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Evaluating a Daily Physical Activity (DPA) Toolkit for Elementary School Teachers

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A thesis submitted in partial fulfillment of the requirements for the Master of Arts degree in Education

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Abstract

The present study investigated whether a centralized toolkit containing easy-to-access resources, and that could be implemented without training, could help to promote greater adherence to Ontario's Daily Physical Activity (DPA) policy and encourage more physical activity within the classroom. From January to March 2023, 142 Ontario elementary teachers completed pre-/post-surveys assessing DPA practices and were given access to the DPA toolkit. The findings demonstrate that access to the DPA toolkit improved DPA fidelity, as well as increased teacher engagement/enjoyment with DPA, and perception of students' cognitive functioning, academic performance and mental health. In conclusion, providing accessible, easy-to-use resources that require no training for teachers to implement can aid in supporting DPA practices as well as provide cognitive and social benefits to teachers and students alike.

Keywords

Daily Physical Activity (DPA)

DPA toolkit

DPA policy

Classroom physical activity

School-based interventions

Physical activity

Teachers

Summary for Lay Audience

Physical activity is critical for child development as it provides numerous mental and physical benefits, while also reducing risk of cardiovascular disease and obesity. Despite the benefits of physical engagement, there has been a significant decrease in the rates of physical activity amongst children. As a necessary response, the Ontario government created the Daily Physical Activity (DPA) policy in 2005, mandating that elementary schools incorporate at least 20 minutes of physical activity each school day during instructional time. Unfortunately, recent evaluations suggest that only 23% of elementary school teachers were meeting this mandate. Two major barriers identified by teachers to DPA implementation were a lack of resources and insufficient training on how to implement DPA. To address these concerns, a DPA toolkit was created containing over 200 physical activity videos, posters, and activities, all located within an easy-to-access website. The purpose of the current study was to evaluate whether a centralized DPA toolkit could help to promote greater adherence to the DPA policy and encourage more physical activity within the classroom.

To investigate this further, 142 teachers from Ontario elementary schools were distributed pre-/post-surveys assessing DPA practices and were given access to the DPA toolkit from January to March 2023 to use for DPA implementation.

Findings demonstrate that access to the DPA toolkit improved DPA fidelity, as well as increased teacher engagement/enjoyment with DPA. In addition, teachers also perceived student increases in cognitive functioning, academic performance, and mental health. Lastly, after introducing the DPA toolkit, teachers also perceived that there was an increase in female students' enjoyment with DPA as well as a decrease in male students' restlessness in the classroom.

In conclusion, providing accessible, easy-to-use resources that require no training for teachers to implement can aid and support DPA practice as well as provide cognitive and social benefits to teachers and students alike.

Co-Authorship Statement

This thesis includes writing from an original paper that has been previously published, as follows:

Thesis Chapter	Publication title/full citation	Publication status*
Chapter 3 Chapter 4	Bigelow, H., Singh, S., & Fenesi, B. (2023). Reducing Key Barriers to Classroom Physical Activity Improves Implementation Fidelity in Ontario Elementary Classrooms. <i>Education Sciences</i> , 13(10), 1060. https://doi.org/10.3390/educsci13101060	Published

The following describes the nature and extent of contributions made by the thesis student and co-authors in the aforementioned paper.

Shelby Singh: Data curation (equal), validation (equal), figure creation, writing (original draft preparation, current draft preparation, and review and editing) (equal).

Hannah Bigelow: Conceptualization (equal), data curation (equal), formal analysis (equal), investigation (equal), methodology (equal), project administration (equal), supervision (equal), validation (equal), visualization (equal), writing (original draft preparation, review and editing) (equal).

Barbara Fenesi: Conceptualization (equal), data curation (equal), formal analysis (equal), funding acquisition (lead), investigation (equal), methodology (equal), project administration (equal), resources (equal), supervision (equal), validation (equal), visualization (equal), writing (original draft preparation and review and editing) (lead).

Estimate of the percentage of the work conducted solely by the thesis student (Shelby Singh) for mentioned paper: 30%

Throughout the remainder of the thesis document, thesis student (Shelby Singh) is responsible for solely writing the remaining chapters/sections including: Introduction (Statement of the problem, the importance of physical activity for children, elementary school and Ontario's DPA policy, social ecological model, lack of resources and training as barriers to DPA implementation), Current research (summary of study), Discussion (implications for school health policy, practice and equity, limitations, conclusions). Edits and reviews were made by Barbara Fenesi.

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Chapter 1

1 Introduction

1.1 Statement of the Problem

In 2005, the Ontario government passed the Ontario Daily Physical Activity (DPA) mandate that required elementary school teachers to incorporate at least twenty minutes of moderate to vigorous physical activity (MVPA) into their daily instruction (Ontario Ministry of Education, 2017). However, recent research indicates that only 23% of Ontario elementary school teachers were implementing this policy (Martyn et al., 2022). As cited by teachers, some of the most prominent barriers to implementation included a lack of resources, inaccessible tools, and insufficient training to facilitate their students in DPA (Allison et al., 2016). If these barriers were reduced, would there be greater DPA fidelity? The current research aims to investigate whether providing teachers with a centralized DPA toolkit containing a variety of physical activity related resources that required no training to implement would improve policy implementation in Ontario elementary schools.

1.2 The Importance of Physical Activity for Children

Physical activity is important for developing children. Previous studies have demonstrated the physical and mental benefits of engaging children in physical activity, including increased strength and endurance, increased self-concept, decreased anxiety and depression, and decreased obesity rates (Janssen & LeBlanc, 2010; Strong et al., 2005). Additionally, engagement in physical activity also provides prominent educational benefits to students, such as higher academic achievement and an increased concentration in school-related work (Fedewa & Ahn, 2011; Rasberry et al., 2011).

Given prior research supporting the importance of physical activity in children, it is unfortunate that the rates of physical inactivity in this age range have become alarmingly high over recent years. For example, obesity is a large and growing problem among Canadian youth, with diseases such as Type 2 diabetes and heart disease becoming more apparent in young children now more than ever (Ball & Macargar, 2003). Additionally, elementary school children are also facing a variety of psychosocial problems associated with overweightness, such as being bullied, depression, self-esteem concerns and the risk of continuing childhood obesity into adulthood (Lee, 2009; Reeves et al., 2008; Wang et al., 2009; Young-Hyman, 2006). The literature recognizes that although there are a variety of factors that result in childhood obesity, a significant preventable cause is physical inactivity. Promisingly, physical inactivity can, in part, be addressed at the school-level by improving physical activity within the classroom (Wieting, 2008).

1.3 Elementary School and Ontario's DPA Policy

The Canadian Physical Activity Guidelines suggests that children aged 5 – 17 years old should be spending around 60 minutes a day engaging in physical activity; yet data from 2009 demonstrates that only 7% of Canadian children in this age range are following these recommendations (Tremblay et al., 2011). Prior research has supported that schools are an ideal environment to promote adherence to physical activity guidelines amongst children as many students spend most of their weekdays in the school environment (Kriemler et al., 2011).

School systems typically rely on physical education class or recess time to help children achieve the recommended 60 minutes of daily physical activity; however, research shows that due to higher demands for improved test scores, time for physical education and recess have been slowly cut out (Lee et al, 2007). To meet the 60 minutes of daily physical activity, an

increase of physical activity outside of physical education and recess was necessary. Providing additional physical activity time in places such as within the classroom, during instructional time, can minimize potential barriers faced by parents and children in achieving these 60 minutes elsewhere. For example, previous studies examining parent and teacher perceived barriers to physical activities found that contextual factors outside of the school environment contributed to great variance in access to physical fitness, such as parents' lack of time, cost of activities, weather conditions, traffic, and long distances (Alcántara-Porcuna & Rodríguez-Martín, 2022). Therefore, the school provides an ideal environment to promote physical activity amongst children as it is free, has the flexibility to be utilized in indoor/outdoor spaces, and is relatively proximal to the student.

Additionally, classroom-based physical activity provides children with a unique array of immediate and long-term benefits, such as greater academic achievement, increased feelings of joy, an increased motivation to learn and promotes greater attention on learning tasks (Alvarez-Bueno et al., 2017; Bedard et al., 2019; Sneck et al., 2019; Watson et al., 2017). Furthermore, children who engage in classroom-based physical activity are less likely to have mental health concerns, such as depression and anxiety (Harvey et al., 2010; Rodriguez-Ayllon et al., 2019; Stanton et al., 2014).

Thus, in response to the necessity of physical activity, coupled with the ideal environment of the classroom, in 2005 the Ontario Ministry of Education mandated a Daily Physical Activity policy (DPA) making it necessary for “publicly funded school boards to ensure that all elementary students, including students with special needs, have a minimum of twenty minutes of sustained MVPA each school day during instructional time” (Ontario Ministry of Education, 2017). Unfortunately, recent surveys of Ontario elementary schools show that only

23% of teachers were implementing DPA (Martyn et al., 2022). Additional studies assessing DPA implementation have shown similar results of poor fidelity in Ontario, in which there was insufficient duration (not 20 minutes), intensity (not MVPA) and frequency (not daily) of the DPA mandate (Patton, 2012; Stone et al., 2012). The question then becomes: what factors are interfering with the implementation of DPA? To explore this question, one has to first consider the social ecological model to understand how barriers can hinder the overall promotion of change.

1.4 Social Ecological Model

The implementation of DPA has been viewed by researchers in the school health promotion field through the social ecological model. The model suggests that a person's behaviour is influenced through a variety of levels, where the closest levels to a person are more likely to cause a direct change in behaviour, and the more distant levels have an indirect effect (Bronfenbrenner, 1977). These levels, in order of closest to most distant to the individual, are intrapersonal, interpersonal, institutional, community, and policy (McLeroy et al., 1988; Richard & Gauvin, 2011). There can also be facilitators and barriers at each level to help and halt change, respectively. If the goal is to promote more physical activity among students, this model would suggest that facilitators and barriers at various environmental levels can influence this objective.

