



# The effectiveness of the REAL™, a school-based, virtual reality-integrated social emotional learning intervention to promote mental health for early Malaysian adolescents

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## ABSTRACT

**Background:** The REAL™ module was developed to impart social and emotional learning (SEL) skills to early Malaysian adolescents using virtual reality (VR) components at school within the local social and cultural dynamics. This study aimed to evaluate the effectiveness of the intervention in improving 1) emotional regulation (ER) skills and 2) depression and anxiety in adolescents attending lower secondary schools in Malaysia.

**Methods:** This randomized controlled trial study was conducted from February 2023 to November 2023. A total of 226 participants aged 13 and 14 years old from lower secondary school students were recruited from four secondary schools selected by multistage cluster sampling in Selangor, Malaysia. Data were collected across four-time points (T0: baseline, T1: immediate post-test, T2: three-month post-test, and T3: six-month post-test) via a locally translated and validated set of questionnaires, including The Difficulties in Emotion Regulation Scale (DERS) for the emotional regulation score, Beck Depression Inventory (BDI) for depression scores and Beck Anxiety Inventory for anxiety scores. A repeated-measures ANCOVA was performed to evaluate the effect of the intervention versus the control group on emotional regulation scores, depression scores, as well as anxiety scores.

**Results:** A significant main effect of the group intervention was observed for emotional regulation ( $F(1, 223) = 20.05, p < 0.001$ ), depression ( $F(1, 223) = 51.16, p < 0.001$ ), and anxiety ( $F(1, 223) = 32.75, p < 0.001$ ). The intervention group showed a sustained reduction for all domains compared to the control group, particularly at time T3. These findings reflect differences in outcomes between the intervention and control groups.

**Conclusion:** This study showed that the REAL™ intervention improved adolescents' emotional regulation skills and reduced their depression and anxiety scores. The program features a feasible school-based delivery using a socioculturally sensitive module integrated with VR components. This could facilitate adolescents' learning engagement and resonate with their sociocultural context, making the skills relatable and attainable.

## 1. Background

Early adolescence is a critical period marked by substantial biological, cognitive, and social transformations, particularly during the transition to middle school (Green et al., 2021). This phase introduces

challenges such as academic stress, peer pressure, and increased anxiety, contributing to nearly half of all mental health issues emerging by mid-adolescence (Jimenez et al., 2023). Vulnerable middle school students often experience both psychopathology and diminished well-being. Furthermore, this phase is pivotal for developing identity

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and life skills essential for adulthood (Ahmad et al., 2010).

In Asian societies, including Malaysia, cultural norms and familial dynamics deeply influence adolescents' emotional regulation. Collectivist values and diverse cultural influences shape how young individuals manage their emotions (Authors, 2023; Aziz et al., 2020; Rashid et al., 2021). For instance, emotional suppression is often encouraged to maintain social harmony (Authors, 2023). However, such norms can hinder self-expression and identity development, increasing Malaysian adolescents' vulnerability to mental health challenges (Siti et al., 2023).

The National Health and Morbidity Survey 2017 (NHMS, 2017), reported that 18.3 % of Malaysian adolescents aged 13 to 17 experienced depression, 39.7 % had anxiety, and 9.6 % showed signs of stress. Alarming, 10.0 % of respondents reported suicidal ideation, while 6.9 % had attempted suicide within the 12 months preceding the survey. By 2022, the National Health and Morbidity Survey revealed a rise in adolescent mental health issues, with 26.9 % now experiencing depression (NHMS, 2022). These statistics underscore the urgent need for targeted mental health interventions, mainly through SEL programs. (Colomeischi et al., 2022).

Addressing these emotional challenges through comprehensive SEL initiatives could significantly enhance adolescents' mental health and well-being. School-based SEL intervention provides an opportunity to equip adolescents with the emotional regulation skills to navigate life challenges. Integrating SEL into the school curriculum has shown numerous benefits, including improved academic engagement and achievement (Diekstra and Gravedstein, 2008).

Effective SEL frameworks like the RULER program focus on five core skills: recognizing, understanding, labelling, expressing, and regulating emotions (Brackett et al., 2019). Other school-based SEL programs emphasize self-awareness, self-management, social awareness, relationship skills, and responsible decision-making, offering avenues for positive development (Hoffmann et al., 2020). Despite the proven benefits, implementing SEL programs in Malaysia remains limited. Previous attempts often lacked cultural accuracy or relevance (Deli et al., 2021; Im et al., 2015; Yap et al., 2022).

Recognizing Malaysia's cultural and societal context is crucial when designing adolescent interventions (Naeem et al., 2019). Emphasized incorporating local values, religious beliefs, and societal norms into effective interventions. Most SEL frameworks originate in the West, necessitating adaptations to reflect Malaysia's unique socio-cultural dynamics. Qualitative findings highlight that SEL programs for Malaysian adolescents should incorporate core values like collectivism, respect for hierarchy, and emotional restraint (Authors, 2023; Muhamad et al., 2023). Further elaborated on the socio-cultural dimensions that shape Malaysian society, such as traditional values and taboos, which are crucial in shaping behaviour, emotional regulation, and social interactions.

Furthermore, engaging adolescents in abstract subjects like emotions presents unique challenges in the digital era. Integrating VR into SEL provides several advantages for Malaysian adolescents. Firstly, VR offers a private, controlled environment for practicing SEL skills, reducing the social pressure and embarrassment associated with group settings. This feature aligns with collectivist cultures like Malaysia, where avoiding public mistakes is highly valued. Secondly, VR's immersive nature creates a dynamic, realistic learning experience, leveraging adolescents' affinity for digital technology (Hamzah et al., 2023).

The REAL™ module was developed as a school-based SEL intervention that was culturally adapted and tailored for Malaysian lower secondary students. The module aligns with the Malaysian conceptual framework on mental health and psychosocial support for adolescents, which emphasizes empowering students to increase mental health literacy and social-emotional skills through school-based interventions (UNICEF, 2022). Integrating SEL strategies with VR technology provides an engaging, relevant, and practical framework for promoting emotional regulation and reducing mental health challenges.

The module's validation process involved a modified Delphi approach, engaging mental health professionals, educationists, and SEL experts (Baharuddin et al., 2025). Pilot testing at a secondary school demonstrated its feasibility as an extracurricular program. Subsequently, this study aimed to determine the effectiveness of the REAL™ in improving adolescents' mental health, with a primary focus on enhancing emotional regulation skills and secondary objectives of reducing depression and anxiety among adolescents attending lower secondary schools in Malaysia.

## 2. Method

### 2.1. Study design, setting, and population

This two-arm, randomized controlled trial (RCT) was conducted from February 2023 to November 2023 in four secondary schools in Selangor, Malaysia, involving lower secondary school students. Following CONSORT guidelines for transparent participant flow reporting, eight schools were initially selected and invited to participate. Of these, four schools agreed to take part in the study. Within these selected schools, eligible students were recruited and randomized into either the intervention group ( $n = 132$ ) or the control group ( $n = 132$ ). Attrition was monitored from baseline (T0) through follow-ups (T1–T3), resulting in a final sample of 126 students in the intervention group and 100 in the control group. The trial was completed as planned without early termination.

