use and give an

154   insight on how the "who" component (older adults) interacts with the "where", "what", and

155   "why" older adults image. Factoring in the characteristics of the exerciser will help applied

156   practitioners develop personalised imagery interventions appropriate for older adults to

157   promote PA. A further purpose of this study was to examine if there are any differences in

158   the patterns of imagery use in individuals who are physically active and insufficiently active.

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161   **Methods**

162   **Participants**

163   Participants were 37 older adult males ($n = 20$) and females ($n = 17$) from the local

164   community in Birmingham, UK. The participants ranged in age from 55 to 80 years ($M = 64$,

165    $SD = 5.2$) and represented a range of PA levels. Participants were classified in groups

166   depending on the self-reported number of minutes they were active in a week. Specifically,

167   binary categories were created based on the Department of Health's (2013) recommendation

168   for engaging in more than 150 minutes of moderate intensity PA a week, to identify

169   participants who either met this recommended activity level or fell below it. Participants

170   reported engaging in either moderate levels of PA ($n = 26$) or being insufficiently active ($n = $

171   11). All but one participant (belonging to a mixed ethnic group) were Caucasian.

172   **Procedure**

173   The Ethical Review Committee at a major University in West Midlands, UK

174   approved this study. Using a purposive sampling strategy, participants were recruited from

175   the local community through flyers and by word of mouth. Seven focus groups were held,

176   which allowed for a range of opinions to unfold through the interactive discussion among

177   participants (Smithson, 2000). Each focus group lasted between 48 and 89 minutes and

178   consisted of 3-6 participants grouped mainly by their PA level. All participants provided

179   written informed consent and demographic information on their age, gender, ethnicity, and

180   PA level. White and Hardy's (1998) definition of imagery was provided to the participants,

181   followed by a clarifying example and a simple imagery exercise, which involved imaging

182   holding a lemon. The participants were then debriefed to get a sense of their imagery ability

183   (e.g., How easy/difficult is it for you to generate these images) and ensure they understood

184   the concept of imagery (e.g., Can you explain in your own words the concept of imagery).

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Interview Guide

The semi-structured interview guide was based on the RAMDIU with an emphasis on what, why, where and when the participants image. The questions directed participants to think about their use of imagery in general, and in relation to PA. To further explore the experiences of participants who were familiar with imagery use, follow-up questions and probes were used (e.g., "Help me to understand what you mean"), whereas those less familiar with imagery were asked to think of ways that imagery could be used to help them be more physically active in retirement.

Data Analysis

Each focus group was audiotape recorded and transcribed verbatim. To protect participants' confidentiality, each participant was identified with a pseudonym. Following transcription and organising the data in NVIVO version 10, a thematic analysis of the data was undertaken (Braun & Clarke, 2006). The aim was to make sense of the responses of the participants in relation to the overall research question; in this case, to explore whether they use imagery for exercise related purposes. Initially, to identify themes that were matching with the RAMDIU, a deductive approach was followed. However, themes that did not readily fit the model were allowed to emerge inductively by encouraging the participants to speak freely about their imagery experiences. Thus, the inductive analysis revealed imagery types unique for older adults.

A critical realist perspective was adopted, which espouses the belief that it is possible to gain insight into people's experiences through their accounts, but also that researchers have a role in constructing knowledge (Madill, Jordan, & Shirley, 2000). A post-positivism approach was also adopted recognising the possible effect of biases on research (Clark, 1998). In this instance, the researchers' familiarity with previous exercise imagery research might have influenced the interpretations of our results. Thus, even though the goal is to

211   grasp the reality as objectively as possible, it is recognised that the researchers' perceptions

212   about reality can have an impact in the findings (Ponterotto, 2005).

