

# Evaluation of Yantiin Kalabara – 5 Ways to a Healthier You: A primary school-based education program targeting healthy living choices through interactive workshops

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The aim of this study was to develop, implement and evaluate the novel one-day, school-based health education program Yantiin Kalabara that embedded Aboriginal and Torres Strait Islander culture and perspectives within a series of interactive learning stations. In consultation with local Aboriginal and Torres Strait Islander community members, the Yantiin Kalabara program was designed to encourage healthy lifestyle choices and promote strong, sustainable and mutually respectful relationships between Aboriginal and Torres Strait Islander peoples and non-Aboriginal Australians. The program involved five primary schools (March–July 2021) within the Awabakal, Wonnarua, Darkinjung and Worimi Countries (Australia) in movement-based and culturally rich learning activities (primarily dance). The feasibility of the program for use in primary schools (mean age: 10.1±1.2yrs) and preliminary efficacy for affecting change in key health behaviours (physical activity, nutrition, screen-time) was assessed using student questionnaires.

Yantiin Kalabara was delivered as intended by the Hunter Primary Care team and volunteers. Students (N = 293) reported that Yantiin Kalabara helped them improve their overall health (mean 3.6 out of 4), physical activity (mean 3.4/4), eating habits (mean 3.3/4) and screen-time patterns (mean 3.2/4). We have demonstrated that the Yantiin Kalabara program can be feasibly delivered in primary schools, and that the program was efficacious in affecting positive changes in key health behaviours of participating children. However, further evaluation of Yantiin Kalabara in larger and more diverse populations using a randomised controlled trial is warranted.

**Keywords:** health, Aboriginal and Torres Strait Islander education, primary schools, evaluation

## Introduction

Wellbeing is a complex multidimensional concept, affected by the combination of a person's physical, mental, emotional and social health factors. Extending from Western definitions, Aboriginal and Torres Strait Islander people also consider collective wellbeing to involve harmony in social relationships, in spiritual relationships, and in the fundamental relationship with the land and other aspects of the physical environment (Australian Institute of Family Studies, 2018; Haswell et al., 2013). Although the continual building of wellbeing throughout one's life is important (Australian Institute of Health and

Welfare, 2020), childhood remains a critical period for the development and learning of how to create a foundation for future and lifelong wellbeing. Three important issues currently affect Aboriginal and Torres Strait Islander students and non-Aboriginal Australian students and warrant innovative intervention: 1) low levels of physical activity, 2) poor nutrition, and 3) increased recreational screen-time. Schools are at the forefront of health education for primary school students in Australia, with mandatory schooling provided to those from age 6 and above. In particular, Aboriginal and Torres Strait Islander students report the importance of attending school, achieving good grades, and contributing to their community and society as a whole (Brown, 2019). This makes schools a prime setting for targeting the health and wellbeing of Aboriginal and Torres Strait Islander children and non-Aboriginal Australian children.

## **Aboriginal and Torres Strait Islander population**

Aboriginal and Torres Strait Islander children (0–14 years) account for 5.7% of all children in Australia and over one-third of all Aboriginal and Torres Strait Islander people (Australian Bureau of Statistics, 2016). Although numerous Aboriginal and Torres Strait Islander people experience optimal health and life success, and many have survived with great resilience in the face of tremendous adversity, overall, many also experience disparities in health and wellbeing. Examples of such disparities may include an increased burden of disease, reduced life-expectancy, reduced self-rated quality of life and increased risk of social issues compared to non-Aboriginal Australians (Australian Institute of Health and Welfare, 2018; Butler et al., 2019; Markwick et al., 2014). Historical national health data indicate Aboriginal and Torres Strait Islander people experience higher rates of preventable chronic lifestyle diseases, including cardiovascular disease, kidney disease, cancer and diabetes (Australian Bureau of Statistics, 2014a; 2014b; 2016).

Novel and evidence-informed early intervention strategies may be an effective approach to closing the gap in health status among Aboriginal and non-Aboriginal Australians (Crowe et al., 2017), as evidence indicates many lifestyle diseases develop during childhood (Bhutta, 2013; Brimblecombe, Van Den Boogaard et al., 2014). Targeted school-based programs that draw from Aboriginal and Torres Strait Islander cultures and perspectives hold great potential for engaging young learners and developing in them the skills, knowledge and understandings to make informed and healthy life choices. Physical activity and nutrition appear consistently as two prominent modifiable risk factors impacting current health status among children. A lack of cultural understanding has also been cited as a potential barrier limiting engagement in health strategies (Crowe et al., 2017). Health interventions that are immersed in local Aboriginal culture and target Aboriginal children may have the potential to reduce prevailing health disparities evident among Aboriginal and non-Aboriginal Australians.

