EFFECTS OF SCHOOL-BASED NUTRITION EDUCATION ON NUTRITION KNOWLEDGE, SELF-EFFICACY AND FOOD CHOICE INTENTIONS OF LEARNERS FROM TWO PRIMARY SCHOOLS IN RESOURCE LIMITED SETTINGS OF PRETORIA

Chido L Zambuko*, Gerda Gericke & Jane Muchiri

ABSTRACT

School-based nutrition education programs (NEP) may promote positive dietary practices in children. Thus, we assessed whether nutrition education would improve the nutrition knowledge and self-efficacy of Grade 2 and 3 learners and food choice intentions of Grade 1 learners in two resource-limited schools in Pretoria. Following a needs assessment, we planned a NEP to address the inappropriate dietary practices of learners. The NEP was guided by evidence from the literature and the South African food-based dietary guidelines and was embedded in Social Cognitive Theory (SCT). We tested the effects of the NEP using a quasi-experimental design. Conveniently selected learners (N=244) from two schools were taught nine lessons over a six-week period. A modified Pathways Knowledge, Attitudes and Behaviours questionnaire assessed the outcomes at baseline, six weeks and 12 months. Sixty-three percent (n=157) of participants completed the study. Compared to baseline, nutrition knowledge and food choice intentions were significantly improved at six weeks, while self-efficacy was slightly reduced. The two schools had significantly different food choice intentions scores. Overall, girls scored higher than boys for the measured outcomes, though non-significant. At 12 months, only nutrition knowledge was sustained. A tailored NEP can improve the nutrition knowledge and food choice intentions of Grades 1 to 3 learners in resource-limited settings. Specific interventions to improve nutrition self-efficacy ought to be developed and implemented for this age group. Further studies using randomisation as well as assessing actual dietary behaviours are needed.

— Ms CL Zambuko*
Department of Human Nutrition
Faculty of Health Sciences
University of Pretoria
South Africa
Email: lczambuko@gmail.com
*Corresponding Author

— Ms G Gericke
Department of Human Nutrition
Faculty of Health Sciences
University of Pretoria
South Africa
Email: gerdagericke158@gmail.com

— Dr J Muchiri
Department of Human Nutrition
Faculty of Health Sciences
University of Pretoria
South Africa
Email: jane.muchiri@up.ac.za

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INTRODUCTION

Several South African studies acknowledge that the school food environment promotes unhealthy eating in children and adolescents (Faber et al., 2014; de Villiers et al., 2012). This is especially true in resource-limited schools, where learners are exposed to low nutritive value, and energy dense foods within the school environment. Resource-limited settings are also associated with poverty, high crime rates and alcohol and substance abuse which perpetuate unhealthy eating (de Villiers et al., 2012; Draper et al., 2010).

Healthy eating practices and behaviours improve, maintain and enhance health (Taylor et al., 2005, Haerens et al., 2006). Healthy eating is vital for optimal growth, health and well-being in all humans (Wang and Stewart, 2013). Healthy eating habits are influenced by individual factors including food preferences and knowledge; and collective factors such as the social and physical environment (Taylor et al., 2005). Unhealthy eating habits in childhood impact negatively on children's health, physical and mental development, and these eating habits may also persist into adulthood (Faber et al., 2014; Taylor et al., 2005; Wang and Stewart, 2013,). Children's unhealthy eating habits together with physical inactivity have been implicated in the rising worldwide epidemic of childhood overweight and obesity, which has also been linked to the high incidence of non-communicable diseases such as diabetes (Baleta and Mitchell, 2014; Dudley et al., 2015; Haerens et al., 2006; Taylor et al., 2005). South Africa records the highest prevalence of obesity among adults in Sub-Saharan Africa (Sartorius et al., 2015).

Nutrition education (NE) is one of the strategies used to establish healthy eating practices in children (Dudley et al., 2015) and is essential to improve nutritional status, and nutrition knowledge, attitudes and behaviours (KAB) (Kupolati et al., 2014). Nutrition education may be more effective in the school environment, which may support natural learning enabling children to make healthy food choices (Dudley et al., 2015;Faber *et al*., 2014; Kupolati et al., 2014; Wang and Stewart, 2013) .

In South Africa, the rising levels of malnutrition (Shisana et al., 2013) indicate a gap between dietary recommendations and intake behaviour. Nutrition KAB can be improved through appropriate NE, which may lead to improved nutrition status. Very little research has been done on the impact of school-based NE in South Africa (Oldewage-Theron and Napier, 2011), especially on interventions targeting younger learners in the foundation phase i.e. below Grade 4 (Kupolati et al., 2014; Steyn et al., 2015).

