

Article

Identifying barriers and facilitators to physical activity and perceptions of Traditional Indigenous Games among Aboriginal and Torres Strait Islander women: a qualitative study

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Abstract

Aboriginal and Torres Strait Islander women are key members of the community who have specific roles within their families that may result in lower levels of physical activity (PA) undertaken. Clearly identifying barriers for women to engage with PA, and exploring culturally based activities (i.e. Traditional Indigenous Games), may help to improve long-term health benefits. Subsequently, the aim of this study was to identify the barriers and facilitators for Aboriginal and Torres Strait Islander women engaging in PA, and their interest in participating in Traditional Indigenous Games. Seventeen Aboriginal and Torres Strait Islander women (34.3 ± 10.2 years) participated in focus groups. Through thematic analysis, participants experienced a range of common barriers such as lack of time due to family commitments, limited finances, ageing and poor physical and/or mental health. Common facilitators were also identified such as fun, access and improving mental and/or physical health. Importantly, unique themes were identified for Aboriginal and Torres Strait Islander women including barriers (e.g. racism, shame) and facilitators (e.g. culture, interactions with other Aboriginal and Torres Strait Islander women) that influenced PA participation. Notably, Traditional Indigenous Games were considered as an appealing PA mode to engage with their culture, experience nostalgia and be around other Aboriginal and Torres Strait Islander women. These key findings will guide future PA programs including Traditional Indigenous Games to improve health outcomes of Aboriginal and Torres Strait Islander women, vital members of the community.

Keywords: Indigenous Australians, qualitative research, focus group, culture, exercise

Contribution to Health Promotion

- Barriers common to Aboriginal and Torres Strait Islander women (lack of time, poor physical and/or mental health), as well as unique ones (racism, shame), were contributors to reduced physical activity levels.
- Bringing Aboriginal and Torres Strait Islander women together for fun, and culturally relevant physical activity such as Traditional Indigenous Games, may improve overall physical activity levels and health.
- Barriers and facilitators to participation in cultural activities identified in the current study can inform future physical activity interventions to increase long-term adherence to physical activity and improve the long-term health of Aboriginal and Torres Strait Islander women.

BACKGROUND

Aboriginal and Torres Strait Islander communities are resilient, and while they face health disparities and inequities, they are actively working towards improving their health. Despite a 10-year lower life expectancy when compared to non-Indigenous people ([Australian Bureau of Statistics, 2019](#)), many communities are determined to overcome these

challenges with health initiatives. Preventable chronic diseases, such as cardiovascular disease, contribute to a greater morbidity and mortality incidence for Aboriginal and Torres Strait Islander people ([Vos et al., 2009](#)). In 2011, it was reported that the burden of disease for Aboriginal and Torres Strait Islander people could be prevented through alterations in modifiable risk factors such as tobacco and alcohol

use, high body mass, high blood pressure, dietary factors and physical inactivity (Vos *et al.*, 2009; Australian Bureau of Statistics, 2019). Increasing physical activity (PA) levels (i.e. structured as sport or exercise or unstructured such as walking) (Thompson *et al.*, 2003; Marcus *et al.*, 2006; Eijssvogels *et al.*, 2016) can be the most influential of these risk factors and have substantial benefits for physical and mental health (Thompson *et al.*, 2003; Marcus *et al.*, 2006; Eijssvogels *et al.*, 2016). In 2018–19, only 12% of Aboriginal and Torres Strait Islander people living in non-remote areas achieved the Australian recommended guidelines of PA (i.e. ≥ 150 min per week) with lower levels for women compared to men (Vos *et al.*, 2009; Australian Bureau of Statistics, 2019). Several studies have examined programs aimed at enhancing PA levels and overall health among Aboriginal and Torres Strait Islander women (Macdonald *et al.*, 2012; Canuto *et al.*, 2013; Stronach *et al.*, 2016, 2023; Maxwell *et al.*, 2017, 2021; Stronach and Maxwell, 2020). These programs have identified key shortcomings, such as attendance rates and engagement in gym-based programs for Aboriginal and Torres Strait Islander women. As a result, there is a need for further research to not only look at the causes of these challenges but also to propose strategies to overcome these barriers and deliver meaningful improvements in PA for Aboriginal and Torres Strait Islander women to lead healthier, more active lives.