## **Physical activity**

Worldwide, young people are not moving as much as they need to for attaining optimal physical, psychological, social and emotional health (Hallal et al., 2012; Hulteen et al., 2017; World Health Organization, 2021). Further, many young people do not do sufficient physical activity to reach or maintain adequate levels of physical fitness needed to maximise health benefits (Eather et al., 2020; Lang et al., 2018; Tomkinson et al., 2019). In Australia, a large proportion of children (~70%) and adolescents (~80%) do not meet current physical activity recommendations (Schranz et al., 2016); similar rates of inactivity are displayed among Aboriginal and Torres Strait Islander children and non-Aboriginal children (aged 5–17) (Australian Bureau of Statistics, 2014a; Evans et al., 2018). Some findings report as little as one-third of non-Aboriginal children (35%) and half of Aboriginal children (48%) meet physical

activity recommendations (ABS, 2014c). Poor physical activity levels during childhood have shown to negatively impact physical fitness, body fat levels, cardiovascular and metabolic disease risk profiles, and bone health in the short- and long-term (Alvarez et al., 2017; World Health Organization, 2020). Physical inactivity is also associated with reduced social-emotional wellbeing, poorer educational outcomes, poor sleep patterns and increased risk of mental health problems in young people (Eime et al., 2013; Lubans et al., 2016; Sember et al., 2020).

Schools may provide an ideal setting for providing physical activity opportunities for children, especially through curriculum programs (Mavilidi et al., 2018; Riley et al., 2021), and during the delivery of physical education and sport (Naylor et al., 2015; Wareing, 2017). However, existing school-based interventions have been largely unsuccessful for improving physical activity levels in the long-term for children (Metcalf et al., 2012) and novel strategies are needed. Opportunities to develop such strategies closely align with the compulsory Personal Development Health and Physical Education (PDHPE) curriculum used in Australia. The PDHPE curriculum involves important contents and concepts for students, including those that relate to many contemporary issues faced by students such as physical activity, nutrition and sedentary behaviours (screen-time).

## Nutrition

There is a similar interest and need for novel approaches to combat nutritional issues among Australians of all ages (Jancey & Trevena, 2019). Australia's Burden of Disease Study reported that physical inactivity combined with poor diet contributed to almost 10% (physical inactivity 2.5% and all dietary risks 7.3%) of the nation's burden of disease (Dunford & Prescott, 2017). Overweight and obesity, the result of a mismatch between physical activity and energy intake, contributed 9%, and was rated as a leading risk factor equal to tobacco smoking (Dunford & Prescott, 2017). Inadequate fruit and vegetable consumption and excess daily consumption of sugar-sweetened drinks are also prominent risk factors for overweight and obesity. Children aged 2–17 years who are daily consumers of sugar-sweetened drinks consume on average 2.4 cups per day (equivalent to 1.6 cans of soft drink or one 600mL bottle). Findings suggest only 2.6% of curricula taught in Australia relate to food and nutrition education (mentioned through two of the seven learning outcomes in PDHPE and technologies) (Love et al., 2020). Suggestions on how to potentially improve knowledge of nutrition in schools for students include strategies such as making improvements in schools' core curricula, training students to develop a critical mind about nutritional issues and creating a supportive educational environment for students (Sadegholvad et al., 2017). Creating exciting and engaging nutrition content, and focusing on this often overlooked topic, may prove beneficial, particularly considering the views of primary school-aged students and their parents in regard to the importance of nutrition education at school are unclear, and the potential life-tracking of nutrition patterns being established (de Vlieger et al., 2020). Previous studies have demonstrated that television viewing can also be linked to poor diet (lower intake of fruit and vegetables; higher consumption of energy-dense snacks, drinks and fast food) in children and across a lifespan (Hobbs et al., 2014; Pearson & Biddle, 2011), supporting a potential relationship between screen-time and nutrition (Tsujiguchi et al., 2018).