213   **Issues of Trustworthiness**

214   Aligned to the critical realist and post-positivist standards of rigour, a number of steps

215   were taken to establish trustworthiness (Creswell, 2007). First, triangulation was performed

216   by involving three researchers in the analysis process (Creswell & Miller, 2000). Regular

217   research group meetings took place while creating the interview guide, throughout the

218   analysis stage by having multiple coders, as well as by getting support and exchanging ideas

219   when interpreting the findings. These meetings provided consistency throughout the analysis

220   process and helped to eliminate researchers' biases and ensure credibility (Onwuegbuzie &

221   Leech, 2007). A pilot focus group composed by researchers experienced in qualitative and/or

222   older adult research established credibility by helping to develop the content of interview

223   guide further. Finally, direct quotes from the participants gave context in the findings and

224   credibility to the researcher's interpretations, allowing the readers to make their own

225   judgments (Tracy, 2010).

226   **Results and Discussion**

227   The analysis led to five higher-order themes associated with older adults' deliberate

228   imagery use: (1) who; (2) where and when; (3) why; (4) what; and (5) how. When

229   appropriate, the interaction between the different components of the model is highlighted.

230   Demographic information (e.g., PA level and gender) is provided to give context to each

231   quote. Figure 1 is a representation of RAMDIU as it applies to the findings of this study.

232   —Insert Figure 1 here—.

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Who

The dimension "who" refers to characteristics of the individual that differentiated participants in imagery use. Two subthemes emerged under "who", participation and familiarity with imagery. Participation refers to the doer of the action and contains two dimensions, imager and observer. While the majority of the participants talked about their experiences using imagery, a few participants had not experienced imagery themselves but had observed other people image. For example, one participant, who was aware that top athletes use imagery, described: "You normally see the top athletes before they get to the blocks, they're standing there and they are quite focused, their eyes aren't closed, but you can almost see them imagining themselves and getting to the finishing line" (Active female). Similarly another participant vicariously experienced imagery through watching a friend's son utilising imagery. He said: "We've got a friend whose son plays golf. He'll be in the garden swinging clubs and he's visualising his movements" (Active male).

A pattern of responses indicated a tendency for physically active individuals to report being more familiar with exercise imagery. They were able to describe their imagery use in more detail and seemed more open to the idea of using imagery for PA purposes compared to insufficiently active participants. For example, a physically active participant, described:

> I know where I want the ball to be put and so I have an image of what's going to happen and what I want is my body to make this come true. So imagery is a way of marrying your body's movements to the result you wish to achieve.

This finding supports previous research demonstrating that regular exercisers use more imagery than less frequent exercisers (Gammage et al., 2000; Giacobbi, 2007). Further, insufficiently active individuals seemed to be less familiar with imagery as indicated by a female, "Imagery is not something I use, hardly at all or I should say I don't really understand it very well. It doesn't come natural to me". Our results agree with the RAMDIU by

262   suggesting that older adults' motivation to use exercise imagery reflects their motivation to

263   be physically active. Specifically, individuals who were insufficiently active tended to use

264   less exercise imagery than physically active participants. This finding is not that surprising

265   because insufficiently active individuals usually struggle with motivation, and the barriers

266   they face tend to be more internal in nature (Kosteli, Williams, & Cumming, 2016).

267   Many of the insufficiently active participants initially reported not using imagery, but

268   nevertheless described spontaneous use of imagery in their daily lives or talked about

269   possible applications of imagery as the focus group discussions progressed. For instance, a

270   participant described,

271   I've never given it a name and I've never really thought about it that consciously, but

272   I have used imagery for quite a few things like when I was skiing, there's a great deal

273   of it there trying to get skiing movements correct. When I was learning to fly I used it,

274   its very… very valuable, trying to land a plane, you know if you try to get it in your…

275   the whole sequence in your head. But I've never actually thought about it consciously,

276   it's just something I did.

277   It is possible that the focus groups provided a relaxed environment that allowed

278   participants to reflect on their imagery use through interacting with others (Walden, 2012).