### 2.2. Selection criteria and sampling method

In Malaysia, secondary education is divided into lower secondary (ages 13–15) and upper secondary (ages 16–17). This study focused on lower secondary students, specifically Malaysian citizens aged 13 and 14 (Form 1 and Form 2) attending daily government schools. Early adolescence was chosen due to its critical transitional phase, where social-emotional learning can support students in navigating developmental challenges. Students from private, international, boarding, and religious-based schools were excluded.

A multi-stage cluster sampling method was used to select participants. In the first stage, four regions within Selangor were randomly selected from a list provided by the Selangor Department of Education (2025). Schools within these regions were then randomly chosen using a computer-based selection method, ensuring a minimum of 16 schools (four per district).

In the second stage, students at the selected schools were recruited through stratified random sampling to ensure equal representation, with 33 students selected from each school. School administrators provided a list of eligible students, and teachers, following randomization training, selected participants by drawing numbers corresponding to the list. This process was conducted separately for the intervention and control groups, with students assigned to different classes to prevent contamination and cross-group interaction.

This study employed a single-blind randomized controlled trial design in which participants were unaware of their group allocation. To minimize potential assessment bias, outcome evaluations were conducted separately, with facilitators assessing the intervention group and independent enumerators evaluating the control group, thereby ensuring assessor blinding.

### 2.3. Study procedure and data collection

Before contacting the schools, approval of the study and permission to conduct the study were obtained from the Ministry of Education (KPM), ensuring compliance with regulatory requirements and facilitating a collaborative engagement in the research process. Subsequently, the selected schools were emailed, and a brief overview of the study was provided, including its purpose, procedures, and the schools' role in the

research. The email also explained the time commitment, eligibility criteria, and benefits or risks involved. It included contact details so that they could reach out with any questions or for further clarification, ensuring they had the opportunity to fully understand their involvement before deciding. Initially, sixteen schools from four districts in Selangor were invited to participate in the study. Eight schools responded positively, while eight schools that failed to reply to the invitation email were excluded from participation without further follow-up. Finally, due to scheduling conflicts and challenges related to the hot weather during that period, only four schools were available within the study's timeline. The schools' official approval granted the final confirmation of their participation.

Subjects meeting the eligibility criteria were invited to participate, with informed parental consent obtained through school administrators (100 % return rate,  $n = 260$ ). Parents received an information letter in Malay and English outlining the study, objectives, and data collection. Inclusion criteria were Form 1 and 2 Malaysian students from daily government schools who provided assent and parental consent and could attend three consecutive intervention sessions. Exclusion criteria included students from boarding, religious, or private schools, as well as those with physical impairments, intellectual deficits, severe mental illness, or receiving professional psychological treatment. The REAL™ intervention was conducted outside the hours of running the standard school curriculum. Meanwhile, the control group was engaged in the study by completing questionnaires at the same timeline as the intervention group while continuing their lessons as usual, following the standard class curriculum.

This intervention was conducted in about 33 participants (equivalent to a classroom in Malaysian lower secondary schools). The group was divided into three equal-number groups for a smaller facilitator-student ratio. The intervention consisted of one chapter delivered (3 sessions) per week for 4 weeks. Each session in Chapters 1 to 3 lasted for 180 min, comprising 120 min allocated to virtual reality (VR) activities and 60 min for two additional activities (30 min each). In contrast, Chapter 4 had a total duration of 130 min, with 30 min dedicated to supplementary activities.

Data were collected across four time points (T0: baseline, T1: immediate post-test (after completion of The REAL™ intervention), T2: three-month post-test, and T3: six-month post-test). Validated instruments tailored for Malaysian adolescents were administered throughout the study, including the Difficulties in Emotion Regulation Scale (DERS) for emotional regulation, the Beck Depression Inventory (BDI) for depression severity, and the Beck Anxiety Inventory for anxiety levels.

#### 2.4. The REAL™ intervention

The REAL™ intervention was delivered through a module developed by the research team consisting of psychiatrists, child and adolescent psychiatrists, developmental psychologists, educationists, and SEL experts. The REAL™ intervention incorporated the local socio-cultural elements as it was tailored for Malaysian adolescents to facilitate effective learning of emotional and social skills. Subsequently, the module underwent validation using the modified Delphi approach (Baharuddin et al., 2025). The finalized and validated REAL™ module has four chapters consisting of 11 interactive socio-emotional learning sessions (incorporating structured games, scenarios, and role plays) plus one reflective session (12 sessions in total). One chapter has three sessions delivered sequentially to a group of students by a trained facilitator. Each chapter takes approximately 180 min and denotes a quarter of a full intervention carried out weekly. To enhance relatability, the module provided scenarios based on shared experiences of Malaysian adolescents and within their social dynamics in school and family settings. It also featured familiar local features like local animated flora and fauna for background and anime to capture the students' interest while maintaining cultural appropriateness. Besides teaching cognitive

appraisal as a practical emotional regulation skill, it also recognized emotional suppression as a commonly utilized self-regulation strategy aligned with being culturally respectful among Malaysian adolescents (Authors, 2023). A substantial intervention component utilized virtual reality (VR), known as MVR-REAL™, which comprises a session each in three out of four module chapters for the advantages described earlier. To reinforce socio-emotional learning (SEL) outcomes, the REAL™ module incorporates MVR-REAL™, a virtual reality component featuring three culturally contextualized scenarios. Participants engage as *Kati*, a 14-year-old student, navigating common emotional and interpersonal challenges. Scenario VR-1 addresses emotional recognition following reprimand from a teacher; users identify and label primary emotions with peer support. Scenario VR-2 promotes cognitive reappraisal in response to perceived social rejection, encouraging perspective-taking. Scenario VR-3 targets self-regulation skills, guiding users through diaphragmatic breathing and muscle relaxation in a sibling conflict context. These interactive, developmentally appropriate simulations offer a safe space for adolescents to practice SEL strategies aligned with the module's objectives. Furthermore, integrating VR in the SEL intervention added novelty to the learning process to increase student engagement (see Fig. 1) (see Fig. 2).

#### 2.5. Training of the facilitators

The intervention was guided by a trainer's manual with structured activities and resource materials. Six developmental psychologists were recruited as facilitators and received a honorarium for their participation. Training was conducted over 5 h by two researchers a developmental psychologist and a VR expert to equip facilitators with the necessary skills to deliver the module. Each participating school had approximately 33 students, divided into three subgroups, with two facilitators assigned per subgroup. Facilitators had no connection to or information about the control group to maintain blinding. Researchers were present to monitor, provide guidance, and address queries but did not directly deliver the intervention.

#### 2.6. The control group

The control group, assessed by independent enumerators separate from those handling the intervention group, continued with the standard school curriculum. Baseline data on socio-demographics, emotion regulation, depression, and anxiety were collected simultaneously with the intervention group. Outcome measures were assessed at baseline, immediately post-intervention, three months, and six months post-intervention. To maintain blinding, control group enumerators were unaware of the intervention group. After the study, control group participants were offered the REAL™ module program.

### 3. Measures

#### 3.1. Socio-demographic characteristics

The socio-demographic data gathered from the subjects comprised variables such as gender, race, age, educational background and household income.