The current study is interested in investigating whether mitigating the barriers of insufficient training and a lack of resources can improve the rates of physical activity implementation in the classroom. The social ecological model conceptualizes these barriers as being hinderances at the institutional level for in-service teachers, and barriers at this level may have an indirect effect on the rates of physical activity implementation. Based on this model, by

mitigating the barriers of insufficient training and a lack of resources, the desired change in behaviour (i.e., increased physical activity implementation) could be achieved.

1.5 Lack of Resources and Training as Barriers to DPA Implementation

Several studies have investigated the different barriers that can affect the implementation of physical activity interventions in school settings. As mentioned, a significant barrier that appears in prior literature is a lack of easy access to tools and resources to help facilitate physical activity in the classroom (Cardon et al., 2012; Mâsse et al., 2012; Naylor et al., 2015).

Specifically, a lack of access to equipment, a necessity for funding, constructing new activities, and a lack of training opportunities were identified as key difficulties in adhering to the DPA policy (Brown & Elliott, 2015). Notably, a positive association between using DPA resources and implementation fidelity has been suggested in prior research; however, only 5.3% of teachers reported using DPA resources (Allison et al., 2016; 2018). This could possibly be due to a lack of available resources, the resources may have required formal training to utilize, or perhaps the resources offered were not current. Prior literature also supports the need for a DPA program with numerous and varied activities (including cardiovascular workouts, flexibility and muscular strength exercises) that are inexpensive and shared by teachers to improve DPA implementation (Allison et al., 2018).

Several classroom-based physical intervention programs have been established previously, such as GoNoodle, ClassDojo and the TAKE 10! Program. However, there could be potential barriers for teachers to engage with these resources. For example, interventions such as GoNoodle has a limited age range as it is designed for children in grades K-5 (GoNoodle, n.d.). ClassDojo requires students and teachers to make and maintain online profiles which may require additional technological devices, could be difficult to keep students on tasks, or students'

may forget their account information (ClassDojo, n.d.). Lastly, TAKE 10! Requires teachers to be formally trained on how to use the intervention program and its' training kits prior to implementation, which teachers may not have time to do (International Life Sciences Institute, n.d.).

Thus, given previous barriers such as resource accessibility and insufficient training, an easy-to-access, resource-intensive toolkit with no formal training required could be a useful approach to promote greater DPA implementation in Ontario elementary schools.

Chapter 2

2 Current Research

2.1 Summary of Study

A DPA toolkit was recently created in the Working to Enhance Brain and Body (WEBB) research lab, containing over 200 classroom-based physical activity videos, posters, and activities for elementary school teachers to help meet the DPA guidelines. The toolkit is included in a website that is easily accessible and implementable within the classroom without additional preparation/training for teachers (dpatoolkit.ca). Given the demand for greater and more easily accessible DPA resources, the toolkit was distributed with the aim of evaluating whether it improved DPA fidelity while also gathering insights and perceptions from teachers. The study also tracked differences in important variables such grade level and the gender of the students. To evaluate the efficacy of the toolkit, teacher participants were instructed to use the DPA toolkit in their classrooms daily during January - March 2023 and complete pre-/post-surveys to assess changes in DPA implementation. The goal of this study is to evaluate the implementation effectiveness of an evidence-based DPA toolkit and, upon showing efficacy, offer Ontario-wide access to an empirically validated resource to help promote physical activity amongst children in the classroom.

Chapter 3

3 Methods

3.1 Participants

To achieve an acceptable margin of error (5% with 95% confidence intervals) based on a population size of Ontario teachers who teach elementary grades (in 2021-2022 it was 85 574), we recruited a total of 344 participants in December 2022 who completed the pre-survey (Government of Ontario, 2022). The post-survey was completed by 142 participants, leading to 8% margin of error (8%). The survey was open to all participants who taught between grades 1–8 in Ontario publicly-funded school boards, and who had at least one full school year of experience in a substitute, long-term occasional or full-time teaching position. Participants were recruited through personal and public social media accounts, as well as through snowball sampling. Digital poster advertisements were shared in the teacher Facebook groups “Ontario Teachers Resource and Idea Sharing” and “Ontario Educators and Mental Health”. The online poster provided a direct link to the pre-survey. The study was fully approved by the University of Western Ontario’s Research Ethics Board under approval code 12142 on 20 September 2022.

3.2 Instrumentation

The pre-survey consisted of 30 questions and used a mix of multiple-choice and short answer questions to query participants about their demographic information, their use of physical activity in the classroom, perceived differences in how their male versus female students responded to classroom physical activity, and their perceptions of DPA. Participants received \$10 CAD for their participation in the form of an Amazon gift card. The post-survey consisted of 22 questions and was identical to the pre-survey but excluded demographic questions and included

additional questions asking for feedback on the DPA toolkit such as, “What features would you like to see in the DPA toolkit in the future?”, “Do you have any other recommendations to improve the DPA toolkit?”, and “Do you see yourself using the DPA toolkit in the future?”.

Participants received \$10 CAD for their participation in the form of an Amazon gift card (total of \$20 across the study). Participants also completed a weekly DPA log sent to them via email every Friday that asked whether they used the DPA toolkit, and if so, how many hours per week; the weekly log also asked participants which toolkit resources were most often used that week.

3.2.1 Physical Activity in The Classroom

Questions assessing teachers’ use of physical activity within their classrooms were based on work by Dinkel, who piloted questions with teachers, academic experts, and community health experts (Dinkel et al., 2016, 2017). The survey was validated in a previous study measuring the willingness of teachers to implement physical activity (Dinkel et al., 2016).

Questions related to DPA-use in the classroom included: How many minutes per week do you incorporate DPA into your classroom?; What types of activities do you do?. Two other items probing for teacher enjoyment and confidence were used including: I enjoy implementing DPA in my classroom; and I feel confident implementing DPA in my classroom. These items were completed using a 4-point Likert scale (1 = strongly disagree ... 4 = strongly agree).

Additionally, questions assessing teachers’ perceptions of differences in male versus female reception of DPA were based on previous work assessing student responses to DPA (Martyn et al., 2022). Three items using a 5-point Likert scale (1 = strongly disagree ... 5 = strongly agree) were included pertaining to both genders (only female items are shown here): Female students were engaged in DPA activities; female students enjoyed the DPA activities; female students were less restless and more manageable following DPA.

3.2.2 Perceptions of DPA

An adapted version of the Attitudes Towards Physical Activity (ATPA) questionnaire was used to measure the attitudes, beliefs, and self-efficacy toward DPA implementation. The ATPA was validated in previous work assessing attitudes toward physical activity (Kenyon, 1968). Five items were used with a 4-point Likert scale (1 = strongly disagree...4 = strongly agree) including: Elementary school teachers play a major role in DPA programs at schools; DPA improves the mental health of students; DPA improves the physical health of students; DPA improves the academic performance of students; DPA improves the cognitive functioning of students (e.g., their ability to think, pay attention and complete tasks).

3.2.3 Weekly DPA Log

Participants were emailed a DPA log on the Friday of every week. The DPA log asked them to answer three questions: 1) Did you use the DPA toolkit this week? (Yes/No); 2) How many minutes per week did you use the DPA toolkit this week? (open-ended); and 3) Which resources did you use from the DPA toolkit this week? (videos, activities, posters).

3.2.4 DPA Toolkit

The toolkit was developed through an extensive search of publicly available YouTube videos, posters, and activities. Several posters and activities were independently created. The search for media occurred multiple times between June and August of 2022 to ensure inclusion of up-to-date media. Video search terms included: classroom exercise, classroom physical activity, classroom physical activity breaks, DPA videos, DPA activities, active brain breaks for children, workouts for classrooms, workouts for children. Grade levels were searched separately with the addition of terms “Grade 1”, “Grade 2 ... Grade 8” in front of the search terms. Search

terms for posters in Google and Pinterest included: Canadian physical activity posters, classroom physical activity posters, Ontario DPA posters, Ontario physical activity posters, exercise posters for classrooms. Search terms for activities in Google and Pinterest included: Ontario DPA activities, classroom exercise activities, classroom exercise games, classroom DPA games, classroom physical activity games, classroom active games. All media were added to an excel sheet and further divided into groups including grade level (1-3, 4-6, 7-8), curriculum ties based on the Ontario curriculum (history and language, math and science, general movement), intensity level (low, moderate-high), and video length (1-5 mins and 5+ mins). Media were included if it fit into the above categories, was publicly available, was age appropriate, and appeared engaging. The DPA toolkit was then organized by grade-level and curriculum in order to provide teachers with a central location to choose what resource was most applicable to their current need. As mentioned previously, the toolkit can be found at dpatoolkit.ca.

3.3 Procedure

In December 2022, interested participants accessed the pre-survey through the recruitment flyer. In January 2023, participants who completed the pre-survey received the DPA toolkit via email. Explicit instructions to use the DPA toolkit were not provided as researchers did not want to coerce participants to use the toolkit if it was not beneficial for them. Instructions simply indicated that the DPA toolkit was to be used as desired over the next few months until the end of March. Participants were asked to complete the weekly DPA log that they received via email each week on Friday. Participants completed the post-survey at the end of March 2023.

3.4 Data Analysis

All statistical analyses were conducted using SPSS (Version 29). Descriptive statistics (frequencies) are provided in Table 1 for demographic characteristics. Several repeated measures ANOVA were conducted with a three-level factor of grade level (1-3, 4-6, 7-8) and within subject variable of time (pre- post-survey) to evaluate whether mitigating the barriers of inadequate teacher-training and lack of access to resources could improve DPA fidelity, teachers' perceptions of DPA, teachers' confidence and enjoyment implementing DPA, and students' DPA enjoyment and engagement, along with their classroom restless. The purpose of stratifying by grade level was to provide nuanced insight into the efficacy of the DPA toolkit at various grade levels. Five participants indicated that they taught all grade levels and were thus removed from the dataset as their data could not be stratified by grade level (N=136). Paired-samples t-tests were conducted between pre- and post-survey outcomes where a main effect of time or interaction was present to elucidate whether observed differences existed at specific grade levels. There were no extreme outliers consistent across outcome variables and grade levels using the SPSS step of $1.5 \times \text{IQR}$ (interquartile range).