Nutrition education is important and effective in changing the nutrition KAB of young school children (Başkale and Bahar, 2011). To meet the needs of young South African learners, a nutrition education programme (NEP) was designed to promote healthful eating practices among foundation phase learners. This NEP was part of a multidisciplinary health promoting intervention that focused on the holistic well-being of children aged seven to nine years in two resource-limited communities in Pretoria. The NEP was informed by the results of a multidisciplinary needs assessment that was carried out with parents and learners using questionnaires and workshops based on participatory reflection and action (PRA) principles. Learners usual dietary intake at home and at school, and their previous day's food intake were among the data obtained in the needs assessment. This revealed inappropriate dietary practices including regular consumption of foods high in fat, sugar and salt, low consumption of vegetables, fruits and dairy foods and the skipping of breakfast. Overall, the learner's dietary practices were not in line with the South African food-based dietary guidelines (SAFBDGs). To address these inappropriate dietary behaviours, the NEP was structured and guided by the SAFBDGs and the relevant literature, and was underpinned by Social Cognitive Theory (SCT) (Zambuko, 2017).

In this quasi-experimental study, we

implemented the NEP in two resource-limited schools in Pretoria, South Africa. We report on the effectiveness of the NEP on changing nutrition related knowledge, self-efficacy and food choices among learners aged 7-9 years.

METHODS

Study design

This study was conducted in two phases. During Phase 1, we developed the NEP, which was implemented and evaluated in Phase 2. In Phase 1, NEP content, activities and materials were developed according to the SAFBDGs and evidence from the literature. In Phase 2, we employed a quasi-experimental design to assess the effectiveness of the NEP. Ethics approval was obtained from the Research Ethics Committees' of the Faculties of Education and Health Sciences, University of Pretoria. Permission to conduct the study was granted by the Gauteng Department of Basic Education (GDBE) (numbers. D2015/375A & D2016/399A) and the participating schools.

Participants

Participants included learners in Grades 1 to 3, aged between 7 and 9 years from two schools (School 1 and School 2) in resource-limited communities in Pretoria, South Africa. These schools serve economically-challenged communities, with most households having low income, unemployment and welfare dependence (Naidoo, 2011). The two schools were selected by the GDBE based on their knowledge of schools serving resource constrained communities which are the target of the multidisplinary health promotion intervention. The learners were mostly of black ethnicity. We obtained assent from learners and informed consent from guardians before commencing the study. Learners were given details of the study using simple age-appropriate English or Afrikaans. They were informed that participation was voluntary, and they could withdraw from the study at any time with no negative consequences.

The nutrition education programme

The principal investigator (PI) of this study, a qualified nutritionist developed the NEP including the lesson plans, homework activities, training manual and all the accompanying material such as the posters. The NEP comprised of two components: (i) the classroom component which was accompanied by context appropriate NE materials, food displays, food demonstrations and a song, and (ii) homework activities which tried to involve parents, who had to work together with the learners on assigned activities. The NE materials and activities for the classroom component included nine posters, an instructor's manual, food displays, food demonstrations and a healthy eating song.

The nine posters were based on the SAFBDGs, each representing a specific guideline. The pictures on each poster represented the messages conveyed by the guideline accompanied by short simple messages regarding the benefits of following the eating guideline. All the visuals in the materials were assessed by four experienced dietitians for age and context appropriateness. The song was also developed based on the SAFBDGs and each of the guidelines was included in the song. The tune of a common childhood song that learners were familiar with was used. The song was intended to reinforce the messages on healthy eating in a fun way.

Each lesson was accompanied by a food display, with real raw, culturally-appropriate healthy foods relevant to each lesson. The foods were placed where learners could easily see and identify them during each lesson. The learners also had the opportunity to handle, identify and describe the displayed food examples from each food group. Food demonstrations involved 'how to' presentations. Examples included correct hand washing techniques before handling food, removing skin from chicken meat to make it more healthy, and how to make simple healthy snacks such as brown bread and peanut butter.

Homework activities comprised age appropriate

TABLE 1: NUTRITION EDUCATION CURRICULUM BY WEEK

Week	Topic	Activities
1	*Lesson 1* **Be active your own way every-day**	Introduction and overview of the NEP. This lesson focused on promoting an active lifestyle. A poster showing pictures of active children was used to illustrate the concept
	Lesson 2 **Enjoy a variety of foods**	This lesson covered the seven different food groups and promoting the consumption of a variety of foods to be healthy
2	*Lesson 3* **Make starchy foods a part of most meals**	The different food items in this group, the energy provided and the number of servings recommended every day was taught. The Zimbabwe hand jive was used to illustrate the quantities to be consumed for the different food items
	Lesson 4 **Eat plenty of vegetables and fruit everyday**	The five different colours, the functions and importance for good health and the daily recommended servings were discussed
3	*Lesson 5* **Eat dry beans , split peas, lentils and soya regularly**	The health benefits of eating beans regularly and the serving suggestions were discussed
	Lesson 6 **Fish, chicken, lean meat and eggs could be eaten daily**	The functions of protein foods in the body, ways of removing excess fat and the reasons why were the focus of this topic
4	*Lesson 7* **Healthy drinks**	Based on two SAFBDs (i) Drink lots of clean safe water (ii) Drink milk, maas and yoghurt everyday: Drinking sufficient water every day and carrying a water bottle to school every day was taught during the lesson. Information on the different low fat dairy products learners could afford and their function was imparted to the children
5	*Lesson 8* **Use fat sparingly; choose vegetable oils rather than hard fats**	Examples of fatty foods as well as the dangers of too many fatty foods were discussed. Examples of healthy fats were given as well as a guidance on the daily amount that should be consumed
6	*Lesson 9* **Use very little**	Based on two SAFBDGs (i) Use salt and foods high in salt sparingly (ii) Use sugar and foods and drinks high in sugar sparingly: The lesson focused on the need to use little salt and sugar in food and how to do it, examples of foods containing excess sugar and salt as well as the dangers of too many sweets and sugar containing drinks in the diet