#### 3.2. Difficulties in the Emotion Regulation Scale (Grazt and Roemer, 2004)

The Difficulties in Emotion Regulation Scale (DERS) is an 18-item self-report tool to measure emotional regulation problems. It evaluates how respondents relate to their emotions, focusing on the modulation of emotional stimuli, awareness, understanding, and acceptance of emotions, as well as the ability to act appropriately regardless of emotional state. The DERS has demonstrated high internal consistency, good test-retest reliability, and adequate construct and predictive validity. Recent

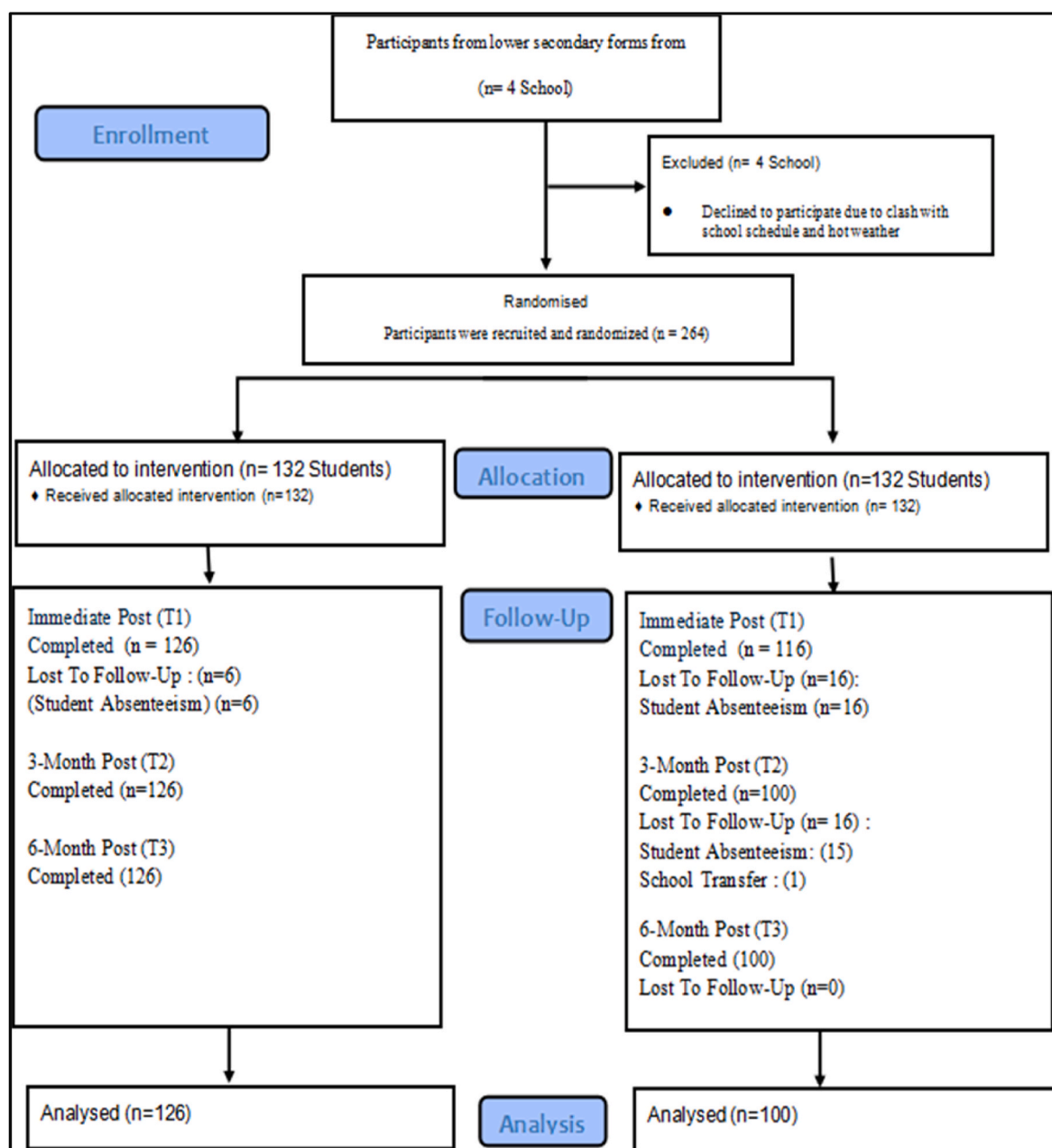


Fig. 1. CONSORT flowchart of participant recruitment and retention.

findings by Rosharudin et al. (2023) The Malay version of DERS-18 is a reliable and valid tool for assessing emotional regulation in Malaysian adolescents aged 13 to 14.

### 3.3. Beck Anxiety Inventory (Beck et al., 1988)

The Beck Anxiety Inventory (BAI) was translated into Malay, i.e., BAI-Malay, and validated by (Ismail et al., 2023). This 21-item scale assesses anxiety symptoms, with participants rating how much each symptom affected them over the past week on a scale from “not at all” (0) to “severe” (3). The BAI-Malay has been validated for use with adolescents in Malaysia aged 13 to 14, ensuring its relevance, reliability, and validity in this demographic.

### 3.4. Beck Depression Inventory (Beck et al., 1961)

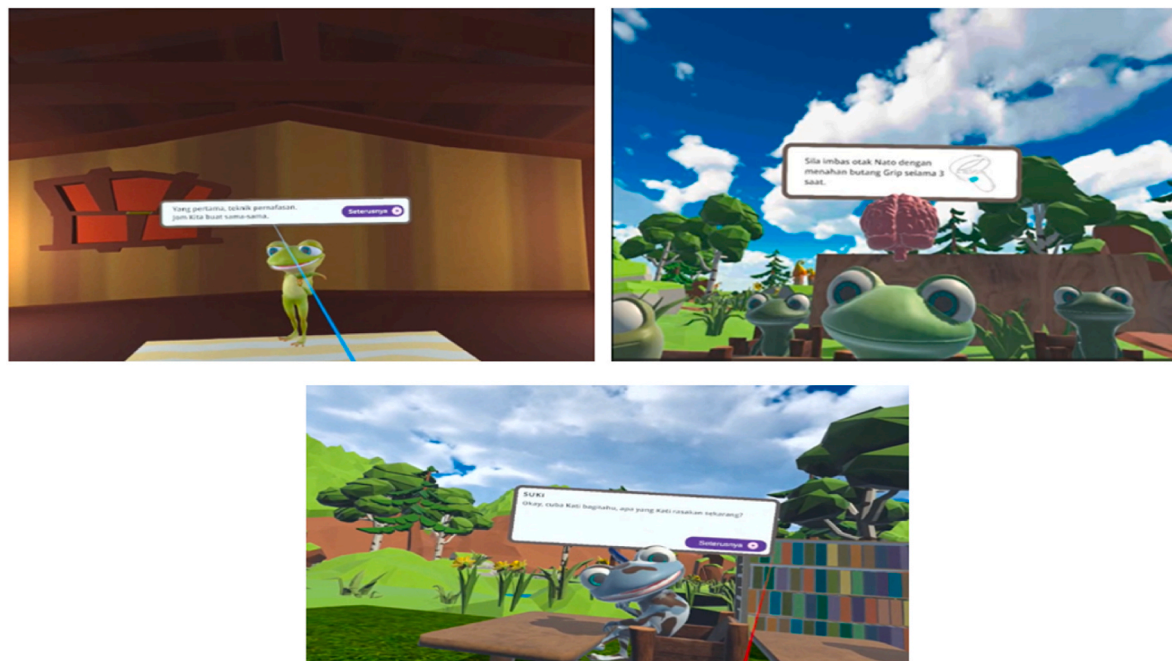
The Beck Depression Inventory (BDI), known as BDI-Bahasa Melayu

in its translated version, is a 21-item scale assessing depressed mood. Validated among Malaysian adolescents, it demonstrates strong psychometric properties, including a mean alpha coefficient >0.90 and test-retest reliability of 0.80. This study utilized the BDI-Bahasa Melayu to assess depression levels, ensuring cultural relevance and efficacy in identifying depression among adolescents (Mukhtar and Oei, 2008).