## Screen-time

Screen-based recreation, and digital technology use in general, by children is not only pervasive but an evolving concern. While screen-time is now considered part of students' developmental and learning landscape, the majority of Australian children are spending more than the recommended two-hour daily limit for screen-time (watching television, using computers and playing electronic games) (Australian

Government, 2021; Virgara et al., 2021). Estimates from Australian researchers suggest only 17 to 23% of preschoolers and 15% of 5- to 12-year-olds meet screen-time guidelines (no screen-time for those under 2 years old, no more than one hour for those 2 to 5 years old or > 2 hours per day for 5- to 17-year-olds) (Cliff et al., 2017; Hinkley et al., 2020; Howie et al., 2020). High levels of screen-based activities during childhood can have detrimental effects on numerous aspects of children's wellbeing (Cliff et al., 2017; Laurson et al., 2014). Screen-time, in particular television viewing, has shown negative associations with the development of physical and cognitive abilities, while being positively associated with obesity, sleep problems, depression and anxiety (Domingues-Montanari, 2017). Although results from studies of the effectiveness of interventions aimed at screen-time reduction are inconsistent (Wu et al., 2016), recent studies show promise in the ability to reduce screen-time among children (Downing et al., 2018; Wahi et al., 2011; Wu et al., 2016). Interventions for screen-time reduction may also be effective in preventing excess weight (Wu et al., 2016), reducing body mass index (BMI) and addressing other wellbeing issues associated with unhealthy behaviours and undesirable psychological states that could contribute to poor quality of life (Yan et al., 2017). Such findings suggest the importance of considering multiple dimensions of health and also highlight the importance of conducting further interventions to help understand the complex nature of health.

## Schools

Limited school-based intervention studies address all three health issues (physical activity, nutrition and screen-time) simultaneously, and/or report intervention impact on physical, social and psychological effects. Schools are being increasingly recognised as an important setting for health promotion and education for Aboriginal and Torres Strait Islander students and non-Aboriginal students (McCuaig & Nelson, 2012). Children and young people spend a substantial proportion of their waking hours at school and the school setting presents opportunities to increase physical activity, improve nutrition knowledge and provide strategies to reduce sedentary behaviours/screen-time. Given the limited number of school-based health education programs that embed Aboriginal and Torres Strait Islander concepts available for use in Australian schools, and in consultation with local Indigenous communities, we therefore aimed to consult, develop, implement and evaluate an innovative and enjoyable school-based health program for children called Yantiin Kalabara – 5 Ways to a Healthier You. The program aimed to build the knowledge, understanding, skills and attitudes of students regarding holistic health, with a particular focus on physical activity and nutrition, in an engaging, acknowledging and inclusive way. A more socio-cultural perspective for Health and Physical Education (HPE) may benefit some students to feel connected with learning.

## Culturally safe and inclusive environments

Many Indigenous learners find that the materials presented in some educational settings are not culturally authentic or relevant (Loewen et al., 2017). Learning materials provided through modelling and practice are more desired (Loewen et al., 2017). Further, bridging two monolithic knowledge structures (Western knowledge and Indigenous knowledge) is often a difficult task. Consequently, using the relevant curriculum (PDHPE syllabus in Australia) and delivering such content in an interactive way may help create authentic learning objectives and assist in creating culturally safe and inclusive learning environments. It is important to examine any possibilities and concepts that may lead to a positive shift in the academic success of Indigenous students at school. Mixing traditional and modern cultural practices may be particularly valuable in assisting younger community members to bridge new and existing knowledge systems (Dunphy & Ware, 2019).

## Materials and methods

### Recruitment and participants

Yantiin Kalabara involved 293 students present at both time points (mean age:  $10.1 \pm 1.2$ ), with feasibility materials implemented in five primary schools in the Hunter Region, New South Wales (NSW) Australia. Interdisciplinary resources were presented by Hunter Primary Care staff and supervised by classroom teachers. Ethics approval for the program was provided by the University of Newcastle Human Research Ethics Committee (H-2020-0060) and the NSW Department of Education (SERAP2020240). The research team, alongside Hunter Primary Care, worked with a reference group (ways of working) to guide decision-making at all stages of the project. This group was comprised of a diverse range of contributors, including Indigenous service providers (e.g., staff at Hunter Primary Care) and Aboriginal staff/consultants, and is described in detail later. Principals, teachers and children in Stage 3 (includes years 5 and 6 in Australian schools) were invited to participate in the program. Baseline surveys were conducted prior to, and on the same day as, the program took place (March 2021 for the first school). Approximately four weeks later, the follow-up questionnaires were completed (July 2021 for the last school's completion). Five primary schools from the Hunter Region (Awabakal, Wonnarua, Darkinjung and Worimi Countries – Hunter Valley, NSW, Australia) consented to participate.