Chapter 4

4 Results

4.1 Demographic Information

Table 1 provides demographic information. The weekly DPA log was completed by an average of 84 participants per week across the duration of the study (range of 65-96 participants), which represents a 59% response rate. Participants used the DPA toolkit on average for 43 minutes per week, and the most used features in order of popularity were videos, activities, and then posters.

Table 1

Demographic characteristics of study sample for pre- and post-surveys.

		Pre-survey	Post-survey
	Variables	N (%)	N (%)
	Total	342 (100)	136 (100)
Demographic characteristic			
Gender	Man	19 (5.6)	9 (6.6)
	Woman	322 (94.2)	126 (92.6)
	Non-binary	1 (.3)	1 (0.7)
Age	20-29	85 (24.9)	37 (27.2)
	30-39	133 (38.9)	60 (44.1)
	40-49	98 (28.7)	33 (24.3)
	50-59	23 (6.7)	4 (2.9)
	60+	1 (0.3)	0 (0)
	Prefer not to answer	2 (0.6)	2 (1.5)
Highest level of education	Bachelor's Degree	280 (81.9)	112 (82.4)
	Master's Degree	60 (17.5)	23 (16.9)
	Doctoral Degree	2 (0.6)	1 (0.7)
Years teaching	1-10	185 (54.1)	81 (59.6)
	11-20	128 (37.4)	45 (33.1)
	21-30	29 (8.5)	10 (7.4)
Typical class size	1-10	10 (2.9)	3 (2.2)
	11-20	49 (14.3)	22 (16.2)
	21-30	258 (75.4)	101 (74.3)
	30+	25 (7.3)	10 (7.4)

4.2 Does providing a DPA toolkit that mitigates the barriers of inadequate teacher-training and lack of access to resources improve DPA fidelity?

Table 2 shows the results of the repeated measures ANOVA and paired-samples t-tests. Findings suggest that there was an improvement in DPA fidelity, and that teachers teaching grades 1-3 and 4-6 benefitted the most from the toolkit, and those teaching grades 1-3 spent the most time (mins/week) engaging in DPA overall (see Figure 1)

Table 2

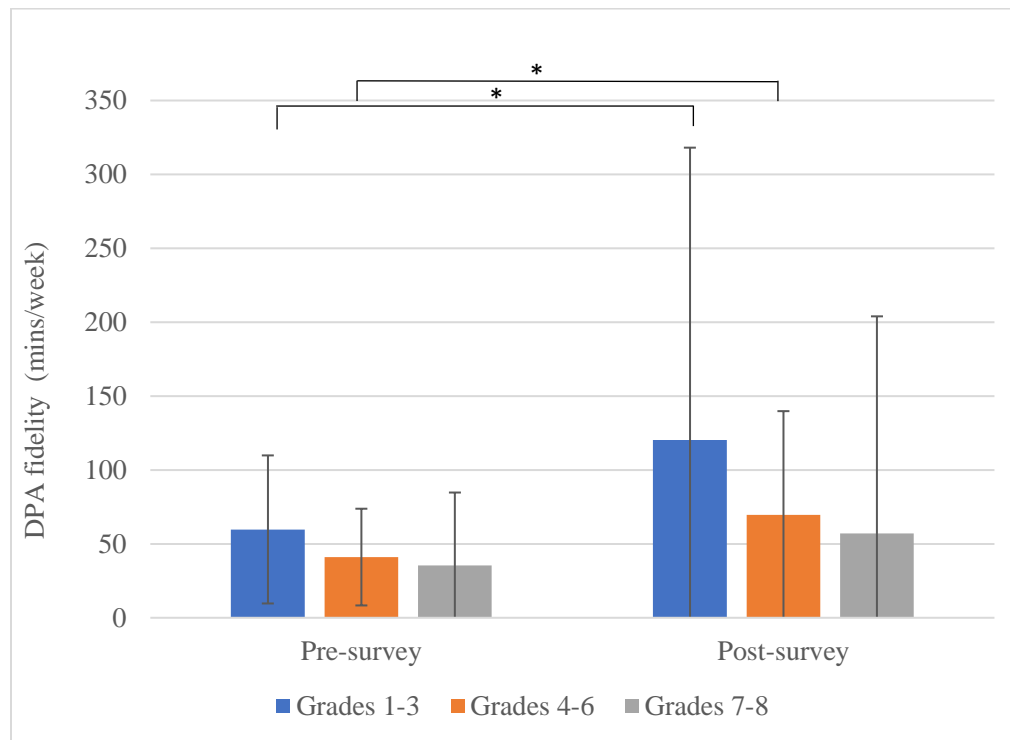
Repeated measures ANOVA and paired-samples t-test results assessing changes in DPA fidelity.

Outcome variable	Grade level Mean (SD) Pre-survey	Grade level Mean (SD) Post-survey	ME time (p, η^2p)	ME grade (p, η^2p)	Interaction (p, η^2p)	T-test (p, d)
DPA fidelity	1-3=59.78(50.09) 4-6=41.08(32.72) 7-8=35.35(49.41)	1-3=120.24(197.85) 4-6=69.59(70.23) 7-8=57.13(146.82)	*p=.007 , $\eta^2p=.053$	*p=.015 , $\eta^2p=.062$	p=.399, $\eta^2p=.014$	1-3: *p=.018, d=0.42 4-6: *p=.023, d=0.52 7-8: p=.128

Note. SD refers to standard deviation; η^2p refers to partial eta squared as a measure of effect size; ME refers to main effect; bold typeface with * indicates $p < .05$ significance; d refers to Cohen's d as a measure of effect size; 1-3 (n=65), 4-6 (n=40), 7-8 (n=30).

Figure 1

Changes in DPA fidelity



Note. Teachers in grades 1-3, and 4-6 experienced a significant increase in DPA fidelity from pre- to post-survey. Teachers in grades 7-8 did not experience a significant increase. Error bars represent standard deviations.

* indicates $p < .05$ significance

4.3 Does providing a DPA toolkit that mitigates the barriers of inadequate teacher-training and lack of access to resources improve teachers' perceptions of DPA?

Table 3 shows the results of the five repeated measures ANOVAs that were conducted for each DPA perception outcome variable: teachers' role in DPA school programming, DPA improves students' mental health, DPA improves students' physical health of students, DPA improves students' academic performance, and DPA improves students' cognitive functioning. Findings suggest that there was no change in teachers' perceptions of their role in DPA programming after receiving access to the toolkit, as well as no change in teachers' perceptions of the role of DPA in student physical health, regardless of grade level being taught. However, there was a significant positive change in teachers' perceptions of the role of DPA in students' mental health (grades 4-6 and 7-8), students' academic performance (grades 4-6) (see Figure 2), and students' cognitive functioning (grades 4-6) (see Figure 3).

Table 3

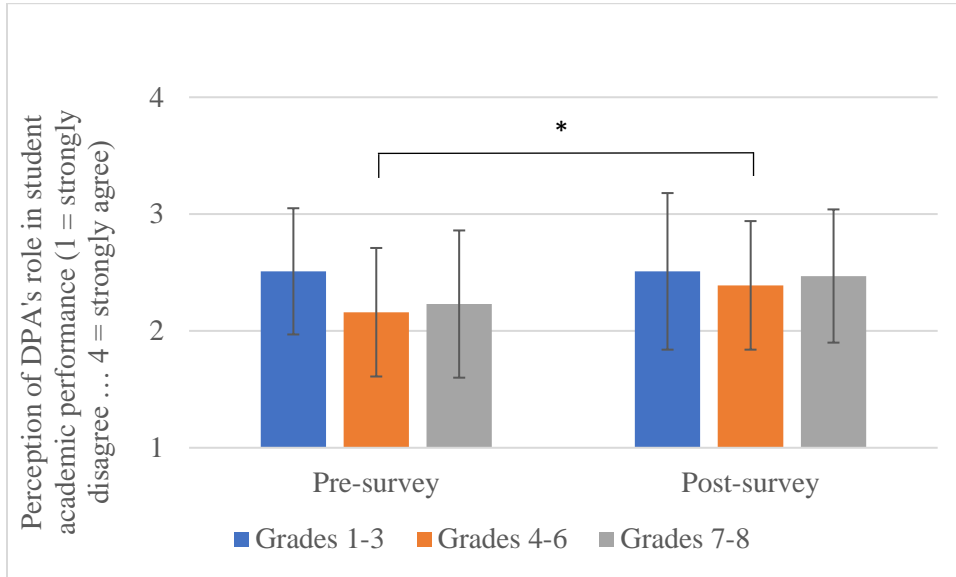
Repeated measures ANOVA and paired-samples t-test results assessing changes in teachers' perceptions of DPA.