### 3.5. Data analysis

All the responses were entered into IBM-SPSS version 26, and the analysis was conducted using the same software. Statistical analysis employed repeated-measures Analysis of Covariance (ANCOVA) to assess the impact of the intervention compared to the control group on emotional regulation, depression, and anxiety scores across different time points. This methodology aimed to provide comprehensive insights into the effectiveness of the intervention in enhancing emotional regulation and improving symptoms of depression and anxiety among





**Fig. 2.** Screenshot of the MVR-REAL™ session interface used in the REAL™ intervention module. The session shown illustrates a culturally adapted scenario designed to help Malaysian adolescents practice emotional regulation in a familiar, immersive environment.

participants.

### 3.6. Sample size calculation

The sample size was calculated based on a study by Dowling et al. (2019), which found that the effect size post-SEL intervention based on stress scores was predicted to be 2.37, with an estimated total sample size of 200 respondents. After the intervention, an approximate 20–30 % attrition rate was anticipated. Hence, the study aimed to recruit 260 students, with 130 students in each study group's total sample size. This study's data was only used for those who completed all assessment periods in the intervention and control groups. No interim analyses or predefined stopping guidelines were planned for this trial. The study was designed to proceed until the planned sample size was reached and all follow-up assessments were completed.

$$N = 2 \times \left[ \frac{Z_{1-\frac{\alpha}{2}} + Z_{1-\beta}}{\delta} \right]^2 \times S^2$$

Substituting the values:

$$N = 2 \times \left[ \frac{1.96 + 0.845}{2.37} \right]^2 \times 72.252$$

With an additional 20–30 % for potential attrition.

$$N = 202 + 60 = 262 \text{ respondent}$$

### 3.7. Ethical approval and permission

This study received ethical approval from the National University of Malaysia Ethics Committee (UKM PPI/111/8/JEP-2021-2023), ensuring confidentiality and data retention throughout the study period. Written assent was obtained from all participants, with parental informed consent required for those under 18, recognizing their status as a vulnerable population. The trial protocol has been registered with [ClinicalTrials.gov](https://www.clinicaltrials.gov) under the registration number NCT06849154 and is accessible for public reference.

The REAL™ intervention was designed as a low-risk program

focused on social-emotional learning, with no anticipated physical or psychological adverse effects. To safeguard participant well-being, facilitators were trained to monitor emotional distress, and a referral system was established for students needing additional support. No adverse events were reported during the study.

## 4. Result

A total of 226 lower form secondary school students aged 13 and 14 were recruited from four high secondary schools selected through multistage cluster sampling in Selangor, Malaysia. Of these, 126 students were assigned to the intervention group, and 100 were assigned to the control group.

### 4.1. Socio-demographic

Overall, over half of the respondents were female (56.2 %,  $n = 127$ ), with a majority of Malay ethnicity (75.7 %,  $n = 171$ ), and about two-thirds comprised form two (aged 14-year-olds) (66.4 %,  $n = 150$ ). Table 1 shows the distribution of the sociodemographic variables between the intervention and control groups. There were no statistical differences between the two groups except for the age/form variable, whereby the control group had a significantly higher proportion of form two (14-year-olds) ( $p < 0.001$ ). This section presents the sociodemographic characteristics of the participants who completed the intervention. Of the 262 participants initially enrolled, 226 participants completed the intervention, with 100 in the control group and 126 in the intervention group. The attrition rate was 13.7 %, corresponding to approximately 36 participants who did not complete the study. Attrition was operationally defined as missing at least one session of the intervention. Based on attendance tracking records and follow-up with participants, dropout appeared to occur at random and was primarily attributed to external factors such as scheduling conflicts and general absenteeism. There was no consistent evidence suggesting that attrition was due to difficulties with emotional regulation or disengagement with the intervention content. Participants were randomly assigned to either the intervention or control group, with 126 and 100 students in each group. The control group had a higher proportion of higher-form

**Table 1**  
Summary of sessions and activities in the REAL™ school-based intervention.

| Chapter                            | Session Title                    | Duration | Time per Week     |
|------------------------------------|----------------------------------|----------|-------------------|
| Chapter 1 (Understanding Emotions) | Introduction to Emotions         | 30 min   | Week 1, Session 1 |
|                                    | Identify Own Emotions (VR)       | 120 min  | Week 1, Session 2 |
|                                    | Brain and Emotions               | 30 min   | Week 1, Session 3 |
| Chapter 2 (Managing Emotions)      | Managing Emotions Independently  | 30 min   | Week 2, Session 1 |
|                                    | Thoughts, Emotions, & My Actions | 30 min   | Week 2, Session 2 |
|                                    | Managing Emotions (VR)           | 120 min  | Week 2, Session 3 |
| Chapter 3 (Regulating Emotions)    | Practice Relaxation              | 20 min   | Week 3, Session 1 |
|                                    | Relaxation Practice (VR)         | 120 min  | Week 3, Session 2 |
|                                    | Emotional First-Aid              | 30 min   | Week 3, Session 3 |
| Chapter 4 (Emotion Awareness)      | Celebrating Emotions             | 30 min   | Week 4, Session 1 |
|                                    | The “Kan-Kan Challenge”          | 30 min   | Week 4, Session 2 |
|                                    | Sharing Session                  | 30 min   | Week 4, Session 3 |

participants (88.0 %, n = 88) and 14-year-olds (12.0 %, n = 12), which differed significantly from the intervention group. Specifically, 37.59 % of the intervention group participants were from higher forms, and the proportion of 14-year-olds was notably lower than the control group. Over half of the respondents were female (56.2 %, n = 127), with a majority of Malay ethnicity (75.7 %, n = 171), and about two-thirds in Form Two (aged 14-year-olds) (66.4 %, n = 150).

4.2. Baseline, second, and third scores for all measures

Table 2 presents the descriptive analysis of each domain measured 1) emotional regulation, 2) anxiety, and 3) depression across time points, which is T0; baseline, T1; immediate post-test, T2; 3-month post-intervention and T3; 6- 6-month post-intervention. The intervention group consistently demonstrated a marked and sustained reduction in mean scores over time across all domains. In contrast, the control group exhibited inconsistent changes, with anxiety and depression scores fluctuating or worsening at T3 (see Table 3) (see Table 4) (see Table 5).