### Aboriginal and Torres Strait Islander consultation members

This group was recommended and comprised of a diverse range of Aboriginal and Torres Strait Islander service providers, community members and other stakeholders. The members reviewed consent forms and delivery methods, and examined each component of the program. This reflected good practice and established critical success factors to guide decisions about ownership. An Indigenous academic within the Indigenous Education and Research Academic Division at the University of Newcastle was engaged throughout the process. The Aboriginal Education Officer at Lake Macquarie High School participated, and additional Aboriginal staff were employed from the Aboriginal Outreach Program, Integrated Team Care, Yudhilidin and Way Back Support Services to help deliver Indigenous-focused services. Hunter Primary Care's Indigenous staff members were well known and well connected within the Indigenous communities to include regular liaison with Aboriginal Medical Services, local Aboriginal Lands Councils and Lifespan's Aboriginal Advisory Group. Hunter Primary Care is a member of the NSW Indigenous Chamber of Commerce. A letter of support was also received from Lake Macquarie Council's Community Planner for Young People and Safer Communities.

### Yantiin Kalabara program overview

The Yantiin Kalabara program featured a series of interactive "PITSTOP" learning stations delivered by Hunter Primary Care's team of dietitians, exercise physiologists, occupational therapists and Aboriginal health workers. Each of the five PITSTOPS provided students with either a culturally rich learning activity, designed to create better health awareness for Aboriginal and non-Aboriginal communities, or were designed to be stimulating and hands-on to help develop critical thinking, which is beneficial throughout students' lives. Each PITSTOP was conducted for approximately 20 minutes and included a brief presentation followed by an interactive and engaging learning activity with local health providers. PITSTOP 1 focused on increasing physical activity and consisted of students playing traditional Indigenous games from the Yulunga resource, such as kai-tarnambai (Australian Sports Commission, 2008). PITSTOP 1 considered traditional games as they are an important aspect of the cultural, social and historical experiences of Indigenous communities. PITSTOP 2 focused on the importance of water, and

students engaged with interactive quizzes. In doing so, PITSTOP 2 was designed to cater to Aboriginal ways of learning and learning styles (Western New South Wales Regional Aboriginal Education Team, n.d.). PITSTOP 3's content focused on increasing fruit and vegetable consumption while subsequently reducing snacking, i.e., choosing healthier alternatives. Similar to PITSTOP 3, PITSTOP 5 centred on minimising unhealthy snacks (students also made fruit skewers). Through hands-on learning experiences, students were to gain an authentic understanding of healthy decision-making and to test their knowledge on developing connections to self, others, and sustainable and ethical futures. PITSTOP 4 involved educating students on switching off screens and highlighting the numerous benefits of doing so (posture, eye strain and physical effects). By getting in touch with their local Indigenous community members, we hoped to inspire the students to build deeper connections to themselves, others and their local environments in meaningful and authentic ways by switching of unnecessary recreational screen-time. To assist with storytelling and bringing the key messages of the PITSTOP learning stations to life, each day concluded with a cultural dance. Elements of dance were incorporated and cultural imagery was used with respect for Aboriginal ownership of their culture and land.

## Feasibility outcomes

The primary outcome of this study relates to program feasibility (intention/dose, feasibility and quality based on student evaluations), with preliminary efficacy outcomes (changes in physical activity, nutrition and screen-time patterns post-program) also assessed. Demographic information was also collected and is displayed in Table 1 below.

Children completed all measures at both baseline and four-week follow-up, with assessment of physical activity, nutrition and sedentary behaviour/screen-time (Finch et al., 2007; Gwynn et al., 2011; Hardy et al., 2007; Prochaska et al., 2001) shown to be reliable and valid in children as young as year 3. All measures were administered on the same day at each school by Hunter Primary Care staff who completed a one-day training session conducted by the researchers from the University of Newcastle (to ensure conformity to protocol).

**Table 1: Baseline demographics**

	<i>N</i>	%	Mean	<i>SD</i>
<b>Gender</b>				
Male	153	52.2		
Female	134	45.7		
Other	3	1.0		
<b>Age (baseline)</b>			10.1	1.2
<b>Language spoken at home</b>				
English	289	98.6		
Other	0	0		
<b>Cultural background</b>				
Australian	276	94.2		
European	8	2.7		
Asian	3	1.0		
Other	1	0.3		
<b>Identify as Aboriginal and/or Torres Strait Islander</b>				
Yes	109	37.2		
No	178	60.8		

<b>SEIFA Index*</b>		
1	173	59.0
2	75	25.6
3	7	2.4
4	4	1.4
5	18	6.1

Missing data as follows: Gender  $N=3$  (1%), Language spoken at home  $N=4$  (1.4%), Cultural background  $N=5$  (1.7%), Identify as Aboriginal and/or Torres Strait Islander  $N=6$  (2%), SEIFA Index  $N=16$  (5.5%).