Outcome variable	Grade level Mean (SD) Pre-survey	Grade level Mean (SD) Post-survey	ME time (p, η^2p)	ME grade (p, η^2p)	Interaction (p, η^2p)	T-test (p, d)
Teachers' role in DPA programming	1-3=2.34(.62) 4-6=2.15(.59) 7-8=2.32(.54)	1-3=2.36(.63) 4-6=2.33(.53) 7-8=2.35(.66)	p=.246, η^2p =.010	p=.525, η^2p =.010	p=.510, η^2p =.010	N/A
DPA role in student mental health	1-3=2.71(.46) 4-6=2.33(.57) 7-8=2.48(.46)	1-3=2.60(.58) 4-6=2.55(.50) 7-8=2.71(.46)	p=.062, η^2p =.026	*p=.018 , η^2p =.058	*p=.03 , η^2p =.051	1-3: p=.211 4-6: *p=.048, d=0.41 7-8: *p=.05, d=0.44
DPA role in student physical health	1-3=2.60(.52) 4-6=2.31(.57) 7-8=2.42(.67)	1-3=2.46(.73) 4-6=2.41(.50) 7-8=2.45(.51)	p=.987, η^2p <.001	p=.304, η^2p =.018	p=.154, η^2p =.028	N/A
DPA role in student academic performance	1-3=2.51(.54) 4-6=2.16(.55) 7-8=2.23(.63)	1-3=2.51(.67) 4-6=2.39(.55) 7-8=2.47(.57)	*p=.019 , η^2p =.042	*p=.044 , η^2p =.048	p=.178, η^2p =.027	1-3: p=1.00 4-6: *p=.018, d=0.42 7-8: p=.07
DPA role in student cognitive functioning	1-3=2.52(.53) 4-6=2.16(.59) 7-8=2.26(.68)	1-3=2.49(.59) 4-6=2.37(.54) 7-8=2.48(.51)	*p=.029 , η^2p =.036	*p=.034 , η^2p =.050	p=.108, η^2p =.033	1-3: p=.727 4-6: *p=.009, d=0.37 7-8: p=.129

Note. SD refers to standard deviation; η^2p refers to partial eta squared; ME refers to main effect; bold typeface with * indicates $p < .05$ significance; d refers to Cohen's d as a measure of effect size; 1-3 (n=65), 4-6 (n=40), 7-8 (n=30).

Figure 2

Role of DPA in student academic performance

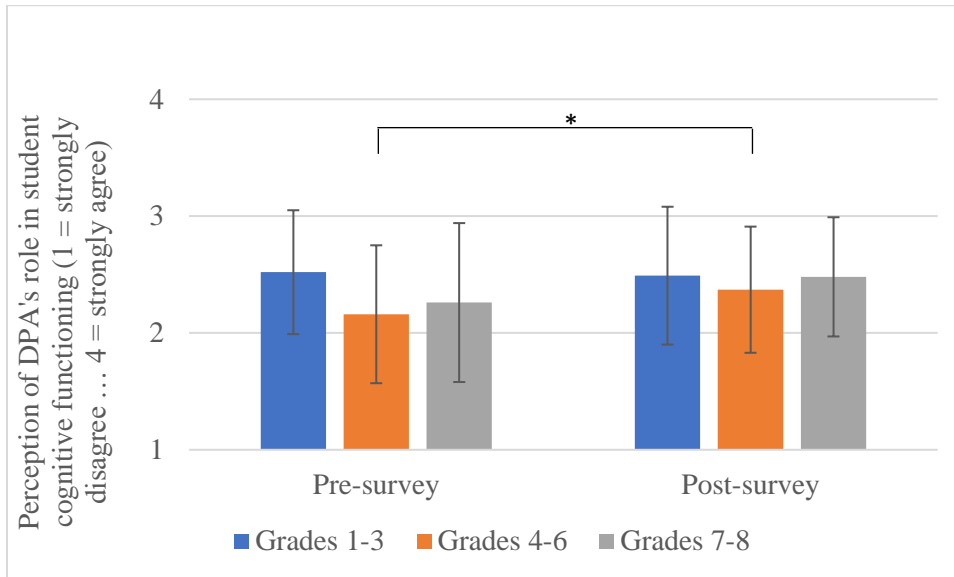


Note. Teachers in grades 4-6 experienced a significant increase in perception of DPA's role in student academic performance from pre- to post- survey. Teachers in grades 1-3 and 7-8 did not experience a significant difference. Error bars represent standard deviations.

* indicates $p < .05$ significance

Figure 3

Role of DPA in student cognitive functioning



Note. Teachers in grades 4-6 experienced a significant increase in their perception of DPA's role in student cognitive functioning from pre- to post-survey. Teachers in grades 1-3 and 7-8 did not experience a significant difference. Error bars represent standard deviations.

* indicates $p < .05$ significance

4.4 Does providing a DPA toolkit that mitigates the barriers of inadequate teacher-training and lack of access to resources improve teachers' confidence and enjoyment implementing DPA?

Table 4 shows the results of the two repeated measures ANOVAs that were conducted to assess changes in teacher confidence and enjoyment implementing DPA. Findings suggest that teachers teaching all grade levels experienced a significant increase in their confidence implementing DPA (see Figure 4), and those teaching grades 4-6 and 7-8 also experienced an increase in their enjoyment implementing DPA (see Figure 5). Additionally, those teaching grades 4-6 had the greatest gains in confidence, while those teaching grades 4-6 and 7-8 had the greatest gains in enjoyment.

Table 4

Repeated measures ANOVA and paired-samples t-test results assessing changes in teachers' confidence and enjoyment implementing DPA.

Outcome variable	Grade level Mean (SD) Pre-survey	Grade level Mean (SD) Post-survey	ME time (p, η^2p)	ME grade (p, η^2p)	Interaction (p, η^2p)	T-test (p, d)
Teachers' confidence implementing DPA	1-3=2.08(.63) 4-6=1.53(.72) 7-8=1.68(.70)	1-3=2.36(.65) 4-6=2.37(.49) 7-8=2.16(.64)	*p<.001 , $\eta^2p=.285$	*p=.004 , $\eta^2p=.079$	*p=.004 , $\eta^2p=.082$	1-3: *p=.008, d=0.44 4-6: *p<.001, d=1.39 7-8: *p<.001, d=0.72
Teachers' enjoyment implementing DPA	1-3=2.41(.64) 4-6=1.85(.78) 7-8=1.84(.74)	1-3=2.48(.64) 4-6=2.41(.60) 7-8=2.32(.60)	*p<.001 , $\eta^2p=.177$	*p=.002 , $\eta^2p=.093$	*p=.004 , $\eta^2p=.079$	1-3: p=.415 4-6: *p<.001, d=0.81 7-8: *p=.001, d=0.72

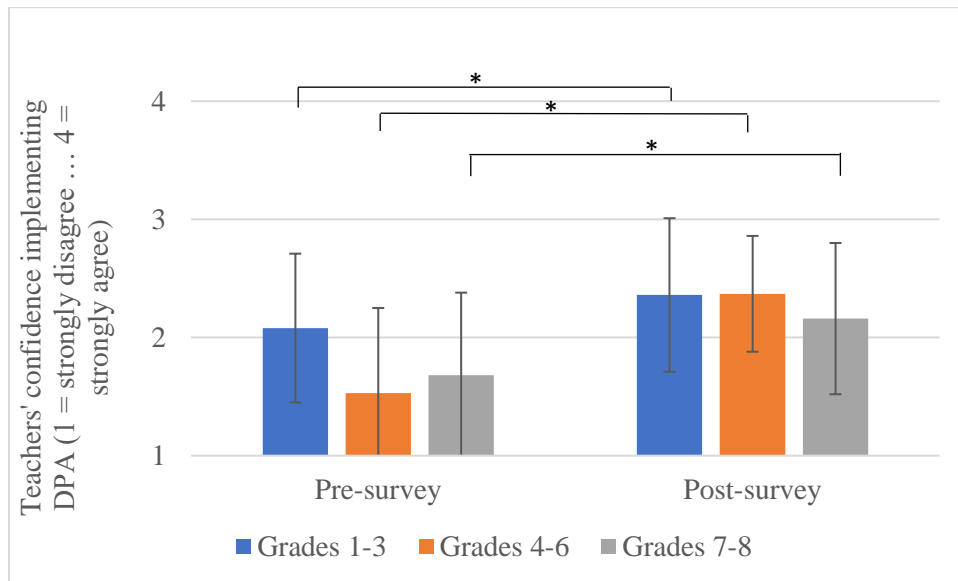
Note. SD refers to standard deviation; η^2p refers to partial eta squared; ME refers to main effect;

bold typeface with * indicates $p<.05$ significance; d refers to Cohen's d as a measure of effect

size; 1-3 (n=65), 4-6 (n=40), 7-8 (n=30).

Figure 4

Teachers' confidence implementing DPA

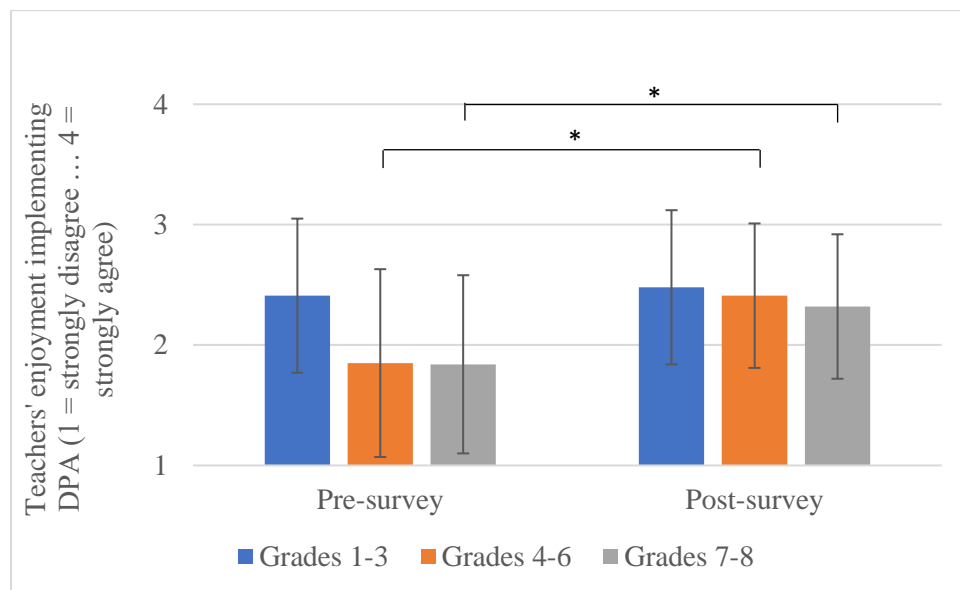


Note. Teachers in all grade levels experienced a significant increase in their confidence implementing DPA from pre- to post-survey. Error bars represent standard deviations.