4.3. ANCOVA analysis of emotion regulation, anxiety, and depression

The ANCOVA was conducted to compare three domains of emotional

**Table 2**  
Participant demographic characteristics: Descriptive statistics.

| No. | Variable                   | Total (N = 226) | Intervention Group (N = 126) | Control Group (N = 100) | $\chi^2$ | df | p-value |
|-----|----------------------------|-----------------|------------------------------|-------------------------|----------|----|---------|
| 1   | Gender                     |                 |                              |                         | 1.68     | 1  | 0.19    |
|     | Male                       | 99 (43.8 %)     | 60 (47.6 %)                  | 39 (39.0 %)             |          |    |         |
| 2   | Ethnicity                  |                 |                              |                         | 3.85*    | 3  | 0.28    |
|     | Female                     | 127 (56.2 %)    | 66 (52.4 %)                  | 61 (61.0 %)             |          |    |         |
|     | Malay                      | 171 (75.7 %)    | 101 (80.2 %)                 | 70 (70.0 %)             |          |    |         |
|     | Chinese                    | 38 (16.8 %)     | 16 (12.7 %)                  | 22 (22.0 %)             |          |    |         |
|     | Indian                     | 13 (5.8 %)      | 7 (5.6 %)                    | 6 (6.0 %)               |          |    |         |
| 3   | School Form (Age in Years) |                 |                              |                         | 37.59    | 1  | <0.001  |
|     | Others                     | 4 (1.8 %)       | 2 (1.6 %)                    | 2 (2.0 %)               |          |    |         |
|     | Form 1 (13)                | 76 (33.6 %)     | 64 (50.8 %)                  | 12 (12.0 %)             |          |    |         |
| 4   | Form 2 (14)                | 150 (66.4 %)    | 62 (49.2 %)                  | 88 (88.0 %)             | 4.04     | 4  | 0.40    |
|     | Household Incomes          |                 |                              |                         |          |    |         |
|     | < RM 2000.00               | 46 (20.2 %)     | 26 (20.6 %)                  | 20 (20.0 %)             |          |    |         |
|     | RM2001 - RM3000            | 58 (25.7 %)     | 32 (25.4 %)                  | 26 (26.0 %)             |          |    |         |
|     | RM3001 - RM4000            | 46 (20.4 %)     | 30 (23.8 %)                  | 16 (16.0 %)             |          |    |         |
|     | RM4001 - RM5000            | 37 (16.4 %)     | 16 (12.7 %)                  | 21 (21.0 %)             |          |    |         |

**Table 3**  
Descriptive statistics for emotional regulation, anxiety, and depression across time points.

| Domain               | Time Point | Overall M (SD) | Intervention M (SD) | Control M (SD) |
|----------------------|------------|----------------|---------------------|----------------|
| Emotional Regulation | T0         | 42.63 (13.55)  | 40.45 (12.01)       | 45.37 (14.88)  |
|                      | T1         | 41.92 (11.33)  | 40.42 (11.29)       | 43.82 (11.15)  |
|                      | T2         | 40.73 (11.85)  | 39.10 (11.07)       | 42.79 (12.51)  |
| Anxiety              | T3         | 39.45 (12.45)  | 36.60 (10.84)       | 43.04 (13.44)  |
|                      | T0         | 16.63 (11.54)  | 15.71 (10.69)       | 17.78 (12.48)  |
|                      | T1         | 17.02 (11.74)  | 15.14 (10.46)       | 19.38 (14.85)  |
| Depression           | T2         | 15.30 (11.67)  | 14.26 (11.04)       | 16.61 (12.34)  |
|                      | T3         | 14.01 (11.41)  | 10.21 (9.16)        | 18.79 (12.17)  |
|                      | T0         | 14.96 (10.52)  | 13.33 (9.98)        | 17.02 (10.87)  |
|                      | T1         | 15.09 (11.46)  | 12.52 (10.36)       | 18.33 (12.00)  |
|                      | T2         | 14.17 (10.58)  | 12.52 (10.51)       | 16.25 (10.34)  |
|                      | T3         | 14.11 (11.03)  | 10.56 (9.03)        | 18.58 (11.72)  |

Note: M = Mean, SD = Standard Deviation.

**Table 4**  
Descriptive statistics for emotional regulation, anxiety, and depression in participants.

| Domain               | Time | Intervention Group M (SD) | Control Group M (SD) |
|----------------------|------|---------------------------|----------------------|
| Emotional Regulation | T1   | 40.39 (1.01)              | 43.86 (1.14)         |
|                      | T2   | 39.12 (1.06)              | 42.76 (1.19)         |
|                      | T3   | 36.79 (1.08)              | 42.81 (1.21)         |
| Anxiety              | T1   | 15.10 (1.03)              | 19.44 (1.16)         |
|                      | T2   | 14.19 (1.04)              | 16.70 (1.17)         |
|                      | T3   | 10.31 (0.94)              | 18.68 (1.06)         |
| Depression           | T1   | 12.49 (1.02)              | 18.37 (1.12)         |
|                      | T2   | 12.46 (0.94)              | 16.33 (1.05)         |
|                      | T3   | 10.77 (0.92)              | 18.31 (1.03)         |

**Table 5**  
ANCOVA results for emotional regulation, anxiety, and depression: Effects of time and treatment.

| Domain               | Source                  | F     | p     | $\eta^2$ |
|----------------------|-------------------------|-------|-------|----------|
| Emotional Regulation | Between-Subjects        | 20.05 | <.001 | .08      |
|                      | Time                    | 1.778 | .17   | .008     |
|                      | Time $\times$ Treatment | 0.853 | .43   | .004     |
| Anxiety              | Between-Subjects        | 32.75 | <.001 | .13      |
|                      | Time                    | 4.509 | .01   | .02      |
|                      | Time $\times$ Treatment | 3.95  | .02   | .02      |
| Depression           | Between-Subjects        | 51.16 | <.001 | .19      |
|                      | Time                    | 1.65  | .19   | .01      |
|                      | Time $\times$ Treatment | 1.57  | .21   | .01      |

regulation (ER), anxiety, and depression between the intervention and control groups. The analysis revealed significant main effects of the intervention group on all three outcomes. For Emotion Regulation, the intervention had a significant impact ( $F(1, 223) = 20.05, p < 0.001$ , partial  $\eta^2 = 0.08$ ). However, there was no significant group-times interaction ( $F(2, 446) = 0.853, p = 0.43$ ) or time effect ( $F(2, 446) = 1.778, p = 0.17$ ), indicating no changes over time in the absence of the intervention. In contrast, for Anxiety, the main effect of the intervention was significant ( $F(1, 223) = 32.75, p < 0.001$ , partial  $\eta^2 = 0.13$ ), with a significant group-times interaction ( $F(2, 446) = 3.95, p = 0.02$ ) and a significant time effect ( $F(2, 446) = 4.51, p = 0.01$ ), suggesting both a change over time and variation in the intervention's effect across time points. For Depression, the intervention also had a significant main effect ( $F(1, 223) = 51.16, p < 0.001$ , partial  $\eta^2 = 0.19$ ). However, neither the group-times interaction ( $F(2, 446) = 1.65, p = 0.19$ ) nor the time effect ( $F(2, 446) = 1.57, p = 0.21$ ) was significant, indicating consistent effects of the intervention over time. No harms or unintended effects were reported in either the intervention or control group during the study period.

## 5. Discussion

This study evaluated the effectiveness of the REAL™ intervention, a social-emotional learning program integrating VR and socio-cultural elements to enhance emotion regulation (ER) skills among early Malaysian adolescents. Designed to strengthen emotional regulation and reduce anxiety and depression, the intervention aimed to improve mental health outcomes across all three time points for the intervention group. Findings demonstrated significant improvements in ER, anxiety, and depression scores, highlighting the intervention's effectiveness. Notably, no adverse effects or harms were reported, indicating that the REAL™ intervention is both beneficial and safe for participants.