worksheets which were developed for each lesson based on messages delivered during the lesson. The worksheets comprised tasks and activities including word searches, puzzles, colouring, cut and paste; to be done at home with the learner's parents for each of the nine lessons. For example, for the SAFBDG guideline "use fat sparingly" black and white drawings of foods were provided on an A4 paper and the activity was to colour the foods low in fat "green" and to put a cross on foods high in fat.

An instructor's manual was developed based on SCT and guidelines from FAO's nutrition education for the public (Hosmer et al., 1997; Smith and Smitasiri, 1997). The manual contained the objectives for each session, the tools needed, the content and ideas to assist the facilitators in helping learners grasp the main ideas and concepts of healthy eating.

Implementation of the nutrition education programme

The NEP was implemented from August to September 2015. Eight nutritionists and dietitians (postgraduate level: 5 MSc students; 3 over 5 years post MSc) from the University of Pretoria presented the NEP. Presenters delivered the NEP after one day of training on the presentation of the NEP by the PI. The trained facilitators used the instructor's manual, the NE tools and activities to present the NEP to the learners. The NEP was presented in English in both schools. In one school (School 1), facilitators presented the NEP in Afrikaans to Afrikaans speaking learners.

The NEP was intended for delivery to small groups of learners by a pair of the trained facilitators, but this was not feasible in one school (School 2) due to challenges with space. In School 1, lessons were delivered in small groups in different classrooms. One facilitator delivered the lesson while the second facilitator assisted with the demonstrations and in ensuring the smooth flow of activities. In School 2, lessons were delivered to learners in big groups in one classroom by one facilitator. Another facilitator assisted with demonstrations while the rest of the facilitators were strategically positioned in the classroom to ensure the smooth flow of activities. The training package for each NE session consisting of the instructor's manual, poster for the session, learner's worksheets, display and demonstration materials and print-outs of the healthy eating song for each learner was provided for all the groups in both schools.

Nine classroom lessons were delivered in six sessions for six weeks (Table 1). The lessons lasted 20 minutes and were presented twice a week.

Interactive activities, simulations, and reflections were used to teach the learners about each of the eleven SAFBDGs. The Zimbabwe hand jive was used to show portion sizes. Each learner was provided with a homework activity sheet, snack pack (fruit juice/fruit and/or a muffin/ sandwich) and all learners participated in singing and dancing to the healthy eating song at the end of each lesson. Lessons were conducted during school hours. The principal investigator and one of the co-investigators conducted a debriefing session with the facilitators at the end of each day to facilitate the smooth flow of the programme. After six weeks, once the NEP was completed, each of the 20 class teachers received a set of the nine laminated posters (lesson 1-9). These posters could be placed on classroom walls so that learners would have continued access to the messages.

Outcomes

The outcomes of this study were nutrition knowledge, intentions to make healthy food choices and nutrition self-efficacy. The outcomes were assessed at baseline, six weeks and 12 months using questionnaires. It was hypothesised that a NEP tailored to the needs of the target group would induce significant improvements in the investigated outcomes at six weeks and that these improvements would be sustained at 12 months (follow-up).

Data collection

We used a modified version of the Pathways KAB questionnaire (Stevens et al., 2003). The original version had been developed for Indian American children to measure knowledge, attitudes and behaviours related to nutrition and physical activity (Stevens et al., 2003). We adjusted the wording of the questions, and the food items for context and age appropriateness. The original questionnaire scales were developed using the constructs of the SCT. Only three scales were adopted for this study, i.e. intentions to make healthful food choices, knowledge of high fat foods and self-efficacy to make healthy food choices. Previous studies had indicated predictive validity for these scales. The questionnaires have been shown to be sensitive to the effects of school-based interventions and could be used successfully with ethnically diverse populations (Stevens et al., 1999). The reliability of the scales based on Cronbach's alpha was high for self-efficacy (0.76) and low for nutrition knowledge (0.56) (Stevens et al., 1999). However, it appears low reliability for nutrition knowledge scales is a common phenomenon in SCT based studies for school children (Hall et al., 2015). The questionnaire was chosen because a modified version has previously been used among Grade 4 learners in South Africa with success (de Villiers et al., 2016). The nutrition knowledge and self-efficacy scales were part of the same questionnaire that was used to assess these outcomes in Grade 2 and 3 learners. Grade 1 learners were only assessed for food choice intentions, with very short items that were easy to comprehend at their level. Therefore, their questionnaire was separate from the other grades. The questionnaires were available in

both English and Afrikaans, the languages of instruction used at the schools. The PI or the NEP facilitators read out questions to participating learners in the classroom, following which, each learner filled out his/ her questionnaire.