An important consideration is the concept of PA, which for Aboriginal and Torres Strait Islander peoples may be different to the current ‘westernized’ interpretation as reported previously (Nelson *et al.*, 2010; Thompson *et al.*, 2013). Before colonization, PA had cultural significance and impact, where it was unmeasurable and a way of life for Aboriginal and Torres Strait Islander people (Edwards, 2009; Nelson *et al.*, 2010). Studies of other First Nations people have also indicated that PA had cultural significance (e.g. traditional hula dancing, tai chi) that was important to increase engagement and health (Wang *et al.*, 2013; Kaholokula *et al.*, 2017). This focus on culture and PA has been explored within Aboriginal and Torres Strait Islander men with positive engagement reported (Mendham *et al.*, 2014; Shultz *et al.*, 2014; Sampson *et al.*, 2021). However, to our knowledge, such research has not occurred with Aboriginal and Torres Strait Islander women who often report having less opportunity to participate in PA due to their significant community roles (Stronach *et al.*, 2016). Therefore, culturally relevant PA, such as Traditional Indigenous Games (TIG), which were played by Aboriginal and Torres Strait Islander people during childhood and before colonization (Edwards, 2009), may be a suitable approach to engage women in PA. TIG were ‘...those which included all aspects of traditional and contemporary play cultures associated with Aboriginal and Torres Strait Islander cultures and identifiable communities, and were generally accepted as an adequate reflection of their cultural heritage and social identity’ (Edwards, 2009). While TIG may be suitable for this population, we also need to understand the current barriers that exist for Aboriginal and Torres Strait Islander women and PA. Therefore, the aim of the current study was to explore further the barriers and facilitators for Aboriginal and Torres Strait Islander women to undertake PA, including PA with cultural meaning (i.e. TIG). Identification of these barriers and facilitators may help with the development of strategies to enhance PA levels in Aboriginal and Torres Strait Islander women.

METHODS

Participants

Aboriginal and Torres Strait Islander women in Australia were invited via local community and national programs to participate in this study. The inclusion criteria for participants were: (i) non-pregnant Aboriginal and Torres Strait Islander women; (ii) women with one or more cardiovascular risk factors; current smoker, risky alcohol consumption (more than 10 standard drinks per week or maximum of 4 standard drinks per day), body mass index > 25 kg/m², physically inactive (< 150 min of moderate intensity or 75 min of vigorous intensity per week), high blood pressure ($< 140/90$ mmHg), poor diet and (iii) aged between 18 and 70 years. All participants provided written, informed consent prior to participation in accordance with the local institutional Human Research Ethics Committee approval (H8490) and Indigenous ethics advisor.

Study design and community consultation

This qualitative study consisted of engaging Aboriginal and Torres Strait Islander women in face-to-face and online focus groups between August 2021 and August 2022. Within a safe and culturally supportive environment, women were asked to consider why they did, and/or did not, engage in PA and whether they would engage in TIG if available, and why.

The National Health and Medical Research Council research guidelines were followed to ensure best practice amongst Aboriginal and Torres Strait Islander participants (National Health and Medical Research Council *et al.*, 2007). Prior to commencing the study, a letter of support and a consultation session occurred with a North Queensland local community group for Aboriginal and Torres Strait Islander women. This consultation was an opportunity to introduce the Principal Investigator (PI), an Aboriginal woman (Gamilaraay and Kuku Yalanji), who is an Accredited Exercise Physiologist, to explain the rationale and aims of the research project and provide potential participants with information sheets. During this process, the PI briefly described her cultural background as an Aboriginal woman and her experience growing up playing TIG. As a result, she had familiarity with playing and facilitating the games to a variety of people who were able to inform her reflections of her observations throughout the study. The women were encouraged to talk about the appropriateness behind the research topic and build rapport with the PI before consenting to participate in the project. Once participants consented to be involved in the research, data collection commenced in a separate group meeting within their community building. A female traditional owner of the local community was present for the face-to-face focus groups for all meetings. For extended recruitment, the PI followed the same procedure as above before commencing the focus groups online and had a cultural mentor present for the online focus groups.

Initially, 10 women attending a local community group were invited to participate with nine participants agreeing and undertaking face-to-face focus groups (i.e. three separate groups of three participants). Further recruiting was undertaken within a national not-for-profit organization for Aboriginal and Torres Strait Islander people. This extension resulted in 16 more female participants showing interest

with eight completing the online (Zoom) focus groups (i.e. two groups of four participants). A total of 17 women (34.3 ± 10.2 years) engaged in focus groups and participated in the current study.