* indicates $p < .05$ significance

Figure 5

Teachers' enjoyment implementing DPA



Note. Teachers in grades 4-6 and 7-8 experienced a significant increase in enjoyment implementing DPA from pre- to post-survey. Teachers in grades 1-3 did not experience a significant difference. Error bars represent standard deviations.

* indicates $p < .05$ significance

4.5 Does providing a DPA toolkit that mitigates the barriers of inadequate teacher-training and lack of access to resources improve students' engagement and enjoyment with DPA, along with their classroom restlessness? And what is the effect of gender on these outcomes?

Table 5 shows the results of the six repeated measures ANOVAs that were conducted to assess changes in male and female students' engagement and enjoyment with DPA, along with their classroom restlessness. Findings show that there was no change in male student engagement with or enjoyment of DPA after receiving access to the toolkit, and that male students in grades 7-8 found DPA the most engaging and enjoyable compared to the other grade levels. When considering changes in male student restlessness however, findings showed an improvement after access to the DPA toolkit, and that this improvement was specific to male students in grades 4-6 (see Figure 6). For female students, teachers noted that the DPA toolkit improved their engagement with and enjoyment of DPA, especially at the grade 7-8 level (see Figure 7 and 8, respectively). In contrast to the male students, there was no change in female students' restlessness after access to the toolkit.

Table 5

Repeated measures ANOVA and paired-samples t-test results assessing changes in male and female students' engagement with and enjoyment of DPA, along with their classroom restlessness.

Outcome variable	Grade level Mean (SD) Pre-survey	Grade level Mean (SD) Post-survey	ME time (p, η^2p)	Main grade (p, η^2p)	Interaction (p, η^2p)	T-test (p, d)
Male students' engagement with DPA	1-3=2.06(.95) 4-6=2.46(.88) 7-8=2.50(1.00)	1-3=2.23(1.04) 4-6=2.46(1.05) 7-8=2.83(1.09)	p=.124, η^2p =.018	*p=.010 , η^2p =.068	p=.513, η^2p =.010	N/A
Male students' enjoyment of DPA	1-3=1.97(.77) 4-6=2.17(.96) 7-8=2.50(.90)	1-3=2.20(.86) 4-6=2.30(.79) 7-8=2.50(.94)	p=.189 η^2p =.013	*p=.029 , η^2p =.052	p=.566, η^2p =.009	N/A
Male students' restlessness	1-3=2.67(.94) 4-6=2.3(.88)	1-3=2.63(.83) 4-6=2.80(.72)	*p=.010 , η^2p =.049	p=.440, η^2p =.012	*p=.042 , η^2p =.047	1-3: p=.725 4-6: *p=.008, d=0.62

	7-8=2.3(.75)	7-8=2.63(1.00)				7-8: p=.134
Female students' engagement with DPA	1-3=1.92(.84)	1-3=2.08(.82)	*p=.005	p=.511,	p=.614,	1-3: p=.184
	4-6=1.92(.78)	4-6=2.16(.89)	$\eta^2p=.058$	$\eta^2p=.010$	$\eta^2p=.007$	4-6: p=.163
	7-8=1.67(.92)	7-8=2.03(.97)				7-8: p=.062
Female students' enjoyment of DPA	1-3=1.92(.76)	1-3=2.09(.79)	*p=.003 ,	p=.474,	p=.771,	1-3: p=.078
	4-6=1.75(.87)	4-6=1.95(.78)	$\eta^2p=.063$	$\eta^2p=.011$	$\eta^2p=.004$	4-6: p=.186
	7-8=1.73(.74)	7-8=2.03(.93)				7-8: *p=.048, d=0.36
Female students' restlessness	1-3=2.60(.81)	1-3=2.57(.75)	p=.067,	p=.345,	p=.229,	N/A
	4-6=2.44(.72)	4-6=2.69(.66)	$\eta^2p=.025$	$\eta^2p=.016$	$\eta^2p=.022$	
	7-8=2.27(.79)	7-8=2.53(.86)				

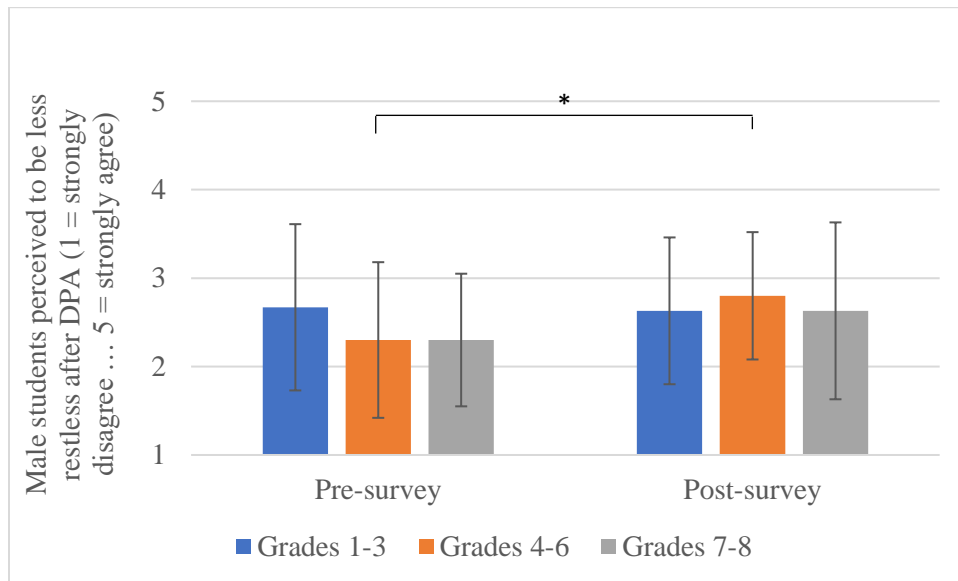
Note. SD refers to standard deviation; η^2p refers to partial eta squared; ME refers to main effect;

bold typeface with * indicates $p < .05$ significance; d refers to Cohen's d as a measure of effect

size; 1-3 (n=65), 4-6 (n=40), 7-8 (n=30).

Figure 6

Male students' less restless after DPA

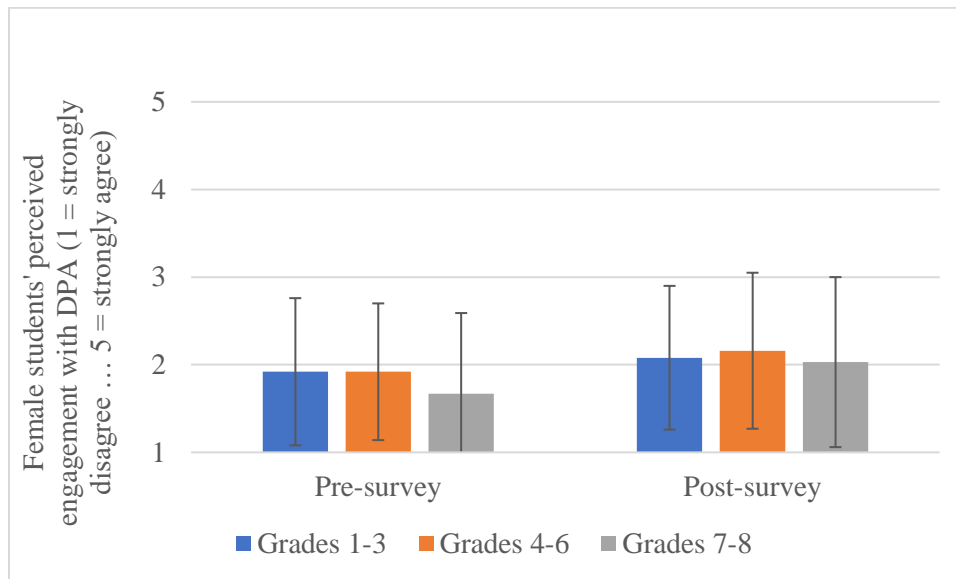


Note. Teachers in grades 4-6 experienced a significant increase in the perception of male students' being less restless after DPA from pre- to post- survey. Teachers in grades 1-3 and 7-8 did not experience a significant difference. Error bars represent standard deviations.

* indicates $p < .05$ significance

Figure 7

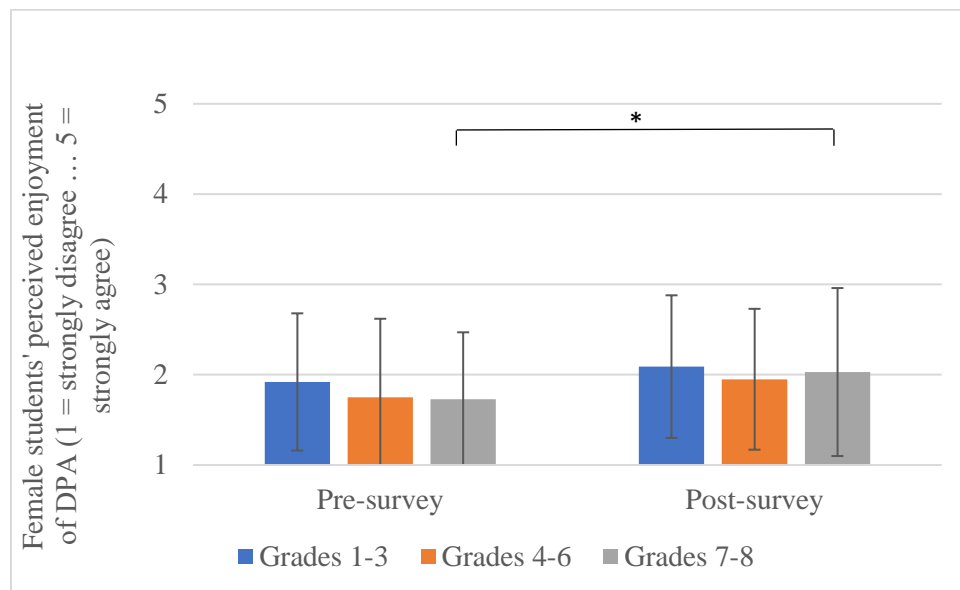
Female students' engagement with DPA



Note. Irrespective of grade taught, teachers' perception of female student engagement with DPA increased from pre- to post- survey. Error bars represent standard deviations.