Data analysis

The SPSS version 22 statistical package was used to analyse the data and the level of significance was set at 0.05 for a two tailed test. Where data for one question was missing in a scale, the mean score for all learners for that question was imputed. If data were missing for more than one question, the data for the particular learner(s) were excluded for that scale (Stevens et al., 1999). Seven out of 244 learners' data were imputed or excluded. This was done for a total of 16 questions both pre-assessment and post-assessment. Only 0.4% of the learners had more than one question in a scale missing.

Each question was set to a scale of 0.0 to 1.0 (1.0 being the healthiest option answer and 0.0 the least healthy option answer) and the mean score for each scale was computed. Therefore, a mean of 1 and 0 would be expected for maximum and minimum scores respectively (Stevens et al., 2003). There were six nutrition knowledge questions and eight questions each for the food choice intentions and self-efficacy questionnaires.

According to the Shapiro-Wilk test, the data were normally distributed, and data were analysed using parametric tests. The power of the study was calculated using repeated measures ANOVA. Independent sample t-tests were used to compare the baseline mean scores between schools and genders. We compared schools because of the differences in group size during NE presentation (small groups in School 1 vs. large groups in School 2). The effect of the NEP on changes in nutrition related knowledge and self-efficacy was measured using paired t-tests. Independent sample t-tests were used to compare differences between pre-assessment, post-assessment and follow-up assessment mean scores by gender and school for both scales. One-way repeated measures (ANOVA) was used to assess the effect of time on the measured outcomes by gender and by school except for food choice intentions due to the small sample size.

RESULTS

A total of 244 learners participated at baseline (Girls (56%); Grades 2 and 3, n = 178 (73%), Grade 1, n = 66 (27%). Their mean age was 8.06 ± 0.821 years. Figure 1 shows the mean scores for food choice intentions, nutrition related self-efficacy and knowledge from baseline to follow-up. At six weeks (P = 0.014) and 12 months (P = < 0.001) the mean nutrition knowledge scores were significantly higher than baseline scores. The mean scores for nutrition self-efficacy decreased from six weeks to 12 months (P = < 0.001). The mean scores for food choice intentions significantly increased at six weeks (P = < 0.001), but decreased significantly at 12 months (P = < 0.001). As shown in Figures 2 and 3, positive effects on nutrition knowledge (P = 0.69) and the reduction in nutrition self-efficacy (P = 0.42) were not significantly different between the two schools, although School 1 appeared to perform better on the two outcomes. The decline in food choice intention scores from baseline to follow-up was not significantly different between School 1 and School 2 (P = 0.21) (Figure 4).

The difference in the nutrition knowledge mean scores between boys and girls was not significant at both baseline and six weeks (P = 0.11) (Table 2 and Figure 5). Girls had significantly higher means scores at 12 months when compared to boys (P = 0.02). Although girls had higher nutrition self-efficacy mean scores when compared to boys, the difference in the scores between boys and girls was not significant at baseline, six weeks (P = 0.71) or 12 months (0.86) (Table 3).

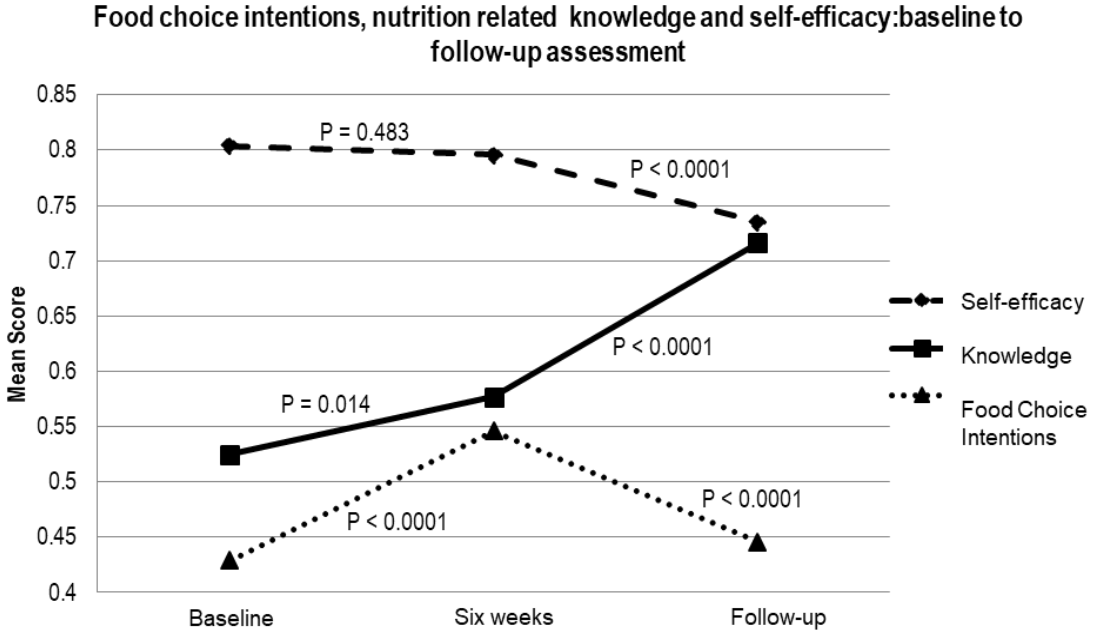

FIGURE 1: EFFECT OF THE NUTRITION EDUCATION PROGRAMME ON THE OVERALL FOOD CHOICE INTENTIONS, NUTRITION RELATED KNOWLEDGE AND SELF-EFFICACY FROM BASELINE TO FOLLOW-UP FOR BOTH SCHOOLS