\*SEIFA combines Census data such as income, education, employment, occupation, housing and family structure to summarise the socioeconomic characteristics of an area. A lower score (1) indicates that an area is relatively disadvantaged compared to an area with a higher score (5).

### Feasibility outcomes – Intention/dose

A process evaluation was conducted to determine whether the Yantiin Kalabara program could be feasibly implemented in the participating schools and whether the program (e.g., design, implementation, content and dose) was well received by staff and students and suitable for use in targeted primary schools.

### Feasibility outcomes – Questionnaire

#### i) Healthy aims

Students responded to five questions relating to their belief as to whether the Yantiin Kalabara program helped improve their behaviours and/or understanding on various health issues (on a 4-point scale ranging from 1 = Strongly disagree to 4 = Strongly agree). Mean averages and standard deviations (*SD*) are provided in Table 2 in the Results section.

#### ii) Recommendation

Students scored if they believed other students should have opportunity to participate in Yantiin Kalabara, using the same Likert scale as in the Healthy aims section of the evaluation. See Table 2 for results.

#### iii) Learning from the PITSTOPs

Students ranked the PITSTOPs on how much they learnt from them using a 1 to 5 scale. A PITSTOP was rated 5 if the students learnt a lot from it; when rated a 1, students may have already known what was being talked about/done or they did not understand the topic. See Table 2 for results.

### Preliminary efficacy outcomes

#### i) Physical activity

A modified version of a self-report questionnaire tasked students to recall physical activity patterns over the last week (Prochaska et al., 2001), and consisted of three questions. The first asked students how much time they usually spent each week playing games or doing activities that make you run around or huff and puff (measured in minutes). The second and third questions asked the students to report the number



of days they meet the 60 minutes special activity guidelines (measured on a scale from 0 days to 7 days). The later question specifically referred to a typical week comparatively.

## ii) Nutrition

A simplified food frequency questionnaire (SFFQ) (Finch et al., 2007; Gwynn et al., 2011) was used to recall food. The SFFQ has been used to monitor and/or evaluate population-wide health programs, including those with rural Aboriginal and Torres Strait Islander children previously (Gwynn et al., 2011). A number of short questions have shown good validity (kappa coefficients for repeated measures between 0.41 and 0.80) for Aboriginal and Torres Strait Islander children, as for their non-Aboriginal counterparts.

## iii) Screen-time

Recreational screen-time was measured by the adolescent sedentary activity questionnaire (ASAQ) (Hardy et al., 2007). The ASAQ required respondents to self-report time spent on recreational screen-time on each day of the week, including weekends. The final item was not part of the original ASAQ instrument, but was added to reflect current trends in screen media use. Similarly, the term “recreational screen-time” was used in the questionnaire to include the screen-based activities outlined in the ASAQ as well as more current technology such as tablets, laptops and phones. Mean daily screen-time was calculated by adding the time spent using any screen device for recreation (not for school or homework) on each day of the week and dividing by the number of reported days (i.e., 7). The ASAQ has shown acceptable test-retest reliability among girls (ICC = 0.70, 95% CI: 0.40, 0.85) and boys (ICC = 0.84, 95% CI: 0.69, 0.91).

## Statistical analyses

Statistical analyses were conducted in IBM SPSS Statistics for Windows (Version 20). The program was deemed successful if the Yantiin Kalabara program was delivered as intended and scored highly on evaluations (intentions or satisfaction) from student evaluations and preliminary efficacy outcomes. One-way analysis of variance (ANOVA) was used to evaluate efficacy outcomes. Following CONSORT guidelines for the conduct of feasibility trials, effect sizes were also determined using partial eta squared. Researchers predominantly report the effect size partial eta squared ( $\eta^2p$ ) as a measure of the proportion of variance associated with each main effect and interaction effect (effect sizes were interpreted as 0.01 = small effect, 0.06 = medium effect, 0.14 = large effect) (Brown, 2008; Lakens, 2013). Results are in Table 3 in the following section. Due to anonymity, the means scores at each of the time points for each school were used in analyses, rather than individual scores.

## Results

### Demographics

In summary, 293 students (153 boys; 134 girls; 3 students identified as other; 3 did not answer this question) from five primary schools from the Hunter Region (Awabakal, Wonnarua, Darkinjung and Worimi Countries – Hunter Valley, NSW, Australia) participated. The students (mean age  $10.1 \pm 1.2$ ) were predominantly born in Australia (94.2%) and spoke English at home (98.6%).



