ORIGINAL ARTICLE

ReReki: The Effectiveness of a Gamified Sexual and Reproductive Health Education in Malaysian Adolescent Boys

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ABSTRACT

Introduction: About one-third of Malaysian adolescents are engaged in sexual activities before the age of 14 that could negatively affect their health. This study aimed to evaluate the effectiveness of a gamified sexual and reproductive health education (*ReReki*) to mitigate early sexual activities amongst Malaysian adolescent boys. **Materials and methods:** A gamified *ReReki* module was developed by using the Analysis, Design, Development, Implementation and Evaluation model, along with the Theory of Planned Behaviour. An experimental study was subsequently conducted with 257 adolescent boys, who were assigned to either an experimental (n=130) and control (n=127) groups. The experimental group was exposed to five gamified *ReReki* modules. Sexual intention (SI) towards pre-marital sex, self-efficacy (SE) on performing sexual activity, social norms (SN) on pre-marital sex, permissive attitude (PA) towards pre-marital sex and knowledge (KN) on SRH were assessed at baseline (P1), immediately after the intervention (P2) and 10 weeks after the intervention (P3). **Results:** The gamified *ReReki* module showed significant reduction in the SI score from P2 to P3, with a small effect (η_p^2 =0.037, p<0.013), SE score reduced from P1, P2 to P3 with large effect (η_p^2 =0.210, p<0.010). The SN score reduced from P1, P2 to P3, also with a large effect (η_p^2 =0.104, p<0.010) and the PA score reduced from P2 to P3 with a small effect (η_p^2 =0.048, p<0.002). **Conclusion:** The gamified *ReReki* module was found to reduce the risk factors such as SI, SE, SN and PA it may be useful in SRH education for adolescent boys in various settings.
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Keywords: Adolescent boys, Gamified sexual health education, Reproductive health, Sexual intention, Quasi-experimental

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INTRODUCTION

Early sexual initiation is linked to risky behaviours(1). For example, adolescents who engaged in early sexual activity are more likely to have multiple partners(2), substance abuse(3), higher rate sexual partner change(4), contact sexually transmitted disease(5), including HIV/AIDS and various forms of sexual violence and coercion(6). Adolescent under the age 16 are more vulnerable to sexually transmitted disease, including HIV/AIDS because they are less likely to use or have access to contraception(7). HIV/AIDS is increasingly progressing worldwide. A study in Malaysia discovered that Sarawak had the fourth-highest rate of HIV/AIDS cases which is very concerning(8).

Adolescents rely on the internet as a common channel for accessing information about sexual health-related topics(9). However, sexual and reproductive health (SRH) information from internet is often inaccurate, inappropriate and full of misinformation which can lead to ignorance, misconceptions and poor attitude(10). Moreover, SRH education in Malaysia is not fully institutionalized and is poorly implemented(11). In addition, SRH education mainly conducted through counselling, health talks, pamphlets and video presentation(12). These methods may have it strengths and weaknesses.

The increasing use of game-based approach is becoming popular in learning environments(13). The game-based approach is expanding its popularity beyond the classroom which includes social media and professional training. Game-based approach platforms increase students' engagement, motivation, and productivity by using gaming components as a training method. This can result in more immersive and interactive learning opportunities. Additionally, it provides students with a unique opportunity to participate in engaging activities that may enhance their knowledge and skills while also being enjoyable(14).

Various study has found that SRH education using

a gamified approach is relevant and promising for adolescents because the role plays and scenarios reflect their actual lifestyle(15). In other word, the gamified approach allows a connection between their learning and real life situations. These studies stated that the adolescents felt confident while going through the self-regulated learning material provided through the gamified approach. However, the use of gamification intervention for SRH education is still limited, especially in Malaysia.

In addition, most SRH intervention education is not evidence-based practice or supported by behavioural theories(16). The Theory of Planned Behaviour (TPB) is one of the principal theories used to design the evidence-based interventions of *ReReki*(17). TPB was chosen because it is the most accurate model for predicting sexual health behaviour and for its ability to predict behaviour change(18). The Analysis, Design, Development, Implementation, and Evaluation (ADDIE) model, along with concepts from TPB was used to develop the content of the gamified SRH health module for adolescent boy (*ReReki*)(19,20). It was developed to provide early SRH literacy skills to adolescent boys(21). Therefore, this study aimed to determine the effectiveness of a gamified *ReReki* on sexual intention, self-efficacy, social norms, permissive attitude and knowledge.