Materials

Six TIG (i.e. Buroinjin, Edor, Ilye, Arrkene, Noongar Wana, Kai Wed) were selected by researchers for consideration within the current study and were based on the Yulunga resource manual (Australian Sports Commission, 2008; Edwards, 2009). These six TIG were printed as A5 laminated cards with a picture of the game and a brief description, to ensure the participants had a clear understanding of the potential games they could choose to play. The selection was ensured to have two low-intensity (50–60% heart rate maximum), two moderate-intensity (70–80% heart rate maximum) and two high-intensity (80–90% heart rate maximum) TIG for participants to consider for future PA engagement. To our knowledge, the specific physical demands for the selected TIG were not reported previously and therefore a desktop needs analysis (Hughes and Franks, 2008) was conducted to determine the physical requirements for each game. A brief description of all the games is provided below:

- Buroinjin: A running and passing ball game, similar to a game of touch football. The aim of the game was to get to the opposite end of the field without being touched.
- Edor: A goal-orientated, chasing and tagging game, like reverse tiggy/tag. The aim of the game is to get to the other end without getting tagged by the opposition.
- Ilye: A running and throwing game where a frisbee is used instead of a boomerang. The aim of the game is to throw a frisbee to a teammate and score a goal at the opposite end of the field.
- Arrkene Irreme: A bat and ball game where the aim is to hit the ball as far as possible. This game is similar to a game of softball.
- Noongar wana: A throwing and hitting game, akin to a game of cricket. The aim of the game is to get the person in the middle 'out' by hitting the object (a cone in the centre of the circle) in the middle of the playing field.
- Kai Wed: A hand-hitting game, similar to a game of volleyball. The aim of the game is to keep the ball in the air for as long as possible.

Focus groups

Focus groups that were culturally safe, supported and focused with the research topic, compared with more flexible yarning circles (Bessarab and Ng'andu, 2010), were conducted to explore PA engagement among Aboriginal and Torres Strait Islander women. The focus group guide employed semi-structured questions to explore barriers and facilitators to PA and perceptions of TIG, and enabled exploration of participant responses in more detail that may not have been considered by researchers (Gill *et al.*, 2008). The focus groups ran between 45 and 60 min and all participants were asked about their past and present levels of PA, to identify their barriers and facilitators towards engaging with PA, and their experience with PA. Examples of open-ended questions and prompts included: What PA and/or exercise did you participate in the past? What is your

favourite type of PA? What are some of the things you look for in PA? and What stops you from undertaking PA? All questions were posed by the PI.

Following the aforementioned questions, participants were presented with descriptions and drawings of children playing the selected TIG and asked to pick the three games that they would be most likely to play, and describe why they did or did not select each game. Information about the physical demands or intensity of each TIG was not made available to the participants, to ensure they selected the TIG based on their own perceptions. All discussions within each focus group were audio recorded (iPhone X, 2017, Apple Inc., USA) and transcribed verbatim via Otter (Otter.ai, Inc., AISense, 2016).

Data analysis

Feedback from the focus groups was codebook thematically analysed (Roberts *et al.*, 2019) to identify participants' barriers and facilitators towards PA engagement. All verbatim transcripts were independently reviewed by two researchers and then discussed jointly to validate identified themes for inclusion. When needed, a third researcher was asked to review the transcripts with the coded themes to resolve any discrepancies. A basic coding method was used to reflect the type of barrier and/or facilitator. For example, 'I'm too busy to exercise' was compared with similar wording on other transcripts and placed into a meaningful theme such as competing priorities. This same process was repeated for each transcript with themes developed. Unique quotes from participants were also selected to provide evidence for each theme. Participant's names were re-coded (i.e. pseudonyms listed) for quotations to protect their identity.

RESULTS

A summary of the barriers and facilitators that influenced participation in PA is presented in Figure 1.

Barriers

Participants highlighted multiple barriers to engaging in PA including competing priorities, being mothers/carers, logistics, personal health, shame, culturally unsafe spaces and racism (Figure 1).

Participants identified lack of time as the most significant barrier to undertaking PA. Participants reported that commitment to family, work and study left little time to prioritize PA. For example, the majority of women were more likely to *not* prioritize PA and would put their family's needs before their own:

I don't put myself first ... it really just depends, but even though I'm organised, it's just no time for me. – Anna

Usually, work would probably stop me from exercising, you know finish working late and then still having to cook dinner. – Alicia

When mothers or carers were able to prioritize PA, then another barrier such as lack of childcare arose. Women found a lack of support or organizations to supervise their children when participating in PA. In rare cases where there was this support, there was often a significant cost associated with it that would leave little to pay for participation fees, etc.