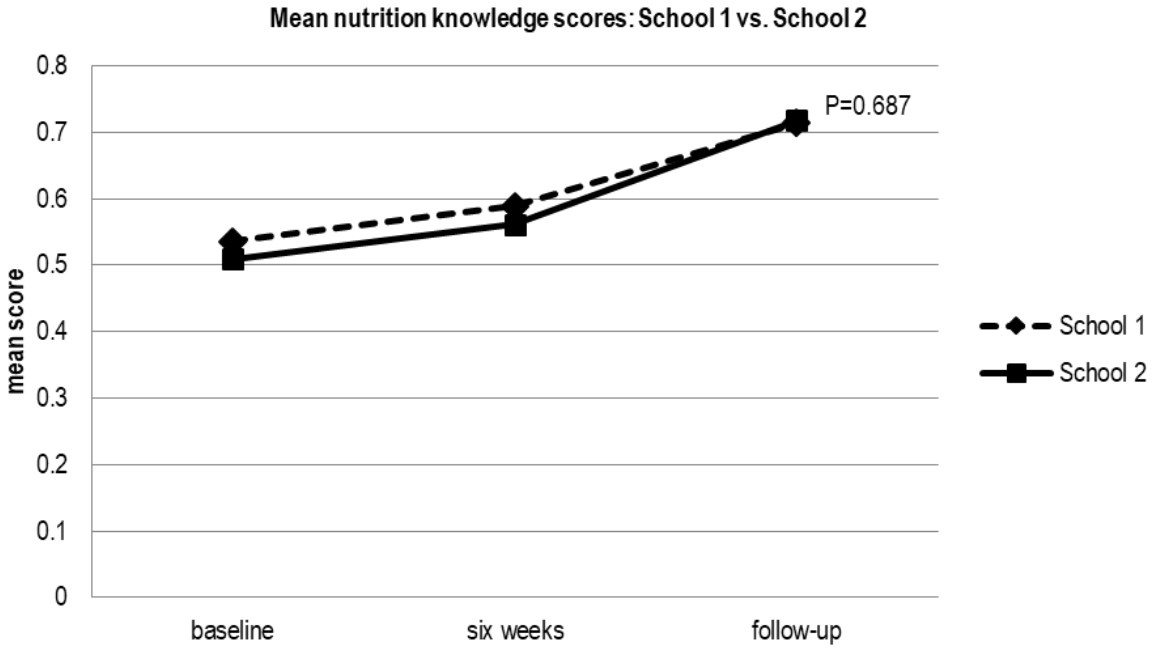

FIGURE 2: EFFECT OF THE NUTRITION EDUCATION PROGRAMME ON THE OVERALL NUTRITION RELATED KNOWLEDGE FROM BASELINE TO FOLLOW UP FOR SCHOOL 1 VS. SCHOOL 2