MATERIALS AND METHODS

Study design

A quasi-experimental study was conducted to assess the effectiveness of the newly developed *ReReki* intervention programme. (Fig. 1)

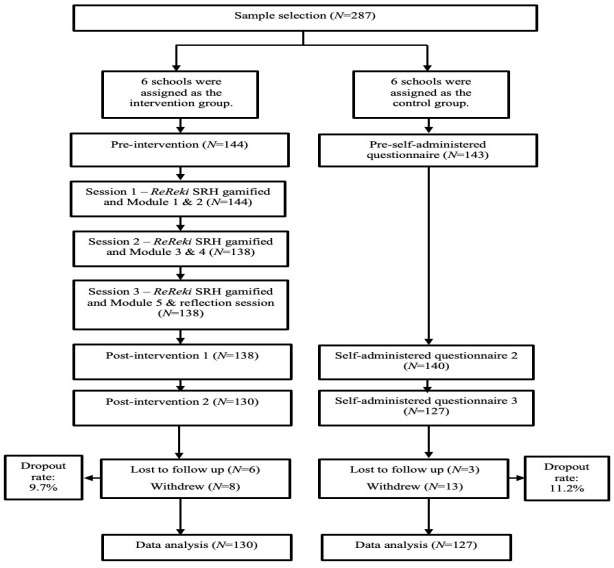

Fig. 1: The study design on Quasi-experimental

Study setting, participant and eligibility

This study was conducted in the southern region of Sarawak. A total of 12 schools (six urban schools and six rural schools) were invited to participate in this study. The urban schools were mainly located in Kuching division, while the rural schools were from Serian, Sri Aman and Betong division. The inclusion criteria for participant were adolescent boys aged 13-17, who were able to read and write in Bahasa Malaysia. The abilities to read and write is required as some questions related to sexual behaviour can be sensitive and personal. Hence, the self-administered questionnaire provides them a privacy.

Sample size

The sample size in this study was calculated using the latest version 3.1.9.7 G*Power software(22). The estimated total size that needed to be recruited was (n=176) participants. By considering a 30% of the attrition rate, the required sample size was (n=228). Based on the ratio of 1:1 between an experimental and control group, (n=114) participant required in each arm.

Sampling methods and blinding procedure

In this study, the samples were selected using a multistage sampling procedure. In the first stage, the southern region was randomly selected out of the three regions of Sarawak. In the second stage, all five divisions in southern region namely Kuching, Samarahan, Serian, Sri Aman & Betong were included in sampling procedure. The Samarahan division was allocated for the pilot study. Subsequently, 12 schools were selected with 1:1 ratio between urban and rural schools. A total of six schools (three urban and three rural schools) were randomly selected for the intervention group, while the remaining six schools were assigned to a control group. Finally, each schools provided a list of students, who were taken as participants. Students were blinded to their group assignment to avoid cross-information.

ReReki Intervention

The Analysis, Design, Development, Implementation and Evaluation (ADDIE) model and concepts from TPB were used to develop the content of the gamified SRH health module for adolescent boys (*ReReki*). Once developed and tested, the intervention group was exposed to *ReReki* SRH education. *ReReki* intervention program consists of five modules with a game-based approach. Six games were delivered for 3 days in week 1, followed by modules in week 1-10. These game-based educational sessions will require 90 minutes for each session in the classroom. There are five main components to the *ReReki* intervention program and they were delivered via six different game-based approaches; (i) Let Xplore, which provides an overview of sexuality;

(ii) The Red Zone, which emphasizes understanding the reproductive system and the development of the puberty phase; (iii) Message card for you, which addresses emotions, psychology, and sexuality; (iv) Box & Portals, which discusses risky behaviour, gender development and roles; (v) TT Game (This or That), include sexual diseases involving men; (vi) MONO*ReReki*, referring to abstinence and positive identity development; and Law Enforcement that sexual acts. On the other hand, participants in the control group did not receive any SRH education.

Instrument and data collection procedure

A 14-item knowledge assessment on SRH was adopted from the PEKERTI module for secondary school, with a Cronbach alpha of 0.73(23). A 20-item of Youth Sexual Intention Questionnaire (YSI-Q) was used to measure sexual intention to perform sexual activity, self-efficacy on performing sexual activity, social norm on pre-marital sex, permissive attitude towards pre-marital sex(24). The reliability of this questionnaire as measured by Cronbach Alpha, was 0.93. A back translation was conducted by an independent language expert to assess the effectiveness of the translation by translating the questionnaire back into the original language. Any discrepancies were addressed.