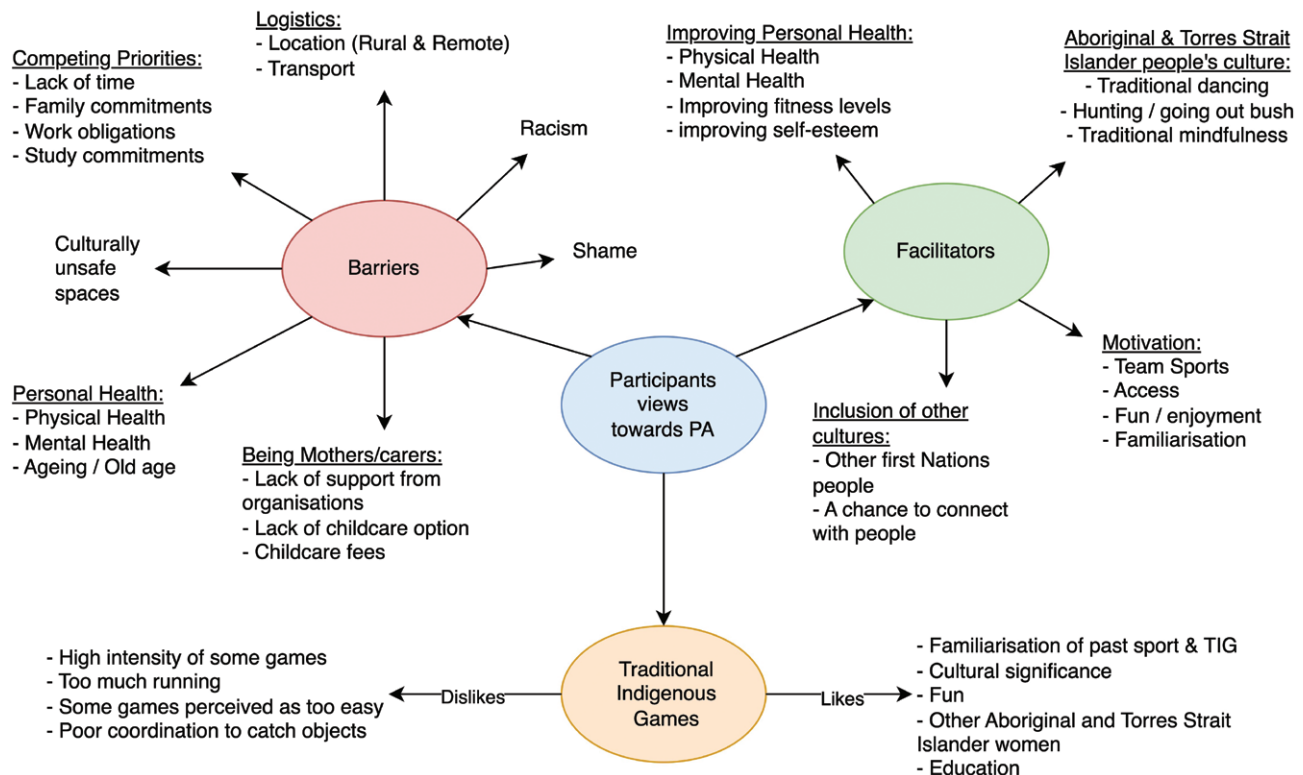


Fig. 1: Aboriginal and Torres Strait Islander women's views about physical activity engagement and Traditional Indigenous Games.

So do you think being mothers is also a barrier to exercise?

– Interviewer

Yeah, with no day care and things – Janaya

No one to look after your kids, you know. – Lesley

So that was the other reason I stopped too. Yeah, because of the fees (i.e., childcare fees). – Janaya

Interestingly, where participants lived also impacted upon their ability to participate in PA. Commonly, participants who lived in rural and remote areas reported limited access, transport and opportunity for local competition (compared to what was available in metropolitan areas) as reasons for *not* participating in PA. The following statements highlighted the barriers for rural and remote communities:

I guess opportunity is one of the biggest things for us. Like where I am located at the moment, we got two and a half hours drive from here to (Darwin) and don't really have the opportunity for any sport out here. – Jade

Here there wasn't much opportunity, like sporting opportunities because we live so remotely. – Lauren

The women's perceived physical ability was stated as impacting upon their capability to regularly engage in PA and dictated the type of PA they would participate in. The women highlighted that their limited physical ability was related to ageing, or pre-existing medical conditions, such as musculoskeletal injury, and chronic illnesses. The women felt like they couldn't engage in PA compared to when they were younger and 'healthier'.

I used to be really active when I was younger, but now that I'm older you just don't move the same... – Manola

Furthermore, other women identified mental health conditions, such as anxiety, depression and post-traumatic stress disorder, as significant factors that affected their participation in PA with most finding it hard to prioritize PA in their life.

What's stopping me from exercising in the first place is my anxiety and depression... I was going through a lot at the time, then that lead to depression and anxiety, which makes me sad all the time and I wouldn't even leave the house....so I stopped exercising. – Janaya

When physical or mental health impacted women's engagement with PA, it was often compounded by their reliance on family or friends to help. For example, one participant mentioned that her friend's inability to commit regularly to PA became a reason she ceased walking.