279   The dynamic nature of the focus groups can bring to light viewpoints that would otherwise

280   remain hidden (Farnsworth & Boon, 2010). For instance, a participant reported being

281   unfamiliar with imagery but after listening to others talking about it, seemed to recognise its

282   potential application to exercise and expressed a desire to try it in the future,

283   It would be worth a try. I just thought about the possibility of seeing myself going

284   there and changing and enjoying the water and swimming and feeling the water

285   supporting your body, perhaps if I did think that for a whole week every day, then the

286   next week I might try it (Inactive male).

287   These results suggest that imagery interventions are feasible with the older adult

288   population, regardless of their level of PA. Furthermore, the findings suggest that it is

289   important to account for "who is the messenger" of imagery interventions as peer supporters

290   may be more effective at conveying information about the intervention (Ginis, Nigg & Smith,

291   2013). For instance, older adult exercisers who have previously used imagery might be more

292   suitable in convincing others on the adoption of imagery for PA purposes.

293   **Where and When Older Adults Use Imagery**

294   Older adults reported using imagery more frequently right before engaging in PA

295   rather than during or after the activity. One participant described, "I am visualising before

296   the event if there's maybe something coming up with folk dancing that I'm nervous about

297   getting right, when I'm thinking about doing it I'll try to visualise how it goes leading up to

298   doing the actual thing"(Active male). In support of RAMDIU, older adults seem to match the

299   timeframe of their imagery use to its intended function. Highlighting the interaction between

300   "when" and "why", the same participant referred to using imagery after engaging in folk

301   dancing to review and correct any mistakes. He stated, "I could visualise if there'd been an

302   incident, maybe when I'm dancing and then I try, afterwards when I've calmed down a bit,

303   I'll think how did that happen, how can I stop that…being frightened about that happening

304   again, what could I have done different". Thus, the same image can be used for different

305   purposes at different times. Participants referred to using imagery during the activity less

306   frequently. One participant reported imaging while doing yoga. She stated "I use that in

307   yoga. I sometimes use it when I'm doing it actually" (Active female).

308   While the majority of the participants stated that they used exercise imagery away

309   from the exercise environment (e.g., at home, at work, in the car), there were still a few

310   participants who used imagery while in the exercise location. For example, one participant

311   stated, "When you're in the gym it can help" (Active female).

312   **Why**

313   The dimension "why" refers to the functions of older adults' imagery, which

314   constituted two categories, motivational reasons and cognitive reasons. Several participants

315   used imagery as a motivator to exercise. Three subthemes were identified, including initiation

316   or completion of PA**,** preparing for challenging situations, and self-efficacy. The majority of

317   participants talked about using imagery before exercise to motivate themselves to initiate PA.

318   For instance, one participant said, "I can think through that walk and think yes I will go, I'll

319   pack my bag and I'll go. It motivates me to pack my sandwiches, get my flask and go"

320   (Active female). However, imagery could also bring back memories from the past and could

321   give older adults an incentive to do something that they have not done for years. For

322   instance, a participant talked about motivating himself to exercise by recalling a past activity,

323   "Imagery could make me go back and do something I've done in the past, like I haven't been

324   skiing for many years" (Active male).

325   In addition to using imagery as a motivator to exercise, a few participants talked about

326   using imagery to overcome different types of barriers that prevented them from exercising.

327   For instance, one participant reported using imagery to overcome bad weather, as reflected in

328   the statement of an active male,

329   I have used it as a precursor to exercise, particularly again, coming back to dog

330   walking, if its absolutely chucking it down with rain and you think I really don't want

331   to do this, but you think well I'm going to put… I'm going to fleece up, I'm going to

332   put my waterproofs on top, this is it, I can feel the rain coming on my face but I know

333   at the end of it, when I come back into the warm, my face will be tingling and I'll

334   be… I'll be fine with it. And it gives a little bit of motivation towards going out into

335   the pouring rain. Another participant described using imagery to overcome fear, and

336   concern for the unknown when she joins a new exercise class. She stated, "When I

337   know I'm going to be doing something or going somewhere that I'm a bit concerned

338   about, I try to see myself in the situation" (Active female). Similarly, one of the older

339   physically active females stated, "I have used it during dance exams because it's

340   always a difficult time. You're apprehensive and you're trying to imagine how it's

341   going to be. It can be a form of preparation for what's to come".