Participant who agreed to join the intervention study received their parental consent. The self-administered questionnaire was completed three times in their classrooms or school halls. For the intervention group, participants were required to answer the questionnaire at baseline, immediately after the intervention and at 10 weeks post-intervention. Similarly, the control group answered the questionnaire three times, following the timeline for data collection as the intervention group.

Data entry and analysis

The data collected were coded, checked manually for any inconsistencies, duplications or missing values and analysed using Statistical Package for Social Science (SPSS), version 26.0. Statistical assumptions were tested prior to descriptive analysis, independent t-test and Repeated Measures ANOVA was performed. Data was presented in both tabular and figure forms.

Ethical Clearance

This study adhered to the Declaration of Helsinki and the Malaysian Good Clinical Practice Guidelines to ensure the safety of respondents during their research participation in this study. Ethical approvals were obtained from the Medical Research Ethics Committee (MREC) [UNIMAS/NC-21.02/03-02 Jld.3(85)] and the Ministry of Health (MOH), National Medical Research Register (NMRR) [NMRR ID-22-00010-DIT]. Approval to conduct this study in schools was obtained from the Ministry of Education KPM.600-3/2/3-eras(12839).

RESULTS

Socio-demography of participants

The average ages of the participants was 15.23 (1.25). The majority of student were at the age of 16 years old and the school located at Kuching. This study revealed that 8.6% of adolescents ever engaged in sexual activity as early as at 13 years old. Meanwhile 6.2% of them experienced oral sex and 1.9% experienced anal sex. (Table I)

Table I: Socio-demographic of participants

Characteristics	Intervention *n* (%), *n* = 130	Control *n* (%), *n* =127	Mean (SD) *N* = 257
Age:			15.23 (1.25)
13 years old	15 (11.5)	20 (15.7)	
14 years old	13 (10.0)	21(16.5)	
15 years old	39 (30.0)	26 (20.5)	
16 years old	38 (29.2)	44 (34.6)	
17 years old	25 (19.2)	16 (12.6)	
Race:			
Dayak	74 (56.9)	57 (44.9)	
Malay	51 (39.2)	54 (42.5)	
Chinese	2 (1.5)	11 (8.7)	
Indian		2 (1.6)	
Others	3 (2.3)	3 (2.4)	
School location:			
Lundu		34 (26.8)	
Bau		28 (22.0)	
Kuching	56 (43.1)	65 (51.2)	
Serian	56 (43.1)		
Sri Aman	18 (13.8)		
Secondary:			
1	15 (11.5)	20 (15.7)	
2	13 (10.0)	21(16.5)	
3	39 (30.0)	26 (20.5)	
4	38 (29.2)	44 (34.6)	
5	25 (19.2)	16 (12.6)	
Have you ever talked about SRH issues with your parents?			
Yes	22 (16.9)	31 (24.4)	
Never	108 (83.1)	96 (75.6)	
Have you ever talked about SRH issues with your siblings?			
Yes	21 (16.2)	29 (22.8)	
Never	109 (83.8)	98 (77.2)	
Have you ever talked about SRH issues with your friends?			
Yes	103 (79.2)	94 (74.0)	
Never	27 (20.8)	33 (26.0)	
Should information on SRH be made and available at school in the future?			
Yes	90 (69.2)	87 (68.5)	
No	40 (30.8)	40 (31.5)	

CONTINUE

Table I: Socio-demographic of participants. (CONT.)