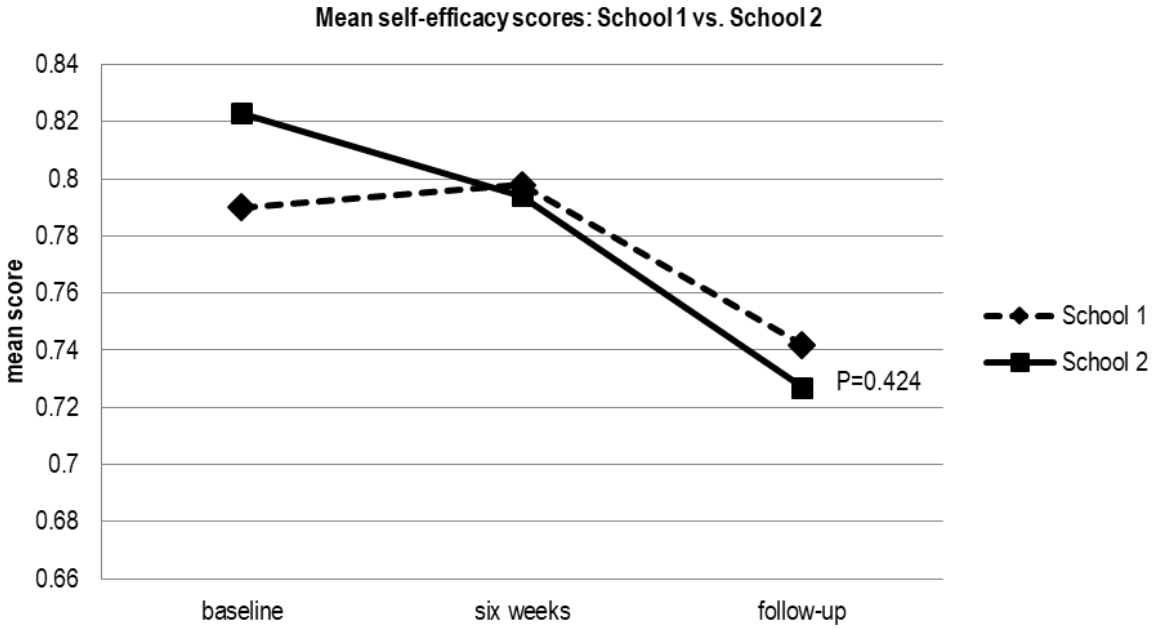

FIGURE 3: EFFECT OF THE NUTRITION EDUCATION PROGRAMME ON THE OVERALL NUTRITION SELF-EFFICACY FROM BASELINE TO FOLLOW UP FOR SCHOOL 1 VS. SCHOOL 2

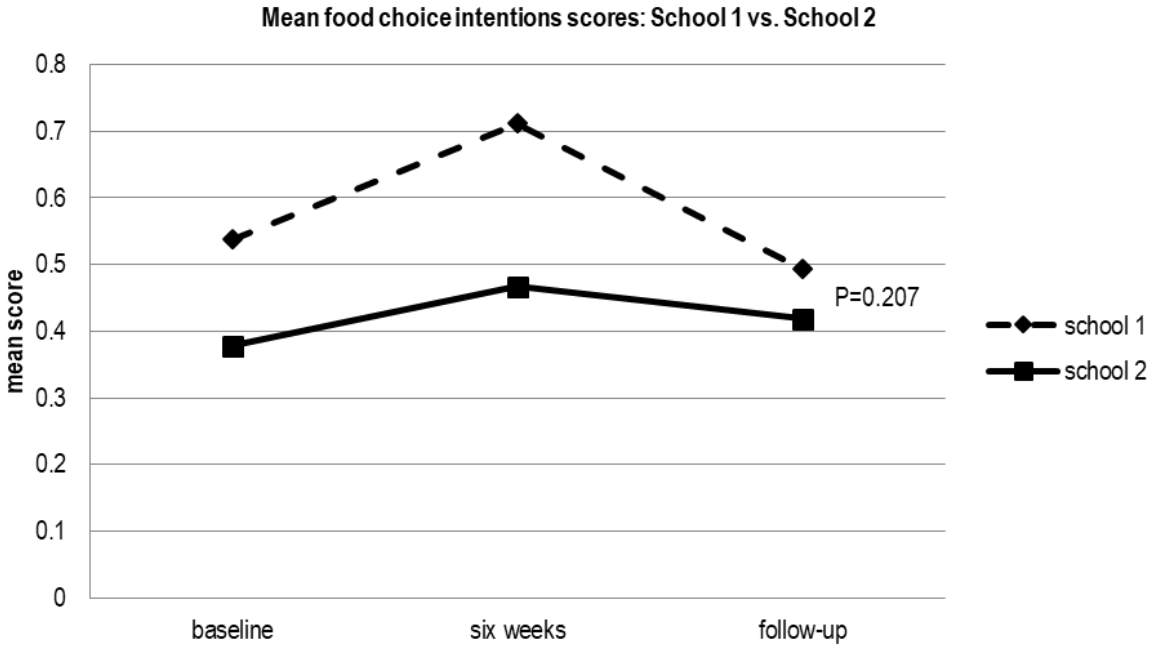

FIGURE 4: EFFECT OF THE NUTRITION EDUCATION PROGRAMME ON THE OVERALL FOOD CHOICE INTENTIONS FROM BASELINE TO FOLLOW-UP FOR SCHOOL 1 VS. SCHOOL 2

TABLE 2: MEAN NUTRITION KNOWLEDGE SCORES BOYS VS. GIRLS FOR BOTH SCHOOLS FROM BASELINE TO FOLLOW-UP

Nutrition Knowledge	Boys			Girls			Mean difference	P Value
	N	Mean	S.D	N	Mean	S.D		
Pre-test	68	0.501	0.181	73	0.551	0.190	-0.050	0.11
Post test	50	0.587	0.190	57	0.584	0.173	0.003	0.96
Follow-up	57	0.630	0.216	64	0.739	0.160	-0.109	0.002

TABLE 3: MEAN NUTRITION SELF-EFFICACY SCORES BOYS VS. GIRLS FOR BOTH SCHOOLS FROM BASELINE TO FOLLOW-UP

Nutrition Self-efficacy	Boys			Girls			Mean difference	P Value
	N	Mean	S.D	N	Mean	S.D		
Pre-test	67	0.792	0.137	74	0.825	0.133	-0.033	0.15
Post test	48	0.801	0.115	57	0.809	0.124	-0.009	0.71
Follow-up	55	0.728	0.131	64	0.732	0.145	-0.004	0.86