342   Other participants stated that imagery gave them confidence to achieve a goal,

343   including attending an exercise class. For example, the participant who used imagery to

344   prepare for challenging situations regarding her dance class, reported having a secondary aim

345   of gaining confidence, "You can think I'm quite comfortable now and I'll be like this and I'll

346   be standing at the back of the class and it'll be alright. It's a form of comfort, it gives you a

347   bit of confidence" (Active female). This example reinforces a main proposition of the

348   RAMDIU that the same image may serve different purposes for the same individual. Other

349   participants reported using imagery to become confident in sport related skills along the lines

350   of,

351   There's some theory says that if you imagine and play it through, you know there's

352   things like muscle men, you can play it through and then you're going to be better.

353   And if I do that I do feel more comfortable in my back hand. (Active male)

354   Participants also acknowledged the importance of employing imagery for cognitive

355   reasons. Three subthemes were identified, including memory, planning, and skill

356   execution/improvement. The majority of participants used imagery in regards to memorising

357   steps in exercise classes or remembering. This was particularly true for the most physically

358   active participants who engaged in activities such as folk dancing. A participant described

359   using imagery in Tai Chi to "memorise the sequence of the movements" (Active female).

360   Similarly, another physically active participant described,

361   With folk dancing, there may be a tricky sequence of steps in some sort of dancing

362   and you try and work it out. But usually when the music starts the muscle memory is

363   there, but it could be a sequence of a pattern that you try and do figures with your set

364   and you try and visualise where everybody else is supposed to be and that's mental

365   exercise as well.

366   Less physically active participants also recognised the importance of imagery to help

367   them remember and retrace lost objects. One participant shared the following, "If you lose

368   things, you've got to retrace your steps in your mind where you've been and go backwards in

369   time and you might be able to work it back. I have actually used that to find things" (Inactive

370   male). Several other participants reported using imagery in an exercise setting to plan their

371   moves ahead of time, which is reflected in the following statement,

372   In sport I used it when I was doing competitive 1500 metre runs. I'd have the race in

373   my head, every 200 metres would be a different stage of the race for me. So you'd

374   know how you were going to run and you changed the way you were going to run

375   depending on what the others were going to do. So you imagined the race before you

376   actually ran it. (Inactive male)

377   The more physically active individuals and/or those who were involved in a sport

378   referred to be using imagery to master sport-related skills. For instance, one participant

379   reported, "I use it in some activities to achieve something which I wouldn't without it. It's

380   yoga or not being able to jump back and to the front elegantly, with control" (Active female).

381   **What**

382   The dimension "what" includes the type of images older adults use; that is, the

383   content of their images. This category consisted of four subthemes (i.e., imagery types),

384   execution images, goal images, affect images and scenery images. Although some of the

385   imagery types that emerged in the current study are similar to those referred by Kim and

386   Giacobbi (2009) (e.g., physical appearance images, health images, plan/strategy images,

387   relaxation images), older adults engaged in unique types of imagery to motivate themselves

388   exercise (e.g., reward images, avoidance images, scenery images). Some participants

389   reported imagining themselves executing certain sport-related skills with the aim of

390   mastering them or for other reasons. These images are similar in nature to technique images

391   that athletes use but rather than focusing on exercise movements they focus on specific skills

392   (e.g., how to hold the racket). For instance, one participant used the same image for two

393   different purposes. He stated, "Before I go to badminton I try and imagine my back hand

394   which is my weakest area. If I don't get it right I don't win the game" (Active male).