## Feasibility results

- i) **Fidelity and quality:** The Yantiin Kalabara program was delivered as intended (five PITSTOPs ranging from 20 to 40 minutes in duration each day/school) and all scored highly on student evaluations. Students' overall ratings on the program for improving their health and wellbeing was a mean of 3.6 out of 4. Students' thoughts on the program helping their understanding of healthy living choices scored a mean of 3.6 out of 4. Students' belief that Yantiin Kalabara helped with eating habits scored a mean of 3.3 out of 4. Additionally, the program provided ideas to help meet physical activity guidelines (3.5 out of 4) and reduce screen-time (3.2 out of 4). Full details including SDs are provided in Table 2 below.
- ii) **Dosage:** All five PITSTOPs at each of the five schools were delivered as intended. PITSTOPs 1 to 5 were successfully conducted in 20, 25, 30, 30, 40 minutes respectively at all schools, 1/day.
- iii) **Responsiveness:** The students' mean score was 3.8 out of 4 when asked if all students should have an opportunity to participate in Yantiin Kalabara.

**Table 2: Evaluation of Yantiin Kalabara by students (N = 293)**

<b>Evaluation on overall program (4-point scale)</b>	<b>Mean</b>	<b>SD</b>
Yantiin Kalabara helped to improve my overall health and wellbeing	3.6	0.7
Yantiin Kalabara helped me understand what makes up healthy living choices	3.6	0.6
Yantiin Kalabara helped me with my eating habits	3.3	0.8
Yantiin Kalabara helped me with ideas to meet physical activity guidelines (60min/day)	3.5	0.8
Yantiin Kalabara helped me to reduce my screen-time (tv, tablets, phones, etc.)	3.2	1.0
I think all students should have an opportunity to participate in Yantiin Kalabara	3.8	0.6
<b>Evaluations on each PITSTOP (1 to 5 scale)</b>		
Station 1: Get active everyday	4.3	1.1
Station 2: Choose water as a drink	4.1	1.2
Station 3: Fun with fruit and vegetables	4.2	1.2
Station 4: Switch off screens	3.9	1.3
Station 5: Superhero snacks	4.5	1.1

## Preliminary efficacy results

Yantiin Kalabara appears efficacious for affecting change in key health behaviours (physical activity, nutrition, screen-time) in students when assessed using student questionnaires. Promising increases in mean scores from baseline to follow-up were found in weekly/typical physical activity patterns and in vegetable, fruit and water consumption. Notably there were also increases in mean values from baseline to follow-up for soft drink, fried/fast food and evening meals in front of television, in addition to screen-time on weekdays, with possible explanations below. Medium effects were found for weekly physical

activity patterns, fruit servings, fried and fast food consumption, and weekday screen-time using one-way ANOVAs. Small associations were found for typical days spent completing 60 minutes of physical activity, vegetable and soft drink/water consumption, and evening meals spent in front of television.

**Table 3: Preliminary efficacy results using one-way ANOVA**

Assessment	Time point	Mean	<i>N</i>	<i>SD</i>	Eta
Week physical activity (mins)	1	164.9.1	268	174.9	.098
	2	203.9		216.8	
Days meeting physical activity guidelines (days)	1	6.1	280	10.7	.052
	2	5.3		2.2	
Typical days physical activity (days)	1	5.3	276	2.3	.034
	2	5.4		2.2	
Vegetable servings per day	1	3.2	284	1.4	.067
	2	3.4		1.5	
Fruit servings per day	1	3.1	286	1.1	.087
	2	3.3		1.1	
Soft drink consumption	1	3.1	286	1.7	.039
	2	3.2		1.7	
Water consumption	1	4.8	288	1.3	.047
	2	4.9		1.3	
Fried food consumption	1	2.6	286	1.3	.094
	2	2.9		1.4	
Fast food consumption	1	2.4	288	1.2	.092
	2	2.6		1.3	
Breakfast (days)	1	1.3	289	0.6	.014
	2	1.3		0.5	
Evening meals in front of tv	1	2.7	286	2.7	.033
	2	2.9		2.8	
Weekday screen-time (mins)	1	666.2	279	791.0	.076
	2	792.8		855.4	
Weekend screen-time (mins)	1	493.9	271	524.3	.002
	2	492.0		507.3	

## Discussion

### Overview

The primary aim of this novel study was to determine the feasibility of delivering Yantiin Kalabara in primary schools for Stage 3 students. The secondary aim was to gain insights into the potential impact of the program on learning and behaviour (self-reported physical activity, nutrition and screen-time patterns), with the next step to investigate its effectiveness in a large-scale randomised controlled trial.

