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Cultural Competence in Delivering Multicultural Health Promotion Programs

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ABSTRACT

Objective: To explore the role of psychosocial resilience, digital literacy, education, and community engagement in influencing the adherence to health behaviour by adolescents.
Methods: Cross-sectional study with validated questionnaires and multivariate logistic regression for the analysis of the adolescents' answers.
Results: Level of education, digital literacy, participation in the program and community engagement were significantly predictive of adherence to health behaviour. Higher resilience together with usage of digital tools and participation in community programs increased adherence. The PD model provided a good interpretation and fit. Interaction effects revealed that external supports amplified the relationship between internal resiliency and maintained behaviour.
Novelty: Unlike previous research, the current study establishes internal assets and external resources operating together in a single predictive model with a multiplicative effect that has rarely been estimated in adolescence health promotion research. We have found that previous research has largely focused on resilience and external factors separately, which has produced certain limitations in understanding the health behaviour related to the combined effect on one.
Implications for Research: Findings offer promise for creating multi-level interventions aimed at increasing adolescent adherence to health behaviour. It may provide the structure for digitally-based, educational or community interventions utilising resilience and environmental based supports. Further research must identify mechanisms of causation and test interventions in a range of populations to ensure generalization to various settings worldwide.

1. Introduction

The worldwide prevalence of Type 1 Diabetes (T1D) in adolescence has been rising and this has a great impact on disease management (Bell & Lain, 2025; Gong et al., 2025; Rahmati et al., 2022; Vanderniet et al., 2022). Adolescents with T1D frequently struggle with compliance with complex self-care regimens that are required insulin injections, blood glucose testing, diet (Andersen et al., 2024; Harazneh et al., 2024; Montali et al., 2022; Schilling et al., 2006). These difficulties are also exacerbated by the psychosocial and developmental features of adolescence resulting in less than ideal glycemic control and higher risk of complications (Bombaci et al., 2025; Costa et al., 2024; Rodríguez-Muñoz et al., 2024). Resilience is increasingly recognized as an essential cornerstone in coping with these difficulties, and studies have shown that adolescents who reported higher levels of resilience are better at coping with the demands of T1D treatment (Survonen et al., 2024; Wu et al., 2023) .

Although resilience is acknowledged as an important construct, insufficient attention exists in the literature on the specific protective factors that underlie resilience in adolescents with T1D (Barnard-Kelly et al., 2025; Shattnawi & Mahassneh, 2025). Additionally, the literature suggested several factors including peer help, family engagement and emotional regulation that might affect resilience (Lu et al., 2024; Pinheiro et al., 2024). Nevertheless, inconsistent

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results between studies have been evidenced, some finding a significant association and others reporting no effect (Weinberg Sibony et al., 2024). This inconsistency highlights the importance of further exploring the complexity of resilience and its relationship to T1D self-care (Yi-Frazier et al., 2024).

The conceptual basis for this study is provided by resilience theory and the ecological model. Resilience theory states that human beings have the ability to respond positively to adversity by activating protective elements. The ecological model, however, focuses on the interaction between an individual's personal and environmental characteristics (de Klerk et al., 2025; Luo et al., 2024; Nam et al., 2024). These constructs in combination offer a broad perspective on traits of resilience among adolescents with T1D (Carrigan et al., 2025; Huang et al., 2025). This composite approach provides a comprehensive perspective on how genetic and extra-genetic provocations may interact to affect disease control resolution (Luo et al., 2024).

The importance of this research is underscored by the current void in the literature. Despite the exploration of a range of resilience correlates in adolescents with T1D, past research has generally examined these factors as independent and in isolation from one another effects (Ades et al., 2025; Morales et al., 2024; Taşdelen Baş et al., 2025). For example, whereas some research has focused on peers' supportive nature contributing to resilience (and has reported positive relationships), others have looked at the role of emotional regulation and have reported a mixture of effects. Further, much of the research has been limited by small sample sizes and cross-sectional designs, potentially precluding causal inferences (Survonen et al., 2024). In addition, there are few researches that combine the internal as well as the external factors in one framework. This absence of identification represents one reason why little is known about what specific protective factors promote resilience in this population (Fonseca et al., 2024; Wu et al., 2024). Closing these gaps is important for tailoring effective interventions to promote adolescents with T1D to manage their disease.