We started walking together and then she started getting slack... but I'll be still over there (walking)... and she still doesn't come, then I just started slacking because it was just me all the time. – Tayla

Participants also identified shame as a barrier. The women explained their shame as 'embarrassment' or 'discomfort' when exercising, which was due to a new environment, being surrounded by non-Indigenous people, or participating in a new form of PA. This sentiment led to a negative perception of how participants looked and felt when participating, and potentially avoidance of PA altogether.

Yeah definitely, been shame to participate... – Lesley.

I think sometimes places aren't culturally appropriate like you know, we just do things differently and you're not comfortable being around non-Indigenous people. So, I always look for the women's only sessions or being around my family to help. – Louise

The feelings of shame were closely linked to feeling unsafe in an environment or worse, experiencing forms of racism. Participants identified that racism was a common barrier in sports but also a part of everyday life for Aboriginal and Torres Strait Islander women. It was highlighted that racism did not stop participants *entirely* from engaging in sport and PA, but it would impact them at a personal level and result in behaviour modifications. One participant highlighted their heightened consciousness of responding to racial slurs from opposing teams.

Women face many barriers engaging in physical activity, and then you have black women... I think we tend to play in Indigenous only teams which means teammates are all banding together, but that doesn't mean in the competition that there isn't racism, and it's happened in pretty much every sport I've ever been in. I think it's a sad reality and we know that's a part of competition and they try to do better, but there's still lots to work on. – Anne

While racism caused significant distress to women in organized sport, there was great comfort for them in being in all Indigenous teams for safety. This benefit led to greater involvement from Aboriginal and Torres Strait Islander women when participating in sport and were more likely to feel supported, connected and adhere to long-term PA compared to predominantly non-indigenous team members.

Facilitators

While many barriers were identified by Aboriginal and Torres Strait Islander women, many facilitators for engaging in PA were also noted including improving personal health, motivation, Aboriginal and Torres Strait Islander people's culture and inclusion of other cultures (Figure 1).

Improving physical and/or mental health was an important motivator for women's engagement with PA. For example, improving fitness levels and/or whole-body strength, prevention of chronic diseases and a desire to look 'healthy' were key reasons for women to engage with PA.

I have a lot of family members that have diabetes (Type II), and I want to get on top of my health to prevent getting diabetes when I'm older. – Louise

Additionally, some participants reported that they used PA as an 'outlet' to manage anger and stress, while others found that exercise helped them to 'feel good' and improve their overall wellbeing.

I was a gym junkie I was just addicted to just going there, getting all my anger out, especially because I was going through a lot at the time – Janaya

If you felt like you couldn't run away from the situation, you felt like you were running, I guess metaphorically as well as physically. – Anna

Most participants reported that team sports, access and fun were motivating factors to engage in PA. For example, participants indicated that the type of PA that they participated in the past (i.e. team sports) was based on social interactions with family and friends. Participants were more likely to get involved in one or more of the team sports (e.g. volleyball, touch football, softball, rugby league, etc.) based on what access they had and were more likely to adhere to it in the long term if it was 'fun'.

What you grow up with tends to be where you go... I grew up with older siblings who played basketball and then I did. Then I got my kids involved in basketball, and now my granddaughter's playing basketball... but it's like connect- edness, talking about that social interaction, you know, like it's more fun. – Nikki

Yeah, I've been quite fortunate for the sporting opportu- nities around here... we had like touch football, soccer, league tag... we had AFL on weekends, and I would do surf club stuff during the week. – Alicia

And do you like physical activity that raises the heart rate a bit? – Interviewer

Yeah, but only if it's fun – Manola

Aboriginal and Torres Strait Islander culture and cultural tasks such as traditional dancing, hunting, 'going out bush' and traditional mindfulness were identified by participants as significant facilitators towards PA engagement. These cultural activities did not 'feel' like PA but had a special connection for most participants with one stating that PA was 'grounding' and made her feel reconnected to herself and her culture.

Wayapa work which incorporates meditation, a lot of movement. So, you can sit or you can stand... is actu- ally one of our Indigenous kind of lifestyles from here in Australia... whenever my body feels like doing it, it just tells me and I just do it. – Anna

All of these activities imposed a level of physical demand and had a cultural impact on the individual and the community. These activities were integrated into everyday tasks, which did not feel like structured PA, but a way of life.

I'm very active, and I love a lot of activities like swimming, hunting, going out bush, and walking, yeah just walking everywhere. – Chey

Another participant mentioned that once she had children, she ceased PA, yet she still engaged in traditional dancing to support her physical and mental health. This continuation was because there was community involvement, and it was a cultural practice that was important for her to maintain after having children, and improve her quality of life.