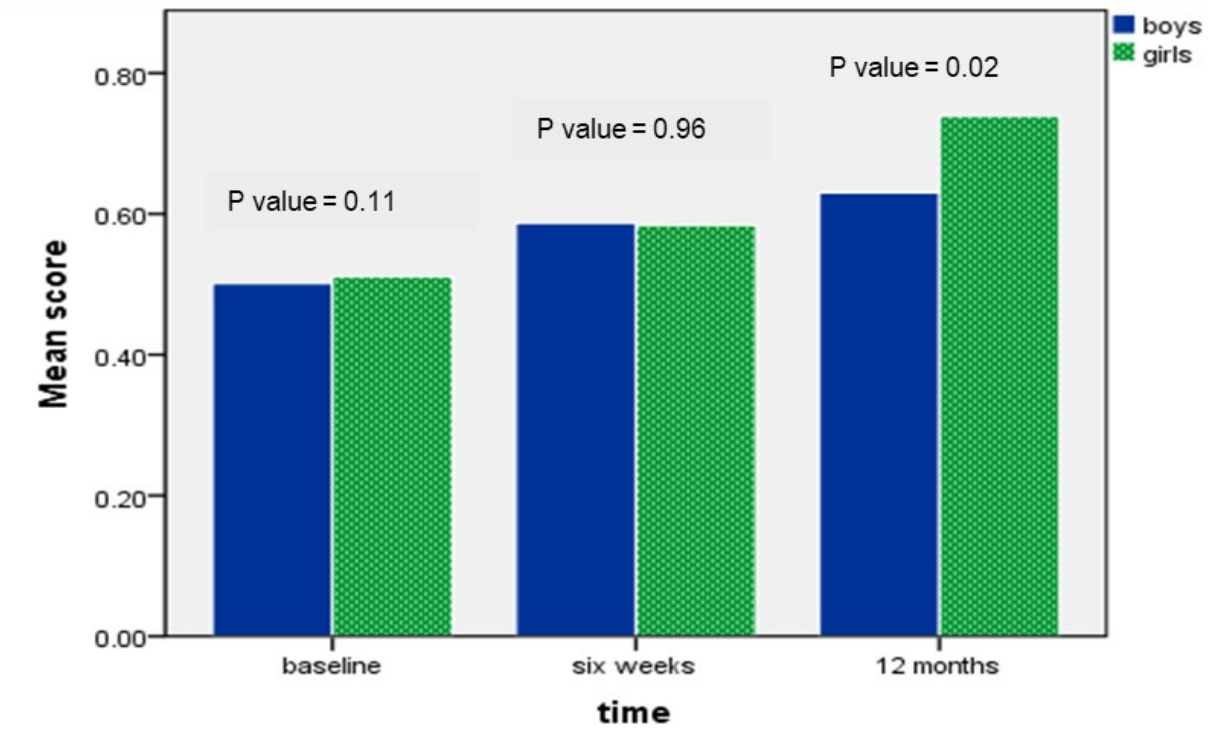

FIGURE 5: PRE-ASSESSMENT, POST-ASSESSMENT AND FOLLOW-UP ASSESSMENTS MEAN SCORES FOR OVERALL NUTRITION KNOWLEDGE FOR BOYS VS. GIRLS

DISCUSSION

In this study, we tested the ability of a NEP to improve the food choice intentions, nutrition related self-efficacy and knowledge of young learners (Grade 1 to 3) from two schools in resource-limited communities in Pretoria. Compared to baseline, learners had better nutrition knowledge scores and better food choice intentions upon completion of the NEP,

but these improvements were only sustained for nutrition knowledge at 12 months. However, the NEP had no positive effects on nutrition self-efficacy.

As in other school-based NEPs (Başkale and Bahar, 2011; Carraway-Stage et al., 2015; Luepker et al., 1998, Powers et al., 2005), this study found improvements in nutrition knowledge, especially at six weeks directly after the intervention. The positive result that we observed may be due to the consistent delivery of messages (Mikkelsen et al., 2014). The NEP used a behavioural theory-based curriculum to promote nutrition knowledge, which may also have led to the favourable, though small result. In this study, the NEP achieved a significant increase in nutrition knowledge after just three hours of NE, which is less than the proposed 10-15 hours for large effects in programme specific knowledge (Powers et al., 2005). The cumulatively short time that learners were exposed to the NEP, coupled with the positive outcomes suggests that a well-planned theory based curriculum in school based NEPs can increase the nutrition knowledge of primary school learners (Dudley et al., 2015; Powers et al., 2005).

In this study, we provided a small copy of the poster under discussion to each learner during each lesson, which may have encouraged participation and increased attention. In this NEP, we also used real food items as supporting visuals, enhancing motivation, understanding and retention of the messages being taught (Contento, 2007; Vermeer, 2014). The sustained effects, and additional increase in nutrition knowledge observed at 12 months, confirm the retention of learning. The sustained positive effects on nutrition knowledge is consistent with other school based programmes (Demetriou et al., 2015). The retention of knowledge at 12 months may be due to the fact that learners had continual access to the messages taught during the NEP because each class teacher had nine laminated copies of posters used in the NEP to hang on classroom walls. Although the posters were not intended to be used for teaching, we hoped that that learners would engage with the messages on the posters as they do with other learning materials posted on classroom walls.