Our preliminary findings support the feasibility and efficacy of a culturally rich and time-efficient school-based learning program. Overall, findings indicate Yantiin Kalabara can be feasibly delivered in the school setting by an external agency, but this approach is not without limitations (as discussed below). Specifically, the Yantiin Kalabara program was successfully delivered during a one-day workshop during school hours in each school by the Hunter Primary Care staff. The low-dose, one-day delivery was palatable for teachers given current and ongoing concerns regarding lack of time and a crowded curriculum among primary school teachers (Nathan et al., 2018). However, running multiple learning stations simultaneously meant that, typically, 12 staff from Hunter Primary Care were needed throughout the day. To test the program content under ideal conditions, it was necessary to have skilled practitioners running the program during the testing phase. For this approach to be cost-effective and sustainable for schools, classroom teachers would need to be trained in the delivery of Yantiin Kalabara to enable the program to be embedded into their learning schedule.

Student evaluations of the program were overwhelmingly positive; most notable was the 3.8/4 mean for the belief that everyone should have an opportunity to participate in the program. Furthermore, high ratings of the PITSTOP learning activities indicate that the content was palatable and suitable for Stage 3 students. The success of the PITSTOP learning stations also indicates development of more balanced and holistic intercultural understandings, and interactive learning experiences may justify a more thorough inclusion of culture into PDHPE in schools. The interactive learning indicates that offering rich contexts to initiate learning and connect PDHPE education with a more holistic worldview may be needed for promoting sustainability.

The success of the program could be attributed to several factors, such as involving the inclusion of culturally rich learning activities significant to the school communities. Recognising and promoting the cultural diversity of school communities through school-based learning programs can help build educational and health and wellbeing outcomes for students and their families. The program was designed and delivered in regional primary schools with student cohorts consisting of a large number of students identifying as Aboriginal or Torres Strait Islander. For example, PITSTOP 1 involved participation in the traditional Indigenous game kai-tarnambai and, through engagement in the game and associated learning, all students were provided with an opportunity to gain a better understanding and appreciation of Indigenous culture. Students were also involved in dances for a welcome to the program and when summarising key messages within each PITSTOP. It is widely accepted that dance plays a vital role in transferring cultural knowledge across generations (Buck & Snook, 2020); further, songs and dances are vital avenues for sharing knowledge and preserving and caring for country (Jamieson & Heron, 2009). Having a focus on expression through movement may have contributed to the learning, success and enjoyment reported by students. Consequently, our findings indicate that a low dose of high-quality and culturally rich learning opportunities that are engaging and significant for children may be a feasible strategy for promoting health behaviours among children.

Yantiin Kalabara was efficacious for affecting change in key health behaviours in students when assessed using student questionnaires. Although our preliminary efficacy results present positive changes in physical activity and nutrition patterns, there are some notable opportunities to further strengthen the program in future trials. Firstly, the self-reported physical activity patterns observed in students participating in the program are notable, with mean scores increasing from 164.9 minutes per day at baseline to 203.9 minutes at follow-up. The impact on physical activity patterns was also noteworthy, i.e., medium effect. However, we also found decreases in the average number of days of self-reported physical activity (declining from 6.1 to 5.3 days per week from baseline to follow-up). It is well documented that providing children with increased doses of health-enhancing physical activity not only

contributes to improved cardiorespiratory fitness levels, but also facilitates improved outcomes for children across health, wellbeing and academic domains (Alvarez et al., 2017; Eime et al., 2013; Lubans et al., 2016; Sember et al., 2020; World Health Organization, 2020).

Nutrition patterns reported by students were also encouraging, with scores increasing from baseline to follow-up in relation to vegetable (3.2 to 3.4), fruit (3.1 to 3.3) and water consumption (4.8 to 4.9). Hunter Primary Care designed a PITSTOP in partnership with a nutritionist and Aboriginal health workers to ensure cultural connections were made when teaching the students about food. This may be an important factor in the reported increases. Brimblecombe, Maypilama and colleagues (2014) recognised that the failure of previous instances may be due to a lack of consideration towards the cultural connection with food, and this may be a key hindrance in the effectiveness of many health interventions.

Increases in soft drink (3.1 to 3.2), fried food (2.6 to 2.9) and fast food consumption (2.6 to 2.9), as well as evening meals in front of television (2.7 to 2.9), were unexpected. Lack of parental involvement in the program (due to COVID-19, schools were not allowing non-essential visitors) may have limited the effectiveness of this PITSTOP. It was intended to have the wider community involved (for example, parents/caregivers), especially considering their involvement in shopping for and packing school lunches. It is proposed that future studies consider options to actively involve parents due to their important role in supporting and maintaining healthy behaviours outside the school. Alternatively, if external parties remain unable to attend school grounds/programs, it is recommended that additional training and resources be provided for teachers (e.g., tailored and community-informed lesson plans that support the curriculum in the area of healthy eating) and parents (e.g., educational resources, videos, newsletter promotions). In doing so, such recommendations could potentially allow for strong community engagement, though parent involvement in such programs is often problematic (Eather et al., 2013).