395   However, he also used the same skill execution image to boost his self-efficacy and

396   feel more comfortable with his backhand, "If you imagine and play it through, then you're

397   going to be better. If I do that, I do feel more comfortable in my back hand". This example

398   supports the assertion of the RAMDIU and suggests that the same imagery content can serve

399   multiple functions, as well as further highlighting the interaction between "what" and "why"

400   (Nordin & Cumming, 2005). The idea that skill execution images could serve dual functions

401   (e.g., motivation to initiate PA and skill improvement) was expressed by several participants.

402   Other individuals reported using skill execution images to master non-exercise related tasks.

403   For example, one participant used imagery while learning to play a musical instrument. He

404   stated, "I'm learning to play the ukulele very badly, so I do visualise about the chord

405   structures and how my hands should be" (Active male).

406   Several participants indicated imaging the steps required to complete a certain

407   exercise task. For instance, a participant described, "With folk dancing there may be a tricky

408   sequence of steps and you try and work it out. You visualise where everybody else is

409   supposed to be" (Active male). Another participant described his experience of using

410   sequence imagery to master a non-exercise related skill, relevant to his job as a pilot. He

411   said, "When I was learning to fly I used it, it's very valuable, trying to land a plane, if you try

412   to get the whole sequence in your head" (Active male). This quote also demonstrates the

413   interaction between "what" and "why" as older adults were found to use imagery within a

414   range of activities.

415   A commonly reported theme amongst participants were images concerned with

416   exercise-related goals, which particularly focused on the results older adults desired

417   achieving. Participants reported experiencing images related to their desired physical

418   appearance such as becoming thinner. For example, a participant imagined how she would

419   like to look following weight loss, "Sometimes I've visualised that I've lost all my weight

420   and I'm doing all sorts of things" (Inactive female). Appearance images also included

421   changes in musculature, "With my walking I think about the inner experience of the muscles

422   toning up" (Inactive female). Although physical appearance imagery was mentioned by a

423   few of the participants, it was not the most frequently reported type of imagery. This is not

424   surprising as incentives for exercise vary with age, with older adults focusing on improving

425   their physical and mental health (Gill & Overdorf, 1994). These findings further reinforce

426   the suggestions from Wesch, Milne, Burke and Hall (2006) that older adults' motivation to

427   exercise is less likely to focus on improving physical appearance.

428   A few participants indicated that they imagined themselves receiving a reward at the

429   end of the exercise session in recognition of their achievement. Reward images could

430   involve anything that provided a sense of satisfaction to older adults. For instance, one

431   participant described, "Having the reward at the end of it, perhaps a nice hot cup of tea when

432   you come back" (Active male). Even insufficiently active participants recalled motivating

433   themselves by using reward images when they were more physically active. A participant

434   commented, "I was imagining this pastry at the end of the race because by then I was

435   starving" (Inactive male).

436   Several other participants discussed wanting to prevent a negative health outcome as a

437   result of getting older. For example, one participant reported, "You might see yourself either

438   in a wheelchair or not being able to get upstairs, having to have a carer and the longer you

439   keep that off the better" (Active male). A few other participants discussed how they would

440   carry out a given task. These images focused on the process of the goal rather than on the

441   actual outcome. For example, one participant reported, "I imagined my ball going exactly

442   where I wanted it, over the tree and onto the green and it did" (Inactive male). Another

443   participant experienced something similar in tennis, "About tennis you've got to visualise

444   where you're going to serve it and where you're going to return it" (Inactive male).

445   Several participants indicated that they experienced images related to mental health

446   and psychological affect such as images of being calm and relaxed. For instance, one

447   participant said, "I imagined that my blood pressure would remain calm and I'd be at peace"

448   (Inactive female). Another participant said, "You go to your happy place and you're just

449   calm and you can just feel yourself relaxing" (Active male). Images of enjoyment were not

450   as common as relaxation images but there were a couple of participants who referred to

451   imagining their enjoyment of PA, "I thought about seeing myself going there, changing and

452   enjoying the water" (Active male).