Figure 8

Female students' enjoyment of DPA



Note. Teachers in grades 7-8 did experience a significant increase in female students' perceived enjoyment from pre- to post-survey. Teachers in grades 1-3 and 4-6 did not experience a significant difference. Error bars represent standard deviations.

* indicates $p < .05$ significance

4.6 Teacher Recommendations for Improvements to Toolkit

Regarding recommendations for improving the DPA toolkit, teachers suggested more multilingual resources, more age-appropriate resources for grades 7-8, more resources connected to curriculum, and more resources for neurodivergent students. Ninety percent of teachers said that they would be using the DPA toolkit in future teaching.

Chapter 5

5 Discussion

The purpose of this study was to evaluate the efficacy of a DPA toolkit designed to mitigate the barriers of inadequate teacher-training and a lack of access to resources to improve DPA implementation. The following will discuss the results of the study in context with previous findings, potential limitations, and future directions to advance further research.

The findings demonstrate that access to the DPA toolkit significantly improved DPA fidelity for teachers instructing grades 1-3 and 4-6. This positive relationship complements previous research advocating for additional resources to improve DPA fidelity amongst teachers (Allison et al., 2018; Brown & Elliot, 2015; Cardon et al., 2012; Mâsse et al., 2012).

Interestingly, teachers in grades 7-8 did not experience improved DPA implementation after the provision of the toolkit. Potentially, this null result for grades 7-8 is due to a lack of varying and plentiful age-appropriate resources/aids available to encourage physical activity (in comparison to the plentiful resources available to grades 1-6). Additionally, it could be possible that providing additional resources was not the most salient barrier for DPA implementation among teachers of grades 7-8. While previous findings have highlighted the importance of providing additional resources to increase DPA fidelity, there are also many other intrapersonal, interpersonal, and institutional barriers such as self-consciousness (which starts to develop in the pre-teen years), and incompatible school climate/culture that were not addressed in this study and could potentially be contributing factors for the lack of DPA implementation in grades 7-8 (Martyn, 2021). Future research should identify and explore barriers specific to each grade-level.

As previously described, the social ecological model suggests that changes in health happen at various multifaceted, complex interactions through the physical and social

environment in order to influence behaviour (Bronfenbrenner, 1977). Specifically, the model identifies five levels of change: intrapersonal, interpersonal, institutional, community, and policy (McLeroy et al., 1988; Richard & Gauvin, 2011). The model describes the existence of barriers and facilitators to halt or help change at each level. In the current study, the social ecological model would suggest that removing barriers, such as insufficient training or a lack of resources, could lead to greater DPA implementation in the classroom. The results demonstrate that there was an increase in DPA implementation for grades 1-3 and 4-6, thus suggesting that mitigating these institutional barriers potentially played a role in increasing the physical activity rates among elementary school children. It is important to note that this study only focused on two institutional level barriers, and other potential barriers were not addressed. In previous studies, intrapersonal level barriers, including adolescent self-consciousness, were identified as the most prominent student-related barriers to DPA implementation (Martyn, 2021). Research shows that puberty often leaves adolescents more self-conscious and can lead students to feel particularly insecure while performing physical activities, as they compare themselves to other students or are worried about others' perceptions of them (Brown, 2014; Santrock, 2012; Van Daalen, 2005). Students also reported disliking physical education classes as they felt athletically inadequate, embarrassed and isolated (Krouscas, 1999). Therefore, students' own self-consciousness can be perceived as an important intrapersonal level barrier that is potentially hindering DPA implementation. Another institutional level barrier that was not addressed in this study was incompatible school climate/culture that discourages DPA implementation (Martyn, 2021). This could entail actions such as schools devaluing the importance of physical activity in children's development, which could lead to a potential barrier in DPA implementation (Martyn, 2021).

Future studies should investigate whether mitigating these barriers can lead to an increase in fidelity to the DPA mandate.

After being provided with a DPA toolkit, teacher participants (especially in grades 4-6) were more likely to perceive that DPA played a role in student cognitive functioning, academic performance, and mental health. These results are similar to previous findings that have explored the link between participation in physical activity and improvements in mental well-being (Alvarez-Bueno et al., 2017; Bedard et al., 2019; Rodriguez-Ayllon et al., 2019). Interestingly, teachers were not more likely to perceive that DPA improved physical health after gaining access to the DPA toolkit. Given that teachers are consistently monitoring their students' cognitive functioning throughout the year (via tests and assignments), it is more likely that teachers will be able to perceive a change in their students' mental well-being rather than their physical well-being, as teachers have limited measures of potential physical health improvements. Future research may benefit from including objective physical health measures (i.e., fitness tests) as part of its pre-/post-survey measures in order to compare physical health statistics before/after the exposure to a DPA toolkit.

Additionally, providing a DPA toolkit improved teachers' confidence and enjoyment when implementing DPA in almost all grades. This is important as previous research credits that positive experiences with DPA are likely to impact teachers' willingness to do DPA activities in the future (Bigelow & Fenesi, 2023). This research is congruent with the current findings, as 90% of teachers who used the DPA toolkit reported that they would use the toolkit in future teachings. Therefore, positive feelings towards using the DPA toolkit could lead to greater fidelity of the DPA mandate as well as implications towards longevity of DPA implementation within the school.

Teachers also perceived that male students did not enjoy or engage more with DPA after access to the toolkit, yet the male demographic had the highest levels of engagement/enjoyment in the study. This may suggest that increasing resources for physical activity among males does not necessarily improve their enjoyment or engagement because they already enjoy/engage with DPA at a consistent level. Previous findings also demonstrate how the enjoyment level of physical activity amongst school-aged males remains constant over time (Cairney et al., 2012; Carroll & Loumidis, 2001). Interestingly, this study has also showed that teachers viewed their male students in grades 4-6 as significantly less restless after the introduction of the toolkit. This could potentially imply that providing additional resources to male students could decrease feelings of restlessness within the classroom. This is an important finding given that male students are perceived as more 'restless' on average than female students which can lead to male students feeling that there is less expected of them, less motivation, more distractions, and more difficulty performing in individual/independent work (Åhslund & Boström, 2018; Younger et al., 1999). Given that a reduction in restlessness has the potential to greatly benefit the life of a male student, future research should investigate the link between restlessness and additional physical activity resources.

In contrast to male students, female students were perceived to be more engaged and enjoyed DPA more after gaining access to the DPA toolkit, especially those in grades 7-8. Previous literature reports that, on average, female students are less likely to engage or enjoy physical activity due to societal expectations and social constructions of gender (Cairney et al., 2012; Holmes, 2012; Messner, 1992; Nicaise et al., 2007). For example, traditional physical activities have been labelled as masculine which prevents many females from participating; additionally, studies report that there are gendered preferences for recess activities, and that

female students traditionally spend recess talking to peers rather than engaging in organized sports (Bevan et al., 2021; Khan et al., 2022). Therefore, it could be possible that by providing additional resources and equal opportunities to participate in physical activities with males, female students were better able to engage and enjoy DPA. As research supports that successful intervention programs promote an increase in adolescent females' participation in physical activity, school programs could benefit from incorporating more activities from the DPA toolkit to improve DPA implementation and physical activity for all students within the classroom (Andruschko et al., 2018; Dudley et al., 2010).

5.1 Implications for School Health Policy, Practice, and Equity

The current study demonstrates that by providing teachers with adequate resources for DPA implementation, there can be a significant increase in fidelity towards the DPA mandate. However, as mentioned previously, multiple studies have also highlighted that there does exist a need for change to other key barriers in DPA implementation, such as competing curriculum priorities, a lack of time, student self-confidence, incompatible school climate/culture, and many others, and thus future research should also investigate how to best mitigate these additional barriers in conjunction with the DPA toolkit (Allison et al., 2018; Martyn et al., 2022).

Additionally, as this toolkit is contained within a free, easy-to-access website with no formal training required, these resources can also aid the greater public beyond educators – such as provide parents/legal guardians with enjoyable and healthy activities for their children or can help to provide additional creative resources for childcare programs (such as after school-care and YMCA programs).

Intriguingly, the results demonstrate a significant positive change in teachers' perceptions of the role of DPA in student's mental health after providing the DPA toolkit. Given that previous research has suggested a link between increased physical activity and improved mental health conditions among children, providing an increase in DPA resources could potentially mitigate several mental health disparities among this population (Ahn & Fedewa, 2011; Larun et al., 2006; Okuyama et al., 2021). Literature has demonstrated that children benefit from non-directive therapy modalities, such as art therapy or play therapy, given the difficulty of identifying how mental health disparities manifest in children, as well as the difficulty children have in communicating mental distress to adults (Bratton et al., 2005; Waller, 2006). Therefore, future research may benefit from exploring physical activity as another potentially non-directive approach to therapy for children in elementary school grades to help minimize mental distress.