Characteristics	Intervention *n* (%), *n* = 130	Control *n* (%), *n* =127	Mean (SD) *N* = 257
Smoking			
Yes	74 (56.9)	66 (52.0)	
No	56 (43.1)	61 (48.0)	
Drinking alcohol			
Yes	60 (46.2)	48 (37.8)	
No	70 (53.8)	79 (62.2)	
Seen porno videos			
Yes	127 (97.7)	119 (93.7)	
No	3 (2.3)	8 (6.3)	
Masturbate			
Yes	110 (84.6)	100 (78.7)	
No	20 (15.4)	27 (21.3)	
Ever had a romantic relationship			
Yes	87 (66.9)	77 (60.6)	
No	43 (33.1)	50 (39.4)	
Hold hands:			
Yes	78 (60.0)	68 (53.5)	
No	52 (40.0)	59 (46.5)	
Hug:			
Yes	39 (30.0)	38 (29.9)	
No	91 (70.0)	89 (70.1)	
Kiss:			
Yes	31 (23.8)	25 (19.7)	
No	99 (76.2)	102 (80.3)	
Touch:			
Yes	24 (18.5)	21 (16.5)	
No	106 (81.5)	106 (83.5)	
Having Sex:			
Yes	15 (11.5)	7 (5.5)	
No	115 (88.5)	120 (94.5)	
Oral sex:			
Yes	10 (7.7)	6 (4.7)	
No	120 (92.3)	121 (95.3)	
Anal sex:			
Yes	3 (2.3)	2 (1.6)	
No	127 (97.7)	125 (98.4)	
Sex debut:			
13 years old	1 (0.8)		
14 years old	5 (3.8)		
15 years old	4 (3.1)	1 (0.8)	
16 years old	3 (2.3)	6 (4.7)	
17 years old	2 (1.5)		
No experience	115 (88.5)	120 (94.5)	

Changes of sexual intention

Mauchly's test indicated that the assumption of sphericity had been met, X^2 (2) = 3.57, p-value 0.16. The effect of a gamified *ReReki* SRH education on sexual intention for pre-marital sex was significant at the <.05 level, F (2, 2) =4.35, p-value 0.013, partial η^2 = 0.037 (small effect). Post-hoc pairwise comparisons indicated that there was a significant increase in sexual intention score from baseline and immediately after intervention (p-value=0.01). There were no significant different score from immediately after intervention to 10 weeks post-intervention (p-value 1.00) and from baseline to 10 weeks post-intervention (p-value 0.06). These results suggest that *ReReki* SRH education increases the adolescent boy sexual intention towards pre-marital sex immediately after intervention and the reduction after 10 weeks post-intervention is minimal. (Fig. 2)

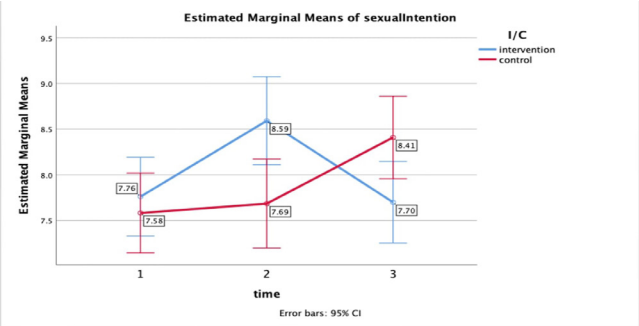

Fig. 2 : Changes of sexual intention over time between group

Changes of self-efficacy

Mauchly's test indicated that the assumption of sphericity had been met, X^2 (2) = 2.95, p-value 0.23. The effect of a gamified *ReReki* SRH education on self-efficacy on performing sexual activity was significant at the <.05 level, F (2, 2) =31.23, p-value 0.000, partial η^2 = 0.210 (large effect). Post-hoc pairwise comparisons indicated that there was no significant changes of self-efficacy from baseline to immediately after intervention (p-value 1.00). However, there was a significant decrement from immediately after intervention to 10 weeks post-intervention (p-value 0.00) and from baseline to 10 weeks post-intervention (p-value 0.00). These results suggest that *ReReki* SRH education had a large effect in reducing self-efficacy on performing sexual activity. (Fig. 3)

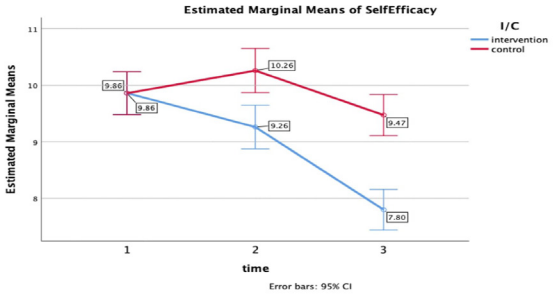

Fig. 2 : Changes of self-efficacy over time between group

Changes of social norms

Mauchly's test indicated that the assumption of sphericity had been violated, X^2 (2) = 11.46, p-value 0.003, and therefore degrees of freedom were corrected using Greenhouse-Geisser estimates of sphericity (ε=0.96). The effect of a gamified *ReReki* SRH education on social norms on pre-marital sex was significant at the <.05 level, F (1.92, 1.92) =33.95, p-value 0.000, partial η^2 = 0.104 (large effect). There were significant differences in score from baseline to immediately after intervention (p-value 0.00) and from immediately after intervention to 10 weeks post-intervention (p-value 0.00). In addition, the score from baseline to 10 weeks post-intervention were also significant (p-value 0.00). These results suggest that *ReReki* SRH education had a large effect on social norms on pre-marital-sex. (Fig. 4)