Comparing previous studies to Yantiin Kalabara is difficult, given that most school-based health promotion strategies typically run for several months (Dobbins et al., 2013; Sahota et al., 2019). Additionally, changes to health behaviours may require a longer learning period, and/or they may become apparent only later on (beyond the study period) given the complex interplay of factors influencing health behaviours (Jones et al., 2010). As follow-up assessments were conducted in a relative short period (approximately four weeks later for each school), perhaps a greater allowance of time to change attitudes/behaviours may have altered the findings.

Any positive intervention effects regarding physical activity and nutrition at any point during childhood are beneficial for short- and long-term health. Consequently, any following phases of Yantiin Kalabara will be to investigate the previously mentioned outcomes in a large-scale randomised controlled trial. More objective measures should be used in future trials, however, including accelerometers to address the limitations of self-reported physical activity outcomes, which are subject to social desirability bias and inaccuracies or exaggerated estimates.

## Strengths and limitations

Yantiin Kalabara provides initial evidence that novel learning opportunities that are engaging for children, culturally rich and significant for health education of students can have a positive impact, even using a low-dose program. The program also demonstrates that when schools can allocate one day to health education, Yantiin Kalabara has the potential to address several prevailing issues affecting the health and wellbeing of Aboriginal and non-Aboriginal Australian children. Despite many strengths,

several limitations must be acknowledged. Firstly, Yantiin Kalabara was delivered by a specialised team of Hunter Primary Care's dietitians, exercise physiologists, occupational therapists and Aboriginal health workers, which was deemed necessary for establishing feasibility and preliminary efficacy of a new program. With no comparison group for this program, causality of improvements for outcomes cannot be determined. The inherent potential biases of using self-report measures need to be acknowledged (i.e., self-reported measures of health perform better than many have believed), especially in young children. While previous culturally and linguistically distinct Aboriginal middle school students using self-report measures have shown to be feasible (Robinson et al., 2020), self-reported results should be interpreted with caution, particularly when long-term follow-ups are not undertaken. Notably, results for the five schools are specific to the demographics and other context factors and may not be representative of other schools in the region or elsewhere. To establish effectiveness and scalability, further large-scale randomised controlled trials are needed whereby teachers in the school will be trained to deliver Yantiin Kalabara (as a teacher training module) to increase reach and maintain cost-effectiveness (Adams, 2006).

## Conclusion

Our results indicate that a targeted one-day health promotion program for primary school children was feasible for delivery in the school setting and efficacious in improving physical activity and nutrition outcomes in Stage 3 students. Our encouraging process evaluation results will inform the refinement and development of the Yantiin Kalabara program for a future larger-scale trial. This study has provided new support for the use of health interventions that support the learning of Australian Aboriginal culture as a potentially effective strategy for improving physical, social and emotional health outcomes among Australian Aboriginal and non-Aboriginal communities.

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Claudine Ford is a primary health care professional with significant experience in the development and operation of care coordination programs and services for Aboriginal and Torres Strait Islander people, people with disability and people living with chronic illness. Claudine is currently General Manager – NDIS and Chronic Disease at Hunter Primary Care, a not-for-profit primary health care organisation based in Newcastle, New South Wales. In this role, Claudine leads a team of over 50 professionals delivering high-value primary care coordination and services. In 2022 Claudine's team was recognised at the Hunter New England and Central Coast Primary Health Network Primary Care Quality and Innovation Awards for the Shared Health Appointments program, providing Aboriginal and Torres Strait Islander Care Coordination clients with online consultations in a supportive group setting.

Carla Torell was a team leader at Hunter Primary Care and assisted with the overall planning and designing of health initiatives and programs.

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Please cite this article as:

Babic, M., Maynard, J., McLeod, R., Ford, C., Torrell, C. & Eather, N. (2023). Evaluation of Yantiin Kalabara – 5 Ways to a Healthier You: A primary school-based education program targeting healthy living choices through interactive workshops. *The Australian Journal of Indigenous Education*, 52(2). DOI 10.55146/ajie.v52i2.636



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**The Australian Journal of Indigenous Education**

**Volume 52 | Issue 2 | © The Author/s 2023 doi 10.55146/ajie.v52i2.636**

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