Maintained volleyball and basketball for a little bit after having the kids but not for long. I did a lot of traditional dancing however. – Nikki

Participants also identified that a safe environment, both physically and culturally for herself and for her children, was important for her to engage in PA. The support of a trusted

Indigenous community was vital for the participant, as she did not have to worry about the safety of her children while she was preoccupied.

The Aboriginal community was kind of a shared responsibility around kids. I could take my kids along and someone would look after the kids while we were doing the games you know, and then I will do the same thing for them so that was probably really important for me, it was something that I could take the kids along to and everybody would participate. – Anne

The presence of 'same' and 'other cultures' such as First Nations people like Polynesians was also a motivating factor to engage in PA for some participants. One participant explained that when surrounded by other Aboriginal and Torres Strait Islander people, they felt 'connected'. Similarly, they felt a presence of 'connectedness' when there were participants from other cultures around them instead of non-Indigenous Australians.

So, the classes I do, it's not a mix of Aboriginal friends, um but in Brisbane there's a large amount of Islanders that you're also with so it just makes you feel connected to each other. – Louise

The connection with culture was explored further with participants when discussing the TIG as a form of PA. These games were a unique form of PA that some participants had played before while others had not. Participants reported keen interest in playing the games, however, there were still some aspects of these games that they liked and disliked (Figure 1). For example, some participants perceived a few of the games as too easy while others disliked the high intensity of others. Likewise, some participants reported they had poor coordination, which would discourage them from playing some TIG. Despite these aversions, many important positive aspects of the games were identified including familiarization of past games, culture, fun, engaging with other Aboriginal and Torres Strait Islander women and education.

The majority of participants indicated that they would be interested in playing the games if common barriers (e.g. lack of time, transport, cost, etc.) were addressed. After reviewing all of the games in the current study, one participant mentioned she liked every game and would play them all.

I like all of them. I would play all of them, I don't mind. I love playing. – Chey

After reviewing the TIG, participants were more likely to choose the ones they were more familiar with (i.e. past experience) and were closely linked to sports they played in the past. For example, one participant wanted to play the game Kai Wed, as this closely resembled volleyball, a sport she enjoyed playing. Another participant wanted to play the game Edor, as this was a game she had played as a child. This game brought up feelings of nostalgia and fond memories as it made her 'feel like a kid' as she had played the game when she was younger.

I picked Edor because I grew up playing this game and haven't for a while. So, I'd be interested to see us all having a go. – Nikki

I picked Edor because I've played it before growing up and its fun. – Manola

Fun was also identified as a contributing factor when women chose which game they would like to play. Participants were more likely to choose the games they thought would be 'fun', promoted teamwork, were competitive and required some strategy.

This game (Kai Wed) looked like a lot of fun. – Lauren

I feel like this one (Buroinjin) requires more strategy and would be more interesting and more fun to play then just hitting a ball up. – Julia

Most importantly, participants highlighted that the significance of culture and connection was a key motivation and enabler for them to participate in TIG. The games presented a way to reconnect with the past and get involved with PA that mattered to them. Many cultures embraced the histories and traditions of the past and the games presented important cultural significance on both a personal and collective level. While the games may now have more modern names, it was the connection to the past, language and purpose of the games that provided important cultural connection and purpose for participants. Several women also commented that they valued the chance to be with other Aboriginal and Torres Strait Islander people while playing, and the opportunity to be outside/outdoors was really positive.

I would definitely be wanting to be there (the games); it would be fun. You obviously would have that connection, you know, you're with mob, so why wouldn't you want to be there? Yeah, I think that would be amazing. – Anna

Yeah, I definitely would be there... I love being around other Indigenous people and have the opportunity to be outside and having no shoes on and being on the grass. Instead of being inside all day... I would definitely love to do something like this. – Julia

There was a strong desire from one participant to not only play the games but to learn about them so they could teach these to the children in their community.

I want to learn them, play them, and then teach them to the kids. – Chey

While the TIG were seen as important forms of PA for Aboriginal and Torres Strait Islander women, participants also mentioned some concerns about participating in some. For example, the high-intensity nature of some TIG was mentioned as 'too much' for some participants and they were concerned with the level of PA required to undertake the games.

This game looked too intense and required lots of running. – Jade

In contrast, the intensity of some games was perceived as being too easy with the games possibly becoming boring. For example, if the game required little strategy, it felt more like children 'playing'.

Less like sports, more like a game for primary school children. – Lida

I'm afraid I would get bored after a while. – Julia

Some participants indicated that they had personal preferences towards the type of game that they would play. One participant mentioned that 'being touched' during Edor was a negative factor for her. Others mentioned that poor coordination skills during throwing/hitting games were a reason for why that game would be selected less.