The age-appropriate play activities, educational materials such as posters, workbooks and food materials used in this study are pivotal to improving the nutrition knowledge of primary school learners (Başkale and Bahar, 2011, Dudley et al., 2015) . The song and visual hand-outs based on the local food based dietary guidelines helped the learners to relate messages to their usual practices, cultural identity and local environment. Başkale and Bahar (2011) suggest that the use of food groups to educate children on variety in the diet may improve learner's nutrition knowledge. The use of age-appropriate educational content and materials that were fun and culture sensitive could have encouraged learners to acquire the knowledge and skills required to motivate one to take action and resulted in the positive effects observed at the six weeks assessment (Başkale and Bahar, 2011; Oldewage-Theron and Egal, 2009).

Increasing learners' self-efficacy is a fundamental part of behaviour change, as it motivates people to act (Kostanjevec et al., 2013). However, this study and previous studies suggest that NE may have a negative effect on self-efficacy (Abrahams and Steyn, 2011; Stevens et al., 2003). The decrease in self-efficacy observed in this study was also reported in the Pathways study that exposed learners in Grades 3-5 to NE and aimed to improve nutrition knowledge and practices, and physical activity (Stevens et al., 2003). On the contrary, a recent review of the effects of SCT interventions on dietary behaviour among children reported significant improvements in self-efficacy related to increased intake of vegetables and fruits and lower fat, sugar and sodium intake (Rolling and Hong, 2016). In that review, high self-efficacy for these behaviours was correlated with actual dietary behaviour (Rolling and Hong, 2016). The unfavourable result in our study may be due to our not being able to specifically address the difficulties learners face when making food choices, for example in the school food environment. Despite experimental learning

being a strong evidence-based strategy for improving knowledge and ultimately self-efficacy of primary school learners (Dudley et al., 2015; Edmundson et al., 1996), learners had limited hands-on experience as most demonstrations were performed by facilitators because of time restrictions. We had to present the NEP sessions during school time, and sessions were kept short to minimise the disruption of academic activities. The limited contact time also deterred optimal checking of homework sheets. Further, the short duration of the programme might have not been long enough to improve self-efficacy, since most successful interventions are implemented for longer than six months (Wang and Stewart, 2013).

In this study, learners improved their intentions to choose more healthy foods across all questions, from baseline to six weeks, which is consistent with other school NEPs (Dollahite et al., 1998; Edmundson et al., 1996). A similar result was found with the "It's all about study", a nutrition and physical activity school based programme that exposed learners to nutrition education and observed a significant increase in the mean scores for food choice intentions for the intervention group (Devault, 2006). In this study, the improvements in food choice intentions noted at six weeks did not persist to 12 months. The high attrition (35.7%, n = 87) due to absenteeism of learners observed from six weeks to 12 months may have reduced statistical power and thus compromised the effectiveness of the NEP (Hoddinott et al., 2008; Prinz et al., 2001).

Overall, we noted slight differences between the two schools, and between boys and girls. Learners in School 1 and girls appeared to perform better in all outcomes, but girls only performed significantly better than boys in knowledge scores at the six-week assessment. Previous studies have shown that girls seem to be more responsive to NEPs than boys (Perry et al., 1998). Compared to School 1, learners in School 2 performed less-well in nutrition self-efficacy and food choice intentions. Learners in School 2 received the NEP in larger groups, than the small groups initially planned. This may have compromised the effectiveness of learning. Presenting the NEP to small groups of learners could have improved the effectiveness of the intervention (Contento, 2007). In addition, Afrikaans speaking learners in School 1 had the benefit of receiving the NEP in Afrikaans, which may have enhanced their understanding and ability to express themselves.

This study had some limitations. Although the quasi-experimental design is often the most feasible method, it is prone to confounding without randomisation. Factors such as ethnicity and socio-economic status of the parents might have influenced the outcomes of this study. Including a control group would have been useful in minimising the threats to validity: however, obtaining two equivalent groups was not possible because the investigators were restricted to the selected schools. Another limitation of this study is the high number of learners who were absent for both the post and follow-up assessments (35.7% attrition rate). This reduced both the sample size and power to detect differences. Furthermore, the low internal reliability of less than 0.7 for the scales limited the ability to detect change by introducing unwanted error. Finally, while the positive and sustained results for nutrition knowledge are encouraging, knowledge by itself does not necessarily translate to positive behaviour change (Hall et al., 2015, Rolling and Hong 2016).

CONCLUSION AND RECOMMENDATIONS

This study demonstrated that tailored school-based NEPs have the potential to improve mediators of change for healthy eating behaviour in learners from resource-limited primary schools particularly with respect to knowledge and food choice intentions. The nutrition self-efficacy could possibly be improved by addressing the barriers to healthy food choices among the learners. Future studies should identify and address the special nutrition education needs for boys. Additionally, parental involvement should be strengthened through incorporating strategies for active participation in

all stages of the NEP (development, implementation and evaluation). Further, future studies should endeavour to enhance the sustainability of the NEP, for example by training and using teachers as facilitators (Habib-Mourad et al., 2020).

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