453   The final type of images, mentioned by most participants, related to the scenery.

454   These images referred to the physical place or general location where exercise would take

455   place. These images support the assertion of Lang's bio informational theory (1977) about

456   the importance of including stimulus propositions (i.e., details about the environment) in

457   imagery. For example, a participant described, "For me it would be like thinking oh yeah I'm

458   going to swim in the Mediterranean and it's going to be lovely and warm and sunshine and

459   everything around me" (Inactive male). This individual not only imagined the ideal exercise

460   setting, but also used response propositions by imagining how it would feel to be there (e.g.,

461   it's going to be lovely). The combination of stimulus and response propositions can lead to

462   more vivid imagery, which can be more effective (Lang, Kozak, Miller, Levin, & McLean,

463   1980). Similarly, another participant reported using scenery images during a spinning class

464   guided by the instructor, highlighting the interaction between "where" and "what", along the

465   lines of, "In the spinning classes you've got an instructor and he is telling you're picturing

466   this, come on push, and he is telling about the greenery, all the scenery that you're seeing and

467   that motivates you" (Inactive female). Another participant described of imagining the natural

468   surroundings for motivational purposes, highlighting the interaction "what" and "why". She

469   said, "If you want to go on a walk you could imagine the walk, the birds, the open spaces and

470   that might actually make you want to go on the walk" (Active female). Overall, the findings

471   suggested that certain imagery is better suited for individuals depending on their age, gender,

472   or PA level.

473   **How**

474   The dimension "How" refers to imagery characteristics and consists of two

475   categories, senses and direction. The majority of the participants tended to use mainly visual

476   images. One participant described, "I'm visualising, you're going to get dressed and you're

477   going to go out and you're going to start running" (Inactive male). Other participants

478   referred to kinaesthetic images, along the lines of "Sitting here I've just been visualising it,

479   going through the feeling of skiing and I think perhaps I should go again this winter" (Active

480   male). However, a few participants described using negative health images to motivate

481   themselves to exercise, reflecting an interaction between "what", and "why". For instance, a

482   participant said "You might think of yourself either in a wheelchair or not being able to get

483   upstairs, having to have a carer and the longer you keep that off the better" (Active male).

484

485

General Discussion

486

487   Previous research on exercise imagery use in older adults has mainly been

488   quantitative in nature (Wesch et al., 2006; Thøgersen-Ntoumani et al., 2012). To date, there

489   is limited qualitative research on exercise imagery use and this has focused on young

490   (Giacobbi et al., 2003) or middle-aged adults (Kim & Giacobbi, 2009). This is one of the few

491   qualitative studies to explore the imagery use of older adults (Giacobbi et al., 2014).

492   Underpinned by the RAMDIU, the study found interactions among the different components

493   of the model, while also drawing comparisons between physically active and insufficiently

494   active individuals. The inclusion of individuals from a variety of PA levels allowed us to get

495   an insight on a wide range of experiences and understand more about the content and the

496   function of imagery of both physically active and insufficiently active older adults. The

497   findings suggest exercise imagery is a promising intervention strategy by demonstrating that

498   that older adults already use it to at least some extent. Similar to athletes and younger

499   exercisers, older adults reported using imagery for both cognitive and motivational reasons

500   (Hausenblas et al., 1999). Thus, exercise imagery has the potential for motivating older

501   adults to engage in PA, which in turn can facilitate healthy ageing and have tremendous

502   public health implications.