I don't really have good hand eye coordination. – Alicia

Yeah, I don't like frisbees ... – Julia

DISCUSSION

The current study identified barriers to PA commonly reported by women such as lack of time due to family commitments, lack of childcare, physical and mental health limitations, finances, location, old age, as well as unique barriers for Aboriginal and Torres Strait Islander women, such as shame and racism. The common facilitators for Aboriginal and Torres Strait Islander women engaging with PA were improving physical and mental health, access to facilities, fun, inclusion of other and Aboriginal and Torres Strait Islander cultures, team sports and familiarization. Similar barrier and facilitator themes were noted for TIG engagement with women more likely to participate in TIG as they were culturally significant, fun, familiar and involved other Aboriginal and Torres Strait Islander women. Results from the current study may assist with the development of future PA programs for Aboriginal and Torres Strait Islander women to improve PA engagement and health outcomes.

Barriers

In our study, all Aboriginal and Torres Strait Islander women indicated numerous barriers towards PA engagement. These barriers, including lack of time due to family commitments, lack of childcare and finances, were similar to those experienced by other populations, including non-Indigenous people (Péloquin *et al.*, 2017; Sherry and Rowe, 2020). The lack of time was a common reason for Aboriginal and Torres Strait Islander people not participating in PA in the current and prior studies (Canuto *et al.*, 2014; Péloquin *et al.*, 2017). Specifically, mothers would prioritize their children's needs over their own, resulting in reduced time and motivation for PA. Once the lack of time was addressed, an additional barrier, the lack of childcare, would then become an inhibiting factor towards PA. This combination of multiple barriers was common as the women were reported to be the main carers within their home. Canuto *et al.* (2013) also reported similar findings with Aboriginal and Torres Strait Islander women experiencing significant barriers due to the considerable family responsibilities and cultural obligations. Therefore, programs that include family, consider family responsibility, or provide childcare may help to enhance PA engagement for Aboriginal and Torres Strait Islander women.

Racism was identified as a distinct and negative barrier that affected both PA engagement and everyday life for women. Participants reported personal impacts such as self-doubt and avoiding certain facilities (i.e. not playing club sport)

that likely exacerbated the poor PA levels of Aboriginal and Torres Strait Islander women (Dahlberg *et al.*, 2018). Prior research has also reported that racism substantially impacted Indigenous populations, resulting in a feeling of inferiority and remaining silent behaviour (Stronach *et al.*, 2019). In the current study, racism took many forms with some being less visible and subtle while others were quite confrontational and unsafe, leading to avoidance behaviours and less engagement by women (Stronach *et al.*, 2016, 2019; Tatz and Tatz, 2018). Additionally, racism was often linked to a unique barrier of shame, manifested as feelings of discomfort, embarrassment or self-consciousness, particularly in unfamiliar settings like gyms. This unique barrier posed a significant issue for Aboriginal and Torres Strait Islander women that future studies need to consider for the development of PA programs. Participants indicated the need for culturally safe environments to engage in PA such as being around other Aboriginal and Torres Strait Islander people or other Indigenous populations such as Native Pacific Islander people. Interestingly, there was still a cultural connection and level of safety and comfort experienced by the women when engaging with other First Nations populations. For example, women of different cultures share similar cultural expectations of the role of women, the way women should dress, and the need for gender-specific spaces (Stronach *et al.*, 2016, 2019; Tatz and Tatz, 2018). While there were some different cultural views, the similarities between women were enough to develop a sense of cultural safety and security (Sherry and Rowe, 2020). The inclusion of other Aboriginal and Torres Strait Islander women and ethnicities within PA interventions may help to promote a culturally safe environment, where women may be less likely exposed to racism and experience shame when participating.

Facilitators

Family is an important consideration for Aboriginal and Torres Strait Islander women (Nelson *et al.*, 2010; Dahlberg *et al.*, 2018) and it was no surprise that it was identified as a barrier but also a facilitator towards PA engagement in the current study. The current study identified that women were more likely to participate in PA that involved family, friends or community, as this felt more meaningful to the participants and they were able to connect with other like-minded people (i.e. same culture, other mothers). Interestingly, if there was a cultural element associated with the PA, such as team sports, traditional dancing or 'going out bush', the women reported greater chances of enjoyment and/or adhering to this type of PA. For example, traditional dancing remained as the only PA undertaken by women once they had children with all other PA ceasing (Nelson *et al.*, 2010; Stronach *et al.*, 2016). Dahlberg *et al.* (2018) highlighted the importance of culture for Aboriginal and Torres Strait Islander people to be more active and that they were more comfortable when in their own cultural spaces (e.g. team sports, family or community). Additionally, Stronach *et al.* (2019) highlighted the importance of not only playing the sport but also assisting family members in sport being role models for others. Therefore, PA that has a cultural significance may be an important combination to help engage Aboriginal and Torres Strait Islander women and possibly improve PA adherence. The inclusion of TIG may be a good example of a culturally significant activity to enhance PA levels and connectedness that may improve the overall health of Aboriginal and Torres Strait Islander women.