However, the group-times interaction and time effect were insignificant for ER and depression outcomes. This means that within the REAL™ intervention group, the ER skills of the participants improved, and their level of depression and anxiety was reduced. Nevertheless, compared to the control group and across the time points, these changes were not significant for ER and depression. The lack of significance of group-time interactions for ER and depression scores implies that the intervention's effects remained constant throughout the trial without changing over time. The findings indicate that while the REAL™ intervention improved emotional regulation (ER) skills and reduced anxiety and depressive symptoms within the intervention group, there was a lack of significant group-time interactions. This could be attributed to the complexity of ER and depression, which often require sustained effort and a longer timeframe to show significant changes. Factors such as cognitive biases, rumination, and ingrained patterns of dysregulation may delay immediate progress. Extending the intervention duration or incorporating additional booster sessions may allow participants to internalize and sustain ER skills.

Although the intervention produced significant main effects for emotion regulation and depression, the absence of significant group  $\times$  time interactions may reflect the more entrenched and multifaceted nature of these constructs. Emotion regulation difficulties are often sustained by habitual suppression, cognitive distortions, and internalized scripts that require extended intervention to shift meaningfully (Aldao et al., 2016; Schäfer et al., 2017). Similarly, depressive symptoms typically respond more robustly to longer-term or reinforced approaches (Schleider and Weisz, 2017).

From a developmental standpoint, early adolescents are still acquiring metacognitive and emotional competencies, which may limit their ability to internalize new regulation strategies over a short period (Crone and Dahl, 2012). In addition, Malaysian adolescents are culturally socialised to value emotional restraint, with expressive suppression often regarded as normative or adaptive (Authors, 2023; Matsumoto et al., 2008), potentially contributing to underreporting of change in

self-report measures. By contrast, anxiety symptoms more reactive and physiologically prominent tend to respond more readily to brief interventions targeting arousal and cognitive threat appraisal (Silverman et al., 2008). Collectively, these factors may explain the observed pattern of main effects without corresponding interaction effects over time.

Interestingly, the anxiety level was significantly reduced across time points with a significant time effect and group-by-time interaction. Anxiety is the most common mental health issue among adolescents. This study's significant reduction in anxiety levels aligns with existing research, and this indicates that anxiety symptoms often respond more rapidly to interventions (De Silva et al., 2024; Haynos et al., 2015; Iqbal et al., 2024). The incorporation of CBT-based techniques in chapter two likely played a crucial role in achieving these outcomes by helping adolescents reframe anxious thoughts and manage emotional reactivity. More interestingly, the intervention also included VR practice that incorporated CBT features, further enhancing the engagement and effectiveness of the intervention in reducing anxiety symptoms.

The merit of a SEL also lies in understanding the targeted group's socio-cultural context. Universal SEL programs often reflect the values and norms of the dominant white, middle-class culture, which may not fully resonate with ethnically, racially, and socioeconomically diverse students (Camangian and Cariaga, 2021). In implementing SEL in Malaysia as a collectivist society, it must be acknowledged that values such as respectful communication with older people may inadvertently lead to emotional suppression, contrasting with the individualistic emphasis of many Western programs. Successful SEL programs in other countries, such as RULER in Singapore (Nathanson et al., 2016), Amal Alliance for Refugees (Yap et al., 2022) and PATHS in Australia and China (Eng et al., 2022) demonstrated that culturally adapted SEL frameworks can be effective worldwide when they respect local values while upholding core principles.

To maximize the benefits of SEL in culturally diverse settings, it is crucial to customize its delivery methods, language use, norms, and structures to align with the cultural norms of local communities, families, and specific racial or ethnic groups. Byrd (2016) shows that culturally responsive teaching practices foster greater school belonging, encourage exploration and commitment to ethnic and racial identities, and promote positive attitudes and comfort in interactions across different ethnic and racial backgrounds (Meland and Brion-Meisels, 2024). (Gutiérrez and Rogoff, 2003) highlight that students' developmental paths are related to their learning identities, significantly shaped by cultural factors. This underscores the critical importance of integrating cultural differences into designing and implementing SEL programs, particularly in fostering positive social interactions. Furthermore, Hecht and Shin (2015) demonstrated that diverse cultural perceptions of the self significantly influenced all five SEL competencies endorsed by CASEL (Collaborative for Academic and Learning, 2015). Mahfouz and Anthony-Stevens (2020) examined these competencies through a cultural equity lens, proposing strategies to leverage each competency to advance fairness and inclusivity in educational settings.

Furthermore, integrating VR in SEL intervention, first and foremost, added novelty to the learning process to increase the student's engagement. More importantly, VR provides a private and safe environment for adolescents to practice skills where real-life consequences are critical. Its immersive, interactive design creates a realistic, three-dimensional experience that enhances engagement and aids in understanding and retaining complex concepts (Rahman et al., 2023; Ridout et al., 2021). Integrating VR into social-emotional learning interventions offers significant potential, especially for addressing the emotional regulation needs of Malaysian adolescents, who often rely on emotional suppression due to cultural norms prioritizing emotional restraint and social harmony Siti et al., 2023.

VR provides a controlled environment for practicing emotional regulation, simulating real-life scenarios to help adolescents manage their emotions effectively (Björling et al., 2024; Hadley et al., 2019). Tan

et al. (2022) highlight that VR enhances empathy, perspective-taking, and decision-making more effectively than traditional methods. This approach aligns with Malaysian values of collectivism and respect, offering a culturally relevant, interactive platform for developing essential social-emotional skills. The inclusion of VR in the REAL™ program offers an innovative way to enhance SEL for Malaysian adolescents. VR allows students to practice ER and decision-making in realistic, simulated scenarios like peer conflicts or exam stress, providing a safe and immersive environment. This interactive approach helps adolescents better understand and manage emotions, aligning with Malaysian cultural values of emotional restraint and social harmony. However, challenges such as limited access to technology, especially in rural schools, and budget constraints could hinder widespread implementation. To address these barriers, schools can explore more affordable VR options, partnerships for funding and resources, or a blended approach that combines VR with traditional methods. By tackling these challenges, VR can be a valuable tool for improving adolescent mental health through culturally relevant SEL interventions.

The study highlights the significance of culturally tailored approaches in adolescent mental health by aligning interventions with culture. This alignment enhances effectiveness and respects local beliefs, underscoring the role of SEL in fostering positive skills and improving mental health. Its culturally sensitive interventions and thorough evaluation methods strengthen the research, enhancing its validity and relevance. However, future research may address potential challenges in implementing the module, such as school schedules, administrative policies, extreme heat, limited school access, and challenges in maintaining a balanced age distribution, especially for 13 to 14-year-olds, as highlighted in this study. Additionally, further studies may explore the long-term effects of the REAL™ intervention, focusing on how students can continue to apply SEL skills in daily routines and the sustained impact on their emotional well-being and mental health.

### 5.1. Limitation

REAL™ module is implemented only in one state of Malaysia, which offers essential insights into the effectiveness of REAL™ in that particular region. However, larger-scale research, including diverse middle school student demographics across multiple geographic regions, is needed to determine the program's effects and greater applicability. With a thorough grasp of the program's efficacy ensured by this methodical methodology, decisions about its implementation and potential modifications to better serve a broader range of student requirements may be made with knowledge.