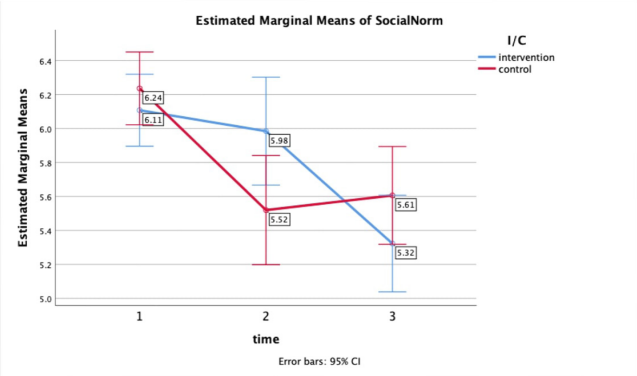

Fig. 4 : Changes of social norms over time between group

Changes of permissive attitudes

Mauchly's test indicated that the assumption of sphericity had been met, X^2 (2) = 0.50, p-value 0.78. The effect of a gamified *ReReki* SRH education on permissive attitude towards pre-marital sex was significant at the <.05 level, F (2,2) =6.45, p-value 0.002, partial η^2 = 0.048 (small effect). Post-hoc pairwise comparisons indicated that there was a significant increase in permissive attitudes score from baseline and immediately after intervention (p-value 0.011). There were also significant decrement in permissive attitude from immediately after intervention to 10 weeks post-intervention (p-value 0.004). However, there were no significant differences in score from baseline to 10 weeks post-intervention (p=1.00). These results suggest that *ReReki* SRH education increases the adolescent boy permissive attitude toward pre-marital sex with small effect on the permissive attitude toward pre-marital sex. (Fig. 5)

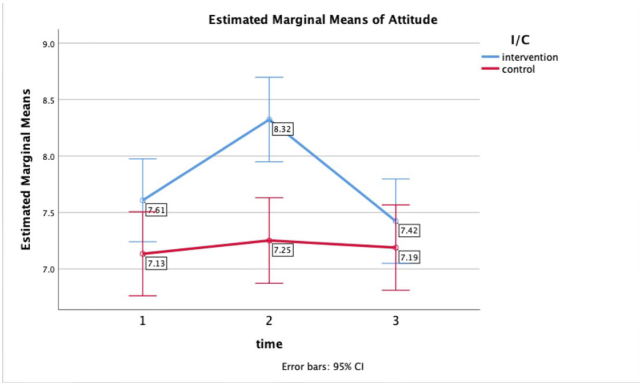

Fig. 5 : Changes of permissive attitude over time between group

Changes of knowledge

Mauchly's test indicated that the assumption of sphericity had been violated, X^2 (2) = 19.59, p-value 0.000, and therefore degrees of freedom were corrected using Greenhouse-Geisser estimates of sphericity (ε=0.93). The effect of a gamified *ReReki* SRH education on knowledge was not significant at the >.05 level, F (1.86, 1.86) =0.38, p-value 0.67, partial η^2 =0.003. These results suggest that *ReReki* SRH education had no significant effect on knowledge on sexual and reproductive health. (Fig. 6)

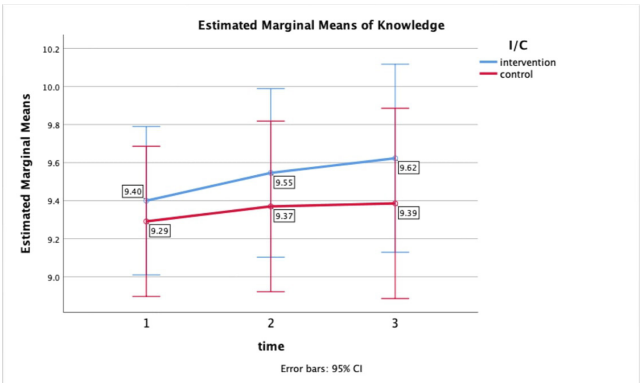

Fig. 6 : Changes of knowledge over time between group

DISCUSSION

Sexual activity

This study revealed that 8.6% of adolescents have engaged in sexual activity as early as 13 years old. Meanwhile, 6.2% of them experienced oral sex and 1.9% experienced anal sex. In Sarawak, Malaysia, pre-marital sex in particular is becoming more prevalent among adolescents(25). Their well-being is negatively