This toolkit also has the potential to aid pre-service teachers through an integration within a Bachelor of Education program. As this toolkit requires minimal training, is centralized, includes various activities, and is for multiple grade levels; a familiarity with this toolkit could potentially increase the likelihood of teachers' engaging with physical activity in the classroom. Several universities have requested training materials from school-based intervention programs for pre-service teachers to integrate learning in health, physical activity, and nutrition into their curriculum to improve teacher self-efficacy (Kibbe et al., 2011). Additionally, in comparison to teachers who specialize in teaching physical education programs, Canadian elementary school generalist teachers (those who are not specifically trained in physical education during pre-service learning) reported insufficient training and a lack of knowledge as barriers to teaching physical education (Truelove et al., 2021). This could suggest that general teaching programs do not have adequate resources to support the facilitation of physical activity in the classroom.

However, since 2005, the DPA mandate requires teachers to incorporate at least 20 minutes of physical activity into the classroom, and there is dire need for generalist teachers to be aware of how to engage with physical activity. Thus, introducing the DPA toolkit into teacher education programs could benefit both pre-service teachers by providing resources to easily assist in meeting the DPA mandate, as well as future students who can enjoy the psychosocial and physical benefits of physical activity.

This study has also shown gender differences in the engagement, enjoyment and perceived restlessness after using the DPA toolkit. The potential implications of female students being perceived to be more engaged and having higher levels of enjoyment in DPA activities could lead to further research examining how to sustain this engagement and ensure female students' longevity of interest in physical activity. Thus, access to the DPA toolkit can potentially help facilitate a decrease societal/gendered expectations of a lack of interest in physical activity amongst female students.

Additionally, the results show that male students were less restless after access to the DPA toolkit. Given how prominent the diagnosis of attention-deficit/hyperactivity disorder is amongst school-aged boys well as their stereotyped 'disruptive' classroom pattern, this toolkit offers a potential (and non-medicinal) solution (Abikoff et al., 2002). Further implications include encouraging changes to students' classroom routine to include additional activity time before important cognitive tasks.

5.2 Limitations

There are several limitations in the current study. First, the collected data was based solely on teacher reports (i.e., self-reports) rather than objective data. Teachers may have inflated

their implementation of DPA in the post-survey to make it seem as though they used the toolkit more than they did. Researchers attempted to mitigate this bias by ensuring participants that their responses were anonymous and could not be tracked. Additionally, objective data, rather than teacher perceptions, could have provided concrete evidence for whether the introduction of the DPA toolkit truly led to an increase in cognitive functioning, academic achievement, and physical/mental health, rather than utilizing teachers' perceptions (which could have been inaccurate). Future research should consider having an independent observer to monitor DPA time or inputting objective measures before and after the study (such as heart-rate monitors).

Secondly, this study lacked an equal distribution of resources for all age groups. As there were more varied options for DPA resources for younger children, there was potentially an overflow of activities/posters/videos for grades 1-6, and less resources directed to older grades (7-8). This could have, in part, explained why there were no significant improvements to DPA fidelity after receiving the toolkit among this age group. Further research needs to be dedicated towards providing DPA resources to older children in the elementary population.

Thirdly, there was a lack of gender representation in the study. Limiting the student category to 'male' and 'female' students could potentially exclude gender diverse, non-binary, or non-cis-gendered students. Future research should investigate how all gendered students uniquely develop and engage with DPA to meet their own needs.

Additional recommendations made by teacher participants in this study for the improvement of the DPA toolkit are to include multilingual resources, resources connected to the curriculum, and neuro-diverse resources.

5.3 Conclusions

Providing elementary school teachers with a DPA toolkit increased fidelity to the DPA mandate, provided perceived socio-cognitive benefits to students, and greater engagement and enjoyment to teachers. Many of these improvements were common among teachers at the younger grade levels, suggesting that more resources may be required to help benefit older grades, such as 7-8. While additional research needs to be conducted regarding the implications of gender and restlessness within the realm of DPA, this study nonetheless provides a helpful resource for teachers to better incorporate DPA into their routines. Future research should focus on incorporating teacher recommendations as well as re-evaluating the DPA toolkit with more objective measures in order to promote physical and mental increases in well-being amongst teachers and students alike.

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Appendices

Appendix A

Ethics Approval



Date: 20 September 2022

To: Dr. Barbara Fenesi

Project ID: 121421

Study Title: Teachers' views on classroom-based physical activity and the use of a DPA toolkit

Short Title: DPA Toolkit

Application Type: NMREB Initial Application

Review Type: Delegated

Full Board Reporting Date: 07/Oct/2022

Date Approval Issued: 20/Sep/2022 09:55

REB Approval Expiry Date: 20/Sep/2023

Dear Dr Barbara Fenesi

The Western University Non-Medical Research Ethics Board (NMREB) has reviewed and approved the WREM application form for the above mentioned study, as of the date noted above. NMREB approval for this study remains valid until the expiry date noted above, conditional to timely submission and acceptance of NMREB Continuing Ethics Review.

This research study is to be conducted by the investigator noted above. **All other required institutional approvals and mandated training must also be obtained prior to the conduct of the study.**

Documents Approved:

Document Name	Document Type	Document Date	Document Version
Toolkit_Post_Survey_- WORD DOC	Online Survey	18/Jul/2022	1
Weekly_DPA_Survey	Online Survey	02/Sep/2022	1
Toolkit_Pre_Survey	Online Survey	08/Sep/2022	2
Toolkit poster ethics	Recruitment Materials	08/Sep/2022	2
DPA Toolkit Survey Consent ethicsx	Implied Consent/Assent	08/Sep/2022	2
Website documentation	Online Survey	15/Sep/2022	1

No deviations from, or changes to the protocol should be initiated without prior written approval from the NMREB, except when necessary to eliminate immediate hazard(s) to study participants or when the change(s) involves only administrative or logistical aspects of the trial.

The Western University NMREB operates in compliance with the Tri-Council Policy Statement Ethical Conduct for Research Involving Humans (TCPS2), the Ontario Personal Health Information Protection Act (PHIPA, 2004), and the applicable laws and regulations of Ontario. Members of the NMREB who are named as Investigators in research studies do not participate in discussions related to, nor vote on such studies when they are presented to the REB. The NMREB is registered with the U.S. Department of Health & Human Services under the IRB registration number IRB 00000941.

Please do not hesitate to contact us if you have any questions.

Sincerely,

Ms. Zoë Levi, Research Ethics Officer on behalf of Dr. Randal Graham, NMREB Chair

Note: This correspondence includes an electronic signature (validation and approval via an online system that is compliant with all regulations).

Appendix B

Pre-Survey Questions

Q0 You are about to begin the survey. Please be honest in your responses, which will be anonymous. You do not have to answer any questions that make you feel uncomfortable.

Q1 Please enter your participant ID (last 2 letters of your last name and the day you were born on e.g., Ashley Smith, Birth date 07 = th07):

Q2 Please indicate your sex:

- Male (1)
- Female (2)
- Intersex (3)

Q3 Are you currently teaching full-time in Ontario?

- Yes (1)
- No (2)
- Prefer not to answer (3)

Q4 How old are you?

- 20-29 (4)
- 30-39 (5)
- 40-49 (6)
- 50-59 (7)
- 60+ (8)
- Prefer not to answer (9)

Q5 Please indicate your level of education. Select all that apply to you.

- Bachelors degree (1)
- Masters degree (2)
- Doctoral degree (3)
- Other (4) _____

Q6 What Ontario school board do you teach in?

Q7 What school do you teach in?

- Elementary school (1)
- Middle school (2)
- Prefer not to answer (3)

Q8 Is your school located in a

- Urban area (1)
- Suburban area (2)
- Rural area (3)
- Prefer not to answer (4)

Q9 What grade level(s) do you teach? (For example: 1, 3, 4):

Q10 What is your role? List all the apply (For example: math teacher, homeroom teacher, gym teacher):

Q11 Are you currently or have you ever taught physical education?

- No, never (1)
- Yes, I am currently teaching only physical education (2)
- Yes, I have previously taught physical education, but am not currently teaching it (3)

Q12 How many years have you been teaching (Including both full and part-time)?

Q13 How many students do you have in your classroom?

Q14 I incorporate physical activity in my classroom

- Yes (1)
- No (2)
- Prefer not to answer (3)

Q15 I incorporate physical activity into my classroom ____ days per week:

Q16 I incorporate physical activity into my classroom ____ times per day:

Q17 The physical activities that I incorporate into my classroom are typically:

- 1-2 minutes in duration (1)
- 3-5 minutes in duration (2)
- 5-10 minutes in duration (3)
- 10-15 minutes in duration (4)
- Over 15 minutes in duration (5)
- Other (6) _____
- Prefer not to answer (7)

Q18 I am willing to incorporate physical activity into my classroom

- Yes (1)
- No (2)
- Prefer not to answer (3)

Q19 Please state how much you agree or disagree with the following statements

	Strongly Disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly agree (5)	Prefer not to answer (6)
Male students were more engaged in DPA activities (1)						
Female students were more engaged in DPA activities (2)						
Male students enjoyed the DPA activities more (3)						
Female students enjoyed the DPA activities more (4)						
Male students were less restless and more manageable following DPA (5)						

Female
students
were less
restless and
more
manageable
following
DPA (6)

Q20 If you incorporate physical activity into your classroom, what types of activities do you do?
Select all that apply.

- Dancing (4)
- Movement videos (5)
- Yoga (6)
- Stretching (7)
- Cardio (8)
- General movement (9)
- Games (10)
- Walks (11)
- Outdoor play (12)
- Other (13) _____
- Prefer not to answer (14)

Q21 Where did you learn/get those activities? Select all that apply.