### 5.2. Suggestion for future

This study elevates our understanding of the REAL™ module by providing preliminary evidence of its efficacy as a preventive intervention for early adolescents vulnerable to mental health problems. It is a first step in verifying its impact on student outcomes in learning environments. Future studies should focus on specific aspects of program execution, such as the training, frequency, and duration of intervention sessions, to examine these influences and what further enhances the effectiveness of SEL-based school interventions. The study findings support incorporating the REAL™ module into existing multi-tiered support systems to expand its reach and impact. Exploring the potential synergistic effects of such integration could maximize student benefits. Additionally, future research should investigate the long-term effects of the intervention and potential moderators, such as gender and socioeconomic status, to tailor interventions for diverse populations. In this context, diversity includes cultural, linguistic, and geographical differences and variations in students' backgrounds, such as urban versus rural settings, and the unique challenges faced by minority or indigenous groups. Expanding the research to consider these factors will ensure that the interventions are more inclusive and effective across

different population segments.

### CRedit authorship contribution statement

**Aimi Nur Athira Putri Baharuddin:** Writing – review & editing, Writing – original draft, Methodology, Formal analysis, Data curation, Conceptualization. **Nik Ruzyanei Nik Jaafar:** Writing – review & editing, Writing – original draft, Supervision, Project administration, Funding acquisition, Conceptualization. **Normala Ibrahim:** Writing – review & editing, Conceptualization. **Abdul Rahman Ahmad Badayai:** Conceptualization. **Hajar Mohd Salleh Sahimi:** Writing – review & editing, Conceptualization. **Nurul Ain Mohamad Kamal:** Writing – review & editing, Conceptualization. **Nur Husna Ismail:** Writing – review & editing, Writing – original draft, Data curation, Conceptualization. **Ely Salwana:** Writing – review & editing. **Mohd Pilus Abdullah:** Data curation, Conceptualization. **Mohd 'Ammar Ihsan Ahmad Zamzuri:** Writing – review & editing, Data curation, Conceptualization.

### Declaration of conflicting interests

The authors declare that the research was conducted without commercial or financial relationships that could create a conflict of interest.

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### Declaration of competing interest

None.

### Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ssmmh.2025.100494>.

### References

- Ahmad, N.S., Hashim, N.H., Aman, R.C., 2010. Adolescent emotional expression and regulation: a case study in Malaysia. *Int. J. Interdiscipl. Soc.Sci.* 5, 45–55.
- Aldao, A., Gee, D.G., De Los Reyes, A., Seager, I., 2016. Emotion regulation as a transdiagnostic factor in the development of internalizing and externalizing psychopathology: current and future directions. *Dev. Psychopathol.* 28 (4pt1), 927–946.
- Authors, 2023. Exploring Malaysian parents' and teachers' cultural conceptualization of adolescent social and emotional competencies: a qualitative formative study. *Front. Public Health* 11, 992863.
- Aziz, S., Nen, S., Mohd, S., Manap, J., 2020. TINGKAH LAKU DEVIAN DALAM KALANGAN REMAJA DI SEMENANJUNG MALAYSIA BERDASARKAN FAKTOR PEMANTAUAN IBU BAPA. *KOMUNIKASI IBU BAPA DAN RELIGIOSITI*.
- Baharuddin, A.N.A.P., Nik Jaafar, N.R., Ibrahim, N., Baharudin, A., Woon, L.S.-C., Sahimi, H.M.S., Badayai, A.R.A., Dahlan, R., Ismail, N.H., Abdullah, M.P., 2025. Content validation of the REAL™, a social-emotional learning module for Malaysian early adolescents using a modified Delphi approach. Department of Psychiatry, Faculty of Medicine, National University of Malaysia, Kuala Lumpur, Malaysia.
- Beck, A.T., Epstein, N., Brown, G., Steer, R.A., 1988. An inventory for measuring clinical anxiety: psychometric properties. *J. Consult. Clin. Psychol.* 56 (6), 893.
- Beck, A.T., Ward, C.H., Mendelson, M., Mock, J., Erbaugh, J., 1961. An inventory for measuring depression. *Arch. Gen. Psychiatry* 4, 561–571. <https://doi.org/10.1001/archpsyc.1961.01710120031004>.
- Björklund, E.A., Sonney, J., Zade, H., Rodriguez, S., Pullmann, M.D., Moon, S.H., 2024. Using virtual reality to reduce stress in adolescents: mixed methods usability study [original paper]. *JMIR XR Spatial Comput.* 1, e49171. <https://doi.org/10.2196/49171>.
- Brackett, M.A., Bailey, C.S., Hoffmann, J.D., Simmons, D.N., 2019. RULER: a theory-driven, systemic approach to social, emotional, and academic learning. *Educ. Psychol.* 54 (3), 144–161.
- Byrd, C.M., 2016. Does culturally relevant teaching work? An examination from student perspectives. *Sage Open* 6 (3), 2158244016660744.