impacted throughout adolescence and possibly into adulthood(26). Pre-marital sex among Malaysian adolescents is becoming more prevalent, with rates ranging from 0.9 percent(27), 1.8 percent(28), 8.3 percent(29), 7.3 percent(30), and 9.5 percent(31). Although there has been some research on adolescent sexual behaviours in Peninsular Malaysia, there is not much evidence coming from Sarawak, despite the state having the highest rate of teenage pregnancies in Malaysia(32,33). Furthermore, adolescents in Sarawak, Malaysia begins their sexual debut at the age of 13 years(31). The consequences of early sexual debut and teenage pregnancies are on rise.

Effectiveness of *ReReki* intervention on sexual intention and permissive attitude

The *ReReki* intervention programme in this study increased the adolescent boy's sexual intention and permissive attitude towards pre-marital sex from baseline (Point 1) to immediately after intervention (Point 2), then decreases at 10 weeks post-intervention. This finding was similarly reported by a study conducted in Indonesia, where the sexual intention among adolescent were increased after the intervention(34). Potential reasons for the initial increase in sexual intention after the intervention could be related to adolescent boys' high level of curiosity and opportunity to have an open conversation about sexual with the researcher(35). Sexual health topics have long been taboo in Malaysian culture and are considered indecent topics among children and adolescents. Nevertheless, in this study, the *ReReki* intervention may have intensified their sexual interest. This finding is consistent with a study conducted by Shek (2013) in Hong Kong, which found that the intention to engage in sexual behaviour was a risk factor for engaging in sexual behaviour and possibility of engaging in sexual behaviour in the future(36). During adolescence, boys undergo significant physical and hormonal changes that can impact their sexual feelings and desires. Since physiological changes are unstoppable, sexual health education must begin during the onset of adolescence itself (9 to 13 years old). The effect of this study is the opposite of the hypothesized intervention outcomes. However, this study was significantly effective in reducing self-efficacy, social norm, and permissive attitude. These findings were most likely due to information delivered in this intervention which was presented in an interesting and engaging manner through games. This gamifies approach enabled the participants to refer to the information or play at any time they wanted. In the meantime, they are encouraged to learn the lessons from the games using the module, which is also provided as a reference and reminder. The relatively high positive social norm among the participants also contributed to these findings.

Effect of intervention on self-efficacy score

There was significant reduction in self-efficacy score after the intervention within the intervention group, as well as significant reduction in self-efficacy after the intervention between the intervention and control group. In term of effect size, the *ReReki* intervention programme showed a large effect size. The large effect of the intervention on self-efficacy likely resulted from the delivery of the gamified approach and module provided. These finding are consistent with the finding of other school-base intervention on gamification(37). Self-efficacy decreased only by applying the gamified approach. This is in line with research conducted by Nikita et al (2022) which explained that preventing pre-marital sex are more effective by innovative approach, such as the use of gamification. The obstacle to implementing this intervention was the limited designated time available to provide health education. In comparison with similar intervention studies, the digital game intervention did not significantly alter the participants' self-efficacy(35).

Effect of intervention on social norms score

In order to evaluate the social norms on pre-marital sex, there was a significant reduction in the subjective norms score after the intervention within the intervention group, as well as significant reduction in the social norms score between intervention and control group after the intervention. In terms of effect size, the *ReReki* intervention programme showed a large effect size on the subjective norms score. The large effect of the intervention on subjective norms scores probably resulted from the delivery of the gamified and module supplied throughout intervention period. The large impact on subjective norms can be attributed to the fact that participants fund the activities entertaining and were eager to play games that openly and directly discussed male reproduction and sexuality. Sexuality and reproduction are often viewed as serious topics that should be avoided, but when respondents are presented with information that is game-oriented, their perception shift to one of enjoyment. Ultimately, the *ReReki* module which is considered novel and addresses issues pertaining to adolescent boys' sexual and reproductive health was given to the respondents. Additionally, the information from *ReReki* intervention programme was able to change participants' perception of the benefits of sexual and reproductive health and their ability to control perceived pressure of social norms of discourage pre-marital sex among adolescents. Similarly, in the study conducted by Yakubu et al (2019) revealed social norms score for sexual abstinence practice based on TPB which significantly increased after the intervention compared to before intervention(38).