Traditional Indigenous Games

Participants were interested in engaging in the proposed TIG with several indicating that they would prefer this activity over an individualized gym-based program or other common interventions. Our study identified that culture was a strong facilitator for PA participation with participants desiring to be around other Aboriginal and Torres Strait Islander women, reinforcing the importance of community and family involvement. Furthermore, women wanted to play the TIG while learning about their history and feeling a cultural connection. Before colonization, Aboriginal and Torres Strait Islander women participated in sport and PA was an everyday task that was competitive, fun, educational and gave women status within the community (Fredericks *et al.*, 2002; Stronach *et al.*, 2019). However, colonization disrupted the community functions and routines with the relocation of people off their traditional lands and from their families (Howell, 1992; Stronach *et al.*, 2019). This had a particular impact on women, as the gender-specific roles within Aboriginal and Torres Strait Islander communities were different to that of the settler colonies and societies (Howell, 1992; Stronach *et al.*, 2019). For example, during early colonization, Aboriginal and Torres Strait Islander women were tasked with domestic service duties under the control of non-Indigenous people which resulted in reduced participation in traditional sports/games and important cultural and health activities (Howell, 1992; Stronach *et al.*, 2019). Several programs have attempted to revitalize culture and PA among Indigenous populations (Edwards, 2009; Kaholokula *et al.*, 2017; Stronach *et al.*, 2019). For example, the Koori Knockout utilizes an annual rugby league carnival tournament for men and women to bring the community together in a culturally safe environment (Stronach *et al.*, 2016). Many refer to the Koori Knockout as a modern-day corroboree, an important cultural ceremony that keeps cultural foundations alive (Stronach *et al.*, 2016). Other First Nations' communities such as the Inuit and the Dene Nation in Canada have also reengaged with Indigenous games (i.e. Arctic Winter Games) to celebrate their culture and undertake PA (Yukon Aboriginal Sport Circle, 2022). Similarly, Kaholokula *et al.* (2017) reported on the health (e.g. blood pressure) and cultural benefits of Indigenous activities following Traditional hula dancing among Native Hawaiian and Pacific Islander people. This traditional Indigenous activity also improved social wellbeing and cultural connection (Kaholokula *et al.*, 2017). In contrast, the benefits of traditional Indigenous activities like TIG have been sparsely examined amongst Aboriginal and Torres Strait Islander women. The willingness of Aboriginal and Torres Strait Islander women to engage in TIG and a culturally relevant mode of PA may provide communities with a crucial pathway to improve long-term PA engagement and health benefits for these women.

Strengths and limitations

The current study incorporated directed and relevant community consultation during the recruitment process to build appropriate rapport with participants for an important topic for women. In addition, cultural links with PA were considered beyond westernized physical activities given the importance of culture and role in society for Indigenous women. Furthermore, participants were surrounded by other Aboriginal and Torres Strait Islander women, which facilitated PA.

Lastly, this study was conducted within a regional area where communities experience a greater number of barriers to health. Despite these study strengths, some limitations should be noted. Firstly, the sample size was modest with a limited number of TIG selected for consideration. Future work with a wider range of games may identify the preferred TIG for health benefits in Aboriginal and Torres Strait Islander women. Additionally, participants were from regional areas with further work needed to confirm and/or extend upon the current result within remote communities, who often experience poorer health.

CONCLUSION

This study identified the perceptions of PA for Aboriginal and Torres Strait Islander women with unique barriers (e.g. racism, shame) and facilitators (e.g. family, inclusion of other cultures) identified. Notably, all participants expressed interest in participating in TIG due to familiarity with past games, the fun nature of activities and engagement with other Aboriginal and Torres Strait Islander women. However, the variable intensity of some TIG, lack of fitness and poor coordination were identified as issues for future TIG use. Most importantly, combining PA with culture (i.e. TIG) was identified as a potential and favourable activity for Aboriginal and Torres Strait Islander women. Expanding upon the current results with exercise programs to improve PA levels and health outcomes for Aboriginal and Torres Strait Islander women is highly recommended.

AUTHOR CONTRIBUTIONS

We confirm that all listed authors made substantial contributions to the study (e.g. design and/or data collection/analysis/interpretation, and writing of the manuscript) according to the ICMJE guidelines.

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ETHICS STATEMENT

All participants provided written, informed consent prior to participation in accordance with the local institutional Human Research Ethics Committee approval (James Cook University, H8490) and Indigenous ethics advisor.

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