- Camangian, P., Cariaga, S., 2021. Social and emotional learning is hegemonic miseducation: students deserve humanization instead. *Race Ethn. Educ.* 25, 1–21. <https://doi.org/10.1080/13613324.2020.1798374>.
- Collaborative for Academic, S., Learning, E., 2015. *Effective Social and Emotional Learning Programs*. Middle and high school edition, Chicago.
- Colomeischi, A.A., Duca, D.S., Bujor, L., Rusu, P.P., Grazzani, I., Cavioni, V., 2022. Impact of a school mental health program on children's and adolescents' socio-emotional skills and psychosocial difficulties. *Children* 9 (11). <https://doi.org/10.3390/children9111661>.
- Crone, E.A., Dahl, R.E., 2012. Understanding adolescence as a period of social-affective engagement and goal flexibility. *Nat. Rev. Neurosci.* 13 (9), 636–650.
- De Silva, S., Peris, R., Senaviratne, S., Samaranyake, D., 2024. Effectiveness of a cognitive behavioural therapy (CBT)-based intervention for reducing anxiety among adolescents in the Colombo District, Sri Lanka: cluster randomized controlled trial. *Child Adolesc. Psychiatr. Ment. Health* 18 (1), 108.
- Deli, W., Kaur, A., Awang Hashim, R., 2021. Who delivers it and how it is delivered: effects of social-emotional learning interventions on learning anxiety and dropout intention. *Malaysian J. Learn. Instruc. (MJLI)* 18 (1).
- Diekstra, R.F., Gravestijn, C., 2008. Effectiveness of school-based social and emotional education programmes worldwide. *Soc. Emotional Educ.: An Int. Anal.* 255–312.
- Dowling, K., Simpkin, A.J., Barry, M.M., 2019. A cluster randomized-controlled trial of the mindout social and emotional learning program for disadvantaged post-primary school students. *J. Youth Adolesc.* 48, 1245–1263.
- Education, S.D.o., 2025. Selangor Department of Education - Persekolahan.
- Eng, L.S., Kuan Khye Ling, S., Lim, C.K., 2022. Attitudes and cross-cultural differences of UCSI university undergraduates towards multicultural group work. *Int. J. InStruct.* 15 (1), 21–38.
- Gratz, K.L., Roemer, L., 2004. Difficulties in emotion regulation scale. *J. Clin. Psychol.*
- Green, A.L., Ferrante, S., Boaz, T.L., Kutash, K., Wheeldon-Reece, B., 2021. Social and emotional learning during early adolescence: effectiveness of a classroom-based SEL program for middle school students. *Psychol. Sch.* 58 (6), 1056–1069.
- Gutiérrez, K.D., Rogoff, B., 2003. Cultural ways of learning: individual traits or repertoires of practice. *Educ. Res.* 32 (5), 19–25.
- Hadley, W., Houck, C., Brown, L.K., Spitalnick, J.S., Ferrer, M., Barker, D., 2019. Moving beyond role-play: evaluating the use of virtual reality to teach emotion regulation for the prevention of adolescent risk behavior within a randomized pilot trial. *J. Pediatr. Psychol.* 44 (4), 425–435. <https://doi.org/10.1093/jpepsy/psy092>.
- Hamzah, I., Salwana, E., Billingham, M., Baghaei, N., Ahmad, M.N., Rosdi, F., Arsad, A., 2023. Virtual Reality for Social-Emotional Learning: A Review. *International Visual Informatics Conference*.
- Haynos, A.F., Roberto, C.A., Attia, E., 2015. Examining the associations between emotion regulation difficulties, anxiety, and eating disorder severity among inpatients with anorexia nervosa. *Compr. Psychiatry* 60, 93–98.
- Hecht, M.L., Shin, Y., 2015. Culture and Social and Emotional Competencies.
- Hoffmann, J.D., Brackett, M.A., Bailey, C.S., Willner, C.J., 2020. Teaching emotion regulation in schools: translating research into practice with the RULER approach to social and emotional learning. *Emotion* 20 (1), 105.
- Im, G.W., Jiar, Y.K., Talib, R.B., 2015. DEVELOPMENT OF MALAYSIAN SOCIAL-EMOTIONAL COMPETENCY INVENTORY (MySECI) FOR PRESCHOOLERS. *Proc. Int. Conf. Spec. Educ.*
- Iqbal, L., Akbar, S., Shehzadi, K., Singh, V., 2024. Examining the effectiveness of cognitive-behavioral approaches in reducing anxiety among adolescents and improving their mental health. *Rev. Appl. Manag. Soc. Sci.* 7 (4), 551–566.
- Ismail, N.H., Nik Jaafar, N.R., Woon, L.S., Mohd Ali, M., Dahlan, R., Baharuddin, A., 2023. Psychometric properties of the Malay-version beck anxiety inventory among adolescent students in Malaysia. *Front. Psychiatr.* 13, 989079. <https://doi.org/10.3389/fpsy.2022.989079>.
- Jimenez, A.L., Banaag Jr, C.G., Arcenas, A.M.A., Hugo, L.V., 2023. Adolescent development. In: *Tasman's Psychiatry*. Springer, pp. 1–43.
- Mahfouz, J., Anthony-Stevens, V., 2020. Why trouble SEL? The need for cultural relevance in SEL. *Occas. Pap.* 2020 (43), 6.
- Matsumoto, D., Yoo, S.H., Nakagawa, S., 2008. Culture, emotion regulation, and adjustment. *J. Pers. Soc. Psychol.* 94 (6), 925.
- Meland, E.A., Brion-Meisels, G., 2024. An integrative model for culturally sustaining SEL in the classroom. *Soc. Emotional Learn.: Res., Practice, and Pol.* 3, 100042. <https://doi.org/10.1016/j.sel.2024.100042>.
- Muhamad, N., Tahir, A., Ramli, I., S Abu Bakar, S.A., 2023. The development of the Malaysian cultural elements framework/Noor A'yunni Muhamad...[et al.]. *Ideal. J.* 8 (1), 176–202.
- Mukhtar, F., Oei, T.P., 2008. Exploratory and confirmatory factor validation and psychometric properties of the Beck Depression Inventory for Malays (BDI-Malay) in Malaysia. *Malaysian J. Psychiatr.* 17 (1), 58–72.
- Naem, F., Phiri, P., Rathod, S., Ayub, M., 2019. Cultural adaptation of cognitive-behavioural therapy. *BJPsych Adv.* 25 (6), 387–395. <https://doi.org/10.1192/bja.2019.15>.
- Nathanson, L., Rivers, S.E., Flynn, L.M., Brackett, M.A., 2016. Creating emotionally intelligent schools with RULER. *Emotion Rev.* 8 (4), 305–310.
- NHMS, 2017. Adolescent Health Survey 2017.
- NHMS, 2022. National Health and Morbidity Survey (NHMS) 2022: Adolescent Health Survey, Malaysia.
- Rahman, A.A., Murad, K., Adnan, W.H., 2023. Acceptance and use of virtual reality and its impact towards learning attitude among young adults in Shah Alam. Selangor, Malaysia.
- Rashid, M., Hashim, A., Nikmat, A.w., Mohamad, M., 2021. Religiosity, religious coping and psychological distress among Muslim university students in Malaysia. *Int. J. Eval. Res. Educ.* 10, 150. <https://doi.org/10.11591/ijere.v10i1.20870>.
- Ridout, B., Kelson, J., Campbell, A., Steinbeck, K., 2021. Effectiveness of virtual reality interventions for adolescent patients in hospital settings: systematic review. *J. Med. Internet Res.* 23 (6), e24967. <https://doi.org/10.2196/24967>.
- Rosharudin, N.A., Hoesni, S.M., Muhammad, N.A., Ali, M.M., 2023. The effects of parental care and autonomy on adolescents' emotion dysregulation in Peninsular Malaysia. *e-BANGI* 20 (3), 218–233.
- Schäfer, J.Ö., Naumann, E., Holmes, E.A., Tuschen-Caffier, B., Samson, A.C., 2017. Emotion regulation strategies in depressive and anxiety symptoms in youth: a meta-analytic review. *J. Youth Adolesc.* 46 (2), 261–276.
- Schleider, J.L., Weisz, J.R., 2017. Little treatments, promising effects? Meta-analysis of single-session interventions for youth psychiatric problems. *J. Am. Acad. Child Adolesc. Psychiatr.* 56 (2), 107–115.
- Silverman, W.K., Pina, A.A., Viswesvaran, C., 2008. Evidence-based psychosocial treatments for phobic and anxiety disorders in children and adolescents. *J. Clin. Child Adolesc. Psychol.* 37 (1), 105–130.
- Siti, Raba'ah Hamzah, Syuhada, S.N., Mohamed, N., Osman, S., Yahya, S., 2023. Youth and mental health problems in Malaysia. *Int. J. Acad. Res. Bus. Soc. Sci.* 13 (5).
- Tan, M.C.C., Chye, S.Y.L., Teng, K.S.M., 2022. "In the shoes of another": immersive technology for social and emotional learning. *Educ. Inf. Technol.* 27 (6), 8165–8188. <https://doi.org/10.1007/s10639-022-10938-4>.
- UNICEF East Asia & Pacific Regional Office, 2022. Strengthening mental health and psychosocial support systems and services for children and adolescents in East Asia and Pacific region.
- Yap, K.H., Koh, A., Kumar, A., Lahpai, M., Cheng, K.H., Ravindaran, T., Vasu, P., Verghis, S., 2022. Protocol for a feasibility evaluation of a Social and Emotional Learning (SEL) programme to improve resilience and academic achievement in refugee children from a community learning centre in Malaysia: PARSEL (Participatory Action Research on SEL). *PLoS One* 17 (8), e0273239.