Effect of intervention on knowledge

In the present study, after introducing the *ReReki* intervention, there were no significant changes of knowledge on SRH for both intervention and control group. Although no significant different in knowledge on SRH were observed between the two sample groups, the results showed that the intervention group performed better in SRH knowledge than the control

group. As knowledge of SRH has become ubiquitous, perhaps using game-based approach can be improved in terms of module content. This is because the content of *ReReki* is so entertaining that it makes the adolescent boy forget the main objective of the learning(39). More exploration is therefore needed to determine topics, knowledge areas and issues in *ReReki* gamified SRH approach which might be appropriate and not failed to engaged participants. This observation corresponds to the finding of Zakaria et al (2020) conducted in Bangladesh which indicated that knowledge was not satisfactory on SRH among the participant(40). Similarly, Rahman et al (2011) exhibited a low level of SRH knowledge in adolescents(41). Another reason is that, knowledge is retained for a short time, where too much information presented at one makes it difficult to understand and digest. This finding agrees with an intervention study aimed at improving knowledge on SRH (HIV/STD/Pregnancy) namely You're your Game: Keep It Real (IYG), where the knowledge those received IYG intervention programmed after intervention was higher than the knowledge score within intervention group (p=0.00), and there were no significant difference of the knowledge score before or after intervention within the control group (p=0.09)(42).

ADDIE and TPB model

There were a number of interventions or modules for sexual and reproductive health that have been published but none of them used ADDIE model during its development(43). However, a few interventions or modules related to sexual and reproductive health that were developed did employ the ADDIE approach. For example, the sex education model with teaching materials using flip-builder application in SMA Nusa Bhakti Semarang, Indonesia was developed using the ADDIE model(43). TPB construct was used as the theoretical basis for the content in *ReReki* intervention programmed. In terms of the *ReReki* intervention programmed content, before the participants were taught on the proper SRH, basic information on sexuality, gender, sexual health, abstinence, positive identity development and law were provided to participants in a simple way through learning module. By doing this, the participants will be better understand permissive attitude towards premarital sex (perceived attitude), the perceived presence of social norms of what is being practiced and perceived by their peers (perceived social norm), self-efficacy of their ability to control sexual intention (perceived behavioural control) and their knowledge of sexual and reproductive health. In the final phase of the intervention programme, participants were divided into groups and exposed to six games created for game-based approach. A number of interventions for SRH also used TPB as the theoretical concept for intervention or module development(44).

Strength and limitation

This present study has several strengths. Firstly, the *ReReki* gamified SRH education materials were all validated and are evidence based because they are grounded in extensive literature research, including experts input and theoretical concepts. The *ReReki* gamified SRH education was based on TPB that promotes behavioural change. The *ReReki* intervention programme are exclusively employed in Malaysian secondary schools. Undoubtedly, educators in schools are highly educated and equipped to use *ReReki* game-based learning methods with adolescent boys. Since the interventions adhere entirely to the module, they have been deemed standard practice among Malaysian educators. This study shed light on the usefulness and efficiency of the *ReReki* material for adolescent boys. However, regarding the inclusion/exclusion criteria, one of the study's flaws is that the main reason for rejection is the inability to read and write. Without making any distinctions for individuals who lack reading and writing skills, SRH education is essential and necessary for everyone. In other words,, those who are illiterate are not allowed to participate in this intervention, and some studies have shown that they may be more vulnerable to risky sexual behaviour. To facilitate data management and prevent data loss (incomplete or unanswered), the researcher must meet the criteria.

CONCLUSION

Adolescent boys in this study performed sex at the age of 13 years old and experimenting the anal and oral sex. To mitigate risky sexual behaviour, *ReReki* intervention is partially successful in reducing adolescent boys self-efficacy and social norm towards pre-marital sex. However, this intervention increases sexual intention and permissive attitude towards pre-marital sex. Thus, the used of gamified *ReReki* SRH education should be considered cautiously. More studies are needed to prove the effectiveness of gamified SRH education approach.

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