503   A number of interactions emerged throughout the results. One of the most apparent

504   interactions was between "what" and "why". The results confirmed the suggestion of the

505   RAMDIU that the content of images is not always indicative of the function of images.

506   Older adults often use the same image for multiple purposes or a variety of images for the

507   same purpose. Accounting for the personal meaning of images, practitioners can help older

508   exercisers to find the right type of images that can serve the right purpose. The interaction of

509   the "when", "what", and "why" components was highlighted in the results, as the same image

510   was used for different purposes in certain time points. This further highlights the importance

511   of accounting for the particular situation. The interaction of the "who" and "what"

512   components is apparent due to different individuals using a variety of images to motivate

513   themselves initiate PA. These results confirm a main assertion of the RAMDIU that it is

514   important to account for who is using the imagery. Individual characteristics of the imager

515   such as age, gender, and PA level appear to impact both the function and the content of

516   images used. For instance, a motivational image for an older adult (e.g., imagining the walk,

517   the birds, the open spaces) might not be motivational for younger exercisers. Similarly,

518   regular exercisers seemed to differ in their imagery use compared to insufficiently active

519   individuals. Thus, practitioners working with older adults should consider PA levels before

520   designing imagery interventions. The interaction between "who" and the other model

521   components indicates the importance of personalising the interventions to make them

522   individually tailored to the PA level of the individual. In the present study imagery content

523   seemed to vary according to activity level of the participants. Specifically, physically active

524   individuals reported using more skill execution images and sequence execution for cognitive

525   reasons (e.g., planning, mastering and improving skills).

526   Finally, the results indicated that older adults were not very descriptive when

527   discussing how they imaged compared to what athletes would describe – i.e., there was no

528   mention of timing, colour/vividness. This finding suggests that their meta-imagery skills,

529   i.e., "people's knowledge about, and control over, their own mental imagery processes"

530   (Moran, 2004, p. 285) may need further development in order to fully benefit from an

531   imagery intervention (MacIntyre & Moran, 2009). An effective strategy that has been used

532   with younger athletes for such purposes is layered stimulus response training (LSRT;

533   Williams, Cooley, & Cumming, 2013). Although not yet applied with older adults, it is

534   possible that LSRT could enhance imagery ability and meta-imagery skills for this

535   population.

536   A limitation from this study is the use of self-reported PA as a way to classify

537   participants as active vs. insufficiently active. Although participants were screened prior to

538   the study and placed in homogeneous groups depending on their reported PA levels, it is

539   possible that some of the participants over-reported their PA level. To overcome this issue,

540   any comparisons made between physically active and insufficiently active participants were

541   based on their responses during the focus groups and not based on the initial screening.

542   Future researchers should perhaps consider using validated self-report measures to determine

543   their actual PA levels.

544   The results indicated that older adults differ in their imagery use compared to younger

545   exercisers. Older adults engaged in some unique types of images (e.g., reward images,

546   scenery images) and these images served functions reflecting their needs (e.g., remembering).

547   Furthermore, the results suggest that the RAMDIU can be a useful conceptual framework to

548   better understand imagery use in older adults and further supports it's applicability for non-

549   athlete populations. Accounting for the needs of this group can help in the creation of

550   personalised imagery scripts, with imagery content tailored to the outcomes older adults want

551   to achieve (Williams, Cooley, Newell, Weibull, & Cumming, 2013). Future researchers

552   might want to consider personalising their approach by providing an appropriate definition of

553   imagery and instructions, as well as relevant examples according to the PA level of the

554   participants.

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690

Where & When (Situation)

- Before – After – During
- Outside exercise setting – In the setting

Who (Individual)

- Active
- Insufficiently active

Why (Function)

- Memory
- Planning
- Skill Execution & Improvement
- Initiate or Complete PA
- Prepare for Challenging Situations
- Self-efficacy

