

# Abstract

## Introduction

Unhealthy eating and physical inactivity are major risk factors for obesity and chronic disease in young people. Effective interventions to improve health-related practices are required to target young people for long-lasting impact. Involving parents in such interventions is important to increase engagement and effectiveness. This study developed and evaluated the effectiveness of a digital story to improve the healthy eating and physical activity of young people and their parents in Colombo District, Sri Lanka.

## Methods

This project included two phases and three studies guided by the theory of planned behaviour (TPB). In Phase 1 – Study 1, a digital story consisting of four episodes (4–5 minutes each) was developed about healthy eating and physical activity. Study 1 was a Delphi study and a panel of experts (N=11) from nutrition, physical activity, and digital technology evaluated the digital story for content accuracy and appropriateness. Phase 2 included two studies, Study 2 and Study 3. Study 2 included a questionnaire validation study (Study 2A) and an intervention study (Study 2B). Study 2A targeted validating a questionnaire on the TPB constructs of knowledge, intention, attitudes, subjective norms, perceived behavioural control, and behaviour related to healthy eating and physical activity. In Study 2B, a non-randomised control trial, was conducted among young people aged 14–15 years (N=267) in two schools in Colombo. The intervention group (N=143) watched the story (one episode a day) over two weeks. The control group (N=124) received no intervention. Baseline and post-intervention data were collected using a pre-validated questionnaire assessing the TPB constructs related to healthy eating and physical activity. All baseline data were collected face-to-face. Post-intervention data from the intervention group were collected face-to-face in week 2 and for the control group, online between weeks 3–7. Study 3 was a qualitative study to explore parents' perceptions of the digital story. A purposeful sample of 11 parents from the intervention school participated in the study. Parents watched the four episodes of the digital story online; with a 1–2 day interval

between each episode before completing online, individual, semi-structured interviews.

Data from the questionnaire validation study were analysed for internal consistency reliability (Cronbach's alpha), test-retest reliability (intra-class correlation coefficient), and validity (descriptive statistics). Data from the Delphi study were analysed using descriptive statistics and qualitative content analysis. Linear mixed model analysis was used to compare outcomes of Study 2B, the non-randomised control trial study for young people. Inductive thematic analysis was undertaken to analyse the data from Study 3, the post-intervention qualitative study for parents.

## Results

*Study 1: Delphi study:* Experts rated items related to predictive effectiveness of the digital story from 'adequate' to 'extremely well'; items related to validity and quality of the content from 'good' to 'excellent'; and items related to narrative qualities of the digital story from 'adequate' to 'greatest', except for the item related to product economy, which was rated low. Experts provided further suggestions to improve the digital story, including reducing the length of the digital story and shortening key health messages, changing the images in some frames, increasing the number of frames in some scenes, changing narrations in some sections, and re-recording narrations by changing the narrator's tone of voice.

*Study 2A: Questionnaire validation study:* The questionnaire assessed six TPB constructs, each regarding healthy eating and physical activity, and comprised 12 scales. Scales related to TPB components including intention, attitudes, subjective norms, and perceived behavioural control for healthy eating and physical activity had acceptable ( $\alpha = 0.7$  to  $0.8$ ) to good ( $\alpha = 0.8$  to  $0.9$ ) to excellent ( $\alpha > 0.9$ ) internal consistency reliability. Healthy eating related behaviour scale had moderate internal consistency reliability ( $\alpha = 0.5$  to  $0.6$ ), while physical activity related behaviour ( $\alpha = 0.474$ ), healthy eating ( $\alpha = 0.423$ ), and physical activity ( $\alpha = 0.264$ ) related knowledge scales had poor internal consistency reliability. Moderate test re-test reliability (ICC between  $0.5$  to  $0.75$ ) was observed in all scales, except the scale used to assess healthy eating related knowledge, which had poor test re-test reliability (ICC =  $0.362$ ).

*Study 2B: Intervention study for young people:* The sample of the young people's intervention study consisted of 191 males and 76 females, aged 14–15 years. A

significant Group\*Time interaction was observed in all outcomes related to healthy eating (knowledge [ $p=0.014$ ], intention [ $p<0.001$ ], attitudes [ $p<0.001$ ], subjective norms [ $p=0.002$ ], perceived behavioural control [ $p<0.001$ ], and behaviour [ $p<0.001$ ], and physical activity (knowledge [ $p=0.005$ ], intention [ $p<0.001$ ], attitudes [ $p=0.003$ ], subjective norms [ $p=0.018$ ], perceived behavioural control [ $p<0.001$ ], and behaviour [ $p<0.001$ ]).

*Study 3: Qualitative Study for parents:* Five main themes emerged related to: 1) individual and family, 2) parenting, 3) society, 4) culture, and 5) the country's economic situation. The findings revealed that healthy eating and physical activity behaviours of parents and young people were influenced by knowledge, intention, attitudes, and family support; their busy lifestyles and Covid-19 related lifestyle changes; other people's influence, the availability of the facilities and opportunities in society; and disruptive national turmoil. In general, parents felt the digital story intervention positively influenced knowledge, intention, attitudes, beliefs, and behaviours about healthy eating and physical activity. In particular, cultural relevance influenced the acceptability of the digital story by parents and young people in this study.

### **Conclusion**

The questionnaire, which was adapted to measure TPB constructs related to healthy eating and physical activity, was found to be a valid tool for use in future studies with young people. The expert panel approved the digital story to be an accurate and valid method to improve TPB constructs related to healthy eating and physical activity of young people and their parents. The digital story intervention improved healthy eating and physical activity related outcomes of young people. Parents perceived the digital story intervention as an effective program to improve parents and young people's healthy eating and physical activity behaviours.

Limitations of this study include the different data collection modes and the duration post-intervention between the control and intervention groups in Study 2B, the intervention study for young people.