- OPHEA (4)
- Professional Development Days (5)
- Youtube (6)
- Colleagues (7)
- Books (8)
- Teachers pay teachers (9)
- Pinterest (10)
- Other (11) _____
- Prefer not to answer (12)

Q22 Please state how much you agree or disagree with the following statements

	Strongly Disagree (1)	Disagree (2)	Agree (3)	Strongly Agree (4)	Prefer not to answer (5)
Elementary school teachers should play a major role in DPA programs at school (1)					
DPA improves the mental health of students. (2)					
DPA improves the academic performance of students. (3)					
DPA improves the physical health of students (4)					
DPA improves cognitive functioning among students (e.g., their ability to think, pay attention, and complete tasks). (5)					

I believe that students would demonstrate improved academic performance after participating in a bout of DPA (6)

I enjoy implementing DPA in my classroom (7)

I feel confident about implementing DPA in my classroom (8)

Q23 Please state how much you agree or disagree with the following statements

	Strongly Disagree (1)	Disagree (2)	Agree (3)	Strongly Agree (4)	Prefer not to answer (5)
I like to exercise (1)					
I am physically active (2)					
I like being physically active (3)					
I am good at sports (4)					

Q24 During the last 7 days, on how many days did you do vigorous physical activities like heavy lifting, digging, aerobics, or fast bicycling? Think about only those physical activities that you

did for at least 10 minutes at a time

	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (7)	Prefer not to answer (8)
Select an answer (1)								

Q25 How much time in total did you usually spend on one of those days doing vigorous physical activities (Not all days combined)?

Hours (1) _____

Minutes (2) _____

Q26 Again, think only about those physical activities that you did for at least 10 minutes at a time. During the last 7 days, on how many days did you do moderate physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis? Do not include walking

	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (7)	Prefer not to answer (8)
Select an answer (1)								

Q27 How much time in total did you usually spend on one of those days doing moderate physical activities (Not all days combined)?

Hours (1) _____

Minutes (2) _____

Q28 During the last 7 days, on how many days did you walk for at least 10 minutes at a time?
This includes walking at work and at home, walking to travel from place to place, and any other walking that you did solely for recreation, sport, exercise, or leisure

	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (7)	Prefer not to answer (8)
Select an answer (1)								

Q29 How much time in total did you usually spend walking on one of those days (Not all days combined)?

Hours (1) _____
Minutes (2) _____

Q30 Thank you for taking the time to complete this survey. You will now be taken to a separate survey to fill in your email address. Your email address will not be stored with your responses to this survey. Your email address will be used to provide you with the link to the post-survey in 2 months, the weekly surveys, and a \$10 Starbucks gift-card for completing this survey.

I would like to provide my email address (1)
I do not wish to provide my email address (2)

Appendix C

Post-Survey Questions

Q0 You are about to begin the survey. Please be honest in your responses, which will be anonymous. You do not have to answer any questions that make you feel uncomfortable.

Q1 Please enter your participant ID (last 2 letters of your last name and the day you were born on e.g., Ashley Smith, Birth date 07 = th07):

Q2 In the last two months, I have incorporated physical activity in my classroom

- Yes (1)
- No (2)
- Prefer not to answer (3)

Q3 I incorporated physical activity into my classroom ____ days per week:

Q4 I incorporated physical activity into my classroom ____ times per day:

Q5 The physical activities that I incorporated into my classroom were typically:

- 1-2 minutes in duration (1)
- 3-5 minutes in duration (2)
- 5-10 minutes in duration (3)
- 10-15 minutes in duration (4)
- Over 15 minutes in duration (5)
- Other (6) _____
- Prefer not to answer (7)

Q6 I am willing to continue to incorporate physical activity into my classroom

- Yes (1)
- No (2)
- Prefer not to answer (3)

Q7 Please indicate how much you agree or disagree with the following

Female students were less restless and more manageable following DPA (6)



Q8 If you incorporated physical activity into your classroom, what types of activities did you do? Select all that apply.

- DPA toolkit videos (4)
- DPA toolkit posters (5)
- DPA toolkit activities (6)
- Dancing (7)
- Movement videos (8)
- Yoga (9)
- Stretching (10)
- Cardio (11)
- General movement (12)
- Games (13)
- Walks (14)
- Outdoor play (15)
- Other (16) _____
- Prefer not to answer (17)

Q9 Where did you learn/get those activities? Select all that apply.

- DPA toolkit (4)
- OPHEA (5)
- Professional Development Days (6)
- Youtube (7)
- Colleagues (8)
- Books (9)
- Teachers pay teachers (10)
- Pinterest (11)
- Other (12) _____
- Prefer not to answer (14)

Q10 Please indicate how much you agree or disagree with the following

	Strongly Disagree (1)	Disagree (2)	Agree (3)	Strongly Agree (4)	Prefer not to answer (5)
Elementary school teachers should play a major role in DPA programs at school (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
DPA improves the mental health of students. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
DPA improves the academic performance of students. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
DPA improves the physical health of students (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
DPA improves cognitive functioning among students (e.g., their ability to think, pay attention, and complete tasks). (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

I believe that students would demonstrate improved academic performance after participating in a bout of DPA (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I enjoy implementing DPA in my classroom (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel confident about implementing DPA in my classroom (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q11 Please indicate how much you agree or disagree with the following

	Strongly Disagree (1)	Disagree (2)	Agree (3)	Strongly Agree (4)	Prefer not to answer (5)
I like to exercise (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am physically active (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I like being physically active (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am good at sports (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q12 During the last 7 days, on how many days did you do vigorous physical activities like heavy lifting, digging, aerobics, or fast bicycling? Think about only those physical activities that you

did for at least 10 minutes at a time

	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (7)	Prefer not to answer (8)
Select an answer (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q13 How much time in total did you usually spend on one of those days doing vigorous physical activities (Not all days combined)?

- Hours (1) _____
- Minutes (2) _____

Q14 Again, think only about those physical activities that you did for at least 10 minutes at a time. During the last 7 days, on how many days did you do moderate physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis? Do not include walking

	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (7)	Prefer not to answer (8)
Select an answer (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q15 How much time in total did you usually spend on one of those days doing moderate physical activities (Not all days combined)?

- Hours (1) _____
- Minutes (2) _____

Q16 During the last 7 days, on how many days did you walk for at least 10 minutes at a time?
This includes walking at work and at home, walking to travel from place to place, and any other walking that you did solely for recreation, sport, exercise, or leisure

	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (7)	Prefer not to answer (8)
Select an answer (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q17 How much time in total did you usually spend walking on one of those days (Not all days combined)?

- Hours (1) _____
- Minutes (2) _____

Q18 Which features of the DPA toolkit did you find the most useful?

Q19 What features would you like to see in the DPA toolkit in the future?

Q20 Do you have any other recommendations to improve the DPA toolkit?

Q21 Do you feel that your ability to implement DPA improved with access to the toolkit? Please indicate yes or no and why.

- Yes (4) _____
- No (5) _____
- Prefer not to answer (6)

Q22 Do you see yourself using the DPA toolkit in the future?

- Definitely not (1)
- Probably not (2)
- Might or might not (3)
- Probably yes (4)
- Definitely yes (5)
- Prefer not to answer (6)

Appendix D

Weekly DPA Survey

Q1 Please enter your participant ID (last 2 letters of your last name and the day you were born on e.g., Ashley Smith, Birth date 07 = th07):

Q2 Did you use the DPA toolkit this week?

- Yes (1)
- No (2)

Q3 How many times did you use the DPA toolkit this week? (please enter a number)

Q4 On average, how many minutes per day did you use the DPA toolkit for, this week? (please enter a number)

Q5 Which resource(s) did you use from the DPA toolkit this week? (select all that apply)

- Videos (1)
- Activities (2)
- Posters (3)

Curriculum Vitae

Shelby Singh

Graduate Student

Counselling Psychology

University of Western Ontario

EDUCATION

MA Counselling Psychology *Sept 2022 - Present*

University of Western Ontario

Thesis title: *Evaluating a Daily Physical Activity (DPA) Toolkit for Elementary School Teachers*

Supervisor: Dr. Barbara Fenesi

HBSc., Psychology *Sept 2017- April 2022*

University of Toronto Mississauga (UTM)

Thesis title: *Social Anxiety and Meta-Liking: What Cues Do Socially Anxious People Use to Decide Who Likes Them?*

Supervisor: Dr. Erika Carlson

RELEVANT WORK EXPERIENCE

Graduate Student Assistant, University of Western Ontario *Oct 2022 – Present*

Counselling Psychology Placement Student, Sheridan College *Sept 2023- Present*

VOLUNTEER EXPERIENCE

Intake Coordinator, Peel Psychology and Therapy Center *Sept 2021- Aug 2022*

Crisis Line Counselling Responder, Distress Centers of Greater Toronto *Apr 2021- Jun 2022*

Cognitive Group Facilitator, 360 IME *Jul 2018- Aug 2020*

RESEARCH EXPERIENCE

Master's Thesis Student *Sept 2022 – Present*

Dr. Barbara Fenesi – University of Western Ontario

Honours Thesis Student *Sept 2021 – April 2022*

Dr. Erika Carlson - University of Toronto Mississauga

Research Assistant - Coder & Data Analyst (Pilot Study) *Apr 2021 - Sept 2021*

Dr. Erika Carlson - University of Toronto Mississauga

Research Assistant - Coder & Data Analyst (Research Assistantship) *Jan 2021 - Apr 2021*

Dr. Doug VanderLaan - University of Toronto Mississauga

Research Assistant - Pre-Screening Administrator *Mar 2020 - Nov 2020*

Dr. Emily Impett - University of Toronto Mississauga

HONOURS AND AWARDS

Canada Graduate Scholarship SSHRC - Master's (\$17, 500)

2023

Ontario Graduate Scholarship (OGS) (\$15, 000)	(decl. 2023)
University of Western Ontario Grad Pact '91 Bursary (\$1000)	2022
UofT Dean's List Scholar	2018 - 2022
UofT Mississauga Entrance Award (\$2000)	2017
Canadian and World Studies Sociology Award (\$100)	2017
Ontario Scholar Award	2017