Personal Meaning

What (type) & How

- Skill Execution
- Sequence Execution
- Physical Appearance Goals
- Avoidance Goals
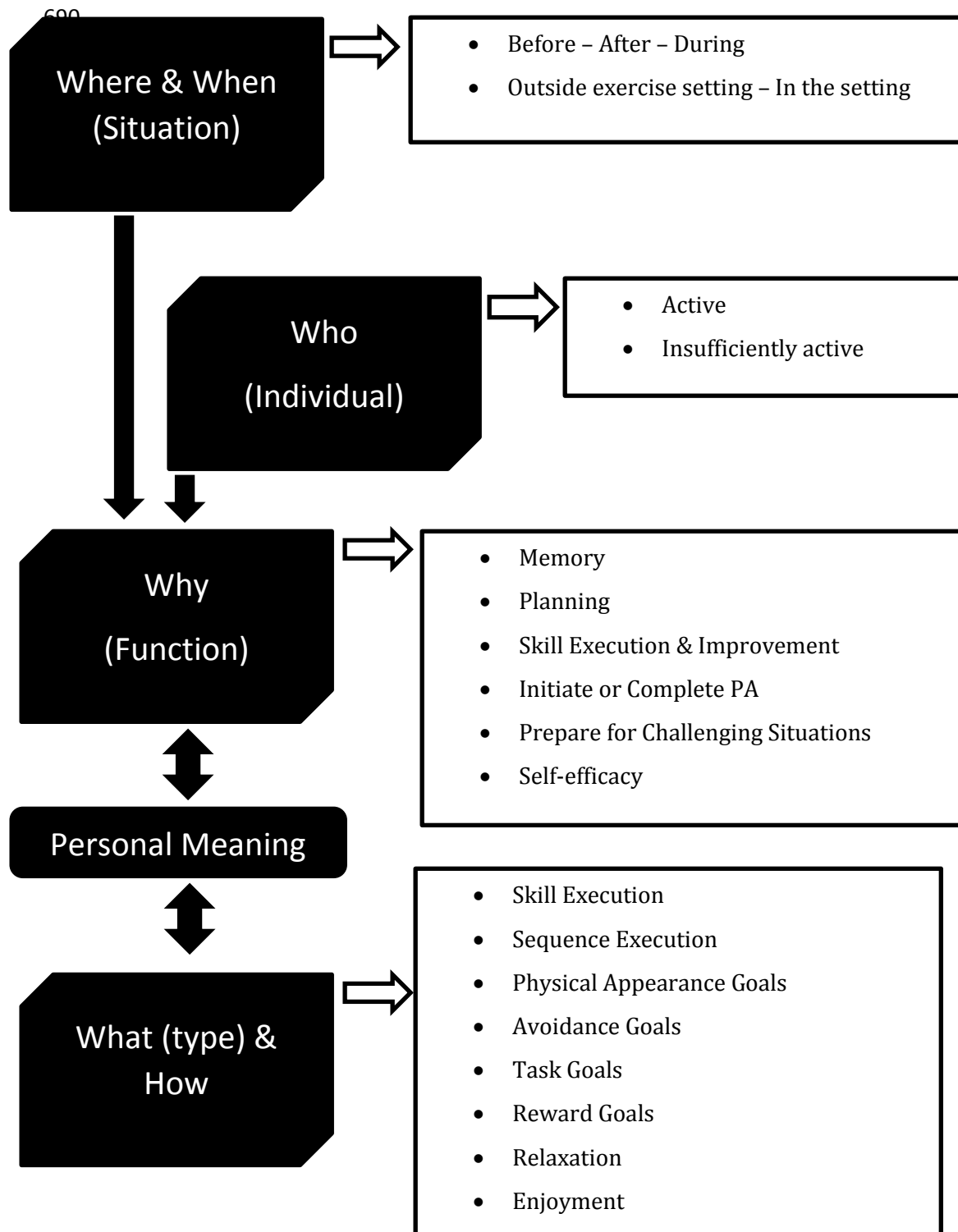- Task Goals
- Reward Goals
- Relaxation
- Enjoyment

Figure 1. Revised applied model of deliberate imagery use