The present study sought to identify and explore both internal and external protective factors relevant to resilience of adolescents with T1D. Leveraging a mixed-methods design, this study aims to elucidate the interplay of these factors on outcomes of disease management. These results are intended to generate a foundation for comprehensive prevention efforts that integrate both individual and environmental levels in order to maximize support for adolescents with T1D. These findings have implications beyond T1D and inform the broader areas of chronic disease self-management and adolescent health.

2. Method and materials

2.1 Study design

To this end, this study adopted a cross-sectional, observational design to analyze the determinants of health behaviour in adolescents and its internal and external factors. Conceptually, this research is based on Resilience Theory (Masten, 2018) and the ecological systems model Bronfenbrenner (2000), as models illustrating individual and environmental determinants of health outcomes. Plain Text Data was gathered in a systematic way to cover personal (e.g., self-efficacy, planning skills) and contextual (e.g., family support, community involvement) factors. This strategy enables an assessment of the associations between the independent variables and the outcome measures after adjusting for potential confounders, and provides a complete picture of protective factors involved in the promotion of adolescent health.

2.2 Sample and setting observation

The adolescents were recruited by purposely selecting each participant aged from 12 to 17 who met the criteria for inclusion, such as attending secondary education and regular participation in health activities in the community. Informed consent was obtained from participants and ethical clearance was received from the appropriate institutional review board. Data collection occurred in school and community locations to examine contextual factors associated

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with the behaviour. The demographic and clinical information (age, sex and other) related to the participants is presented in Table 1.

2.3 Research instrument and measurement

The survey instrument was constructed using a structured questionnaire including adapted scales from previous studies and scales developed by the researcher. Predictors were: Digital Literacy, Health Apps Users, Community Participation, School and Health variables and Health Behaviour Change. An additional factor novelty Mental Health Integration was extracted to measure comprehensive wellbeing results. Attitude and behaviour measures used Likert type scales (1–5) and digital engagement and program participation were quantified as frequency counts.

2.4 Data analysis

Statistical analysis was performed with SPSS version 28. All variables were summarized using descriptive statistics (mean and standard deviation; frequency and percentage). objective To use meta-analysis to examine the effectiveness of health behaviour interventions and to investigate the characteristics, including effectiveness, of the interventions and study populations. The fit of the model was estimated by -2 Log Likelihood, Cox & Snell R^2 and Nagelkerke R^2. Hosmer-Lemeshow tests assessed goodness-of-fit. Furthermore, multicollinearity among the predictors was examined by VIF, with VIF > 5 as indicative of a problem. Statistical significance was considered at $p < 0.05$. The data were further presented using tabulation and graphical presentations to ensure that patterns and association were well set out for sound and strong interpretation of association between the independent and the dependent variables.

3. Results

3.1 Descriptive characteristics of participants

The sample of the study was adolescent of different age, education and gender which represent heterogeneous base line for comparing results. Moderate to high ability with digital applications was reported among participants (3.28-4.73), implying an existing understanding of digital solutions used to promote health behaviour adherence. Levels of community engagement ranged from 3.15 to 5 with particular degrees of social participation, and interacting with support. Frequency of program involvement varied from 2.08 to 4.17 sessions per week, indicating variable exposure to formalised interventions. Health behaviour scores were relatively high in this group of teens (3.81-4.53) which reflects good adherence behaviour. In general, descriptive data suggest multiple educational and psychosocial profiles in the cohort, ranging from moderate to high levels of digital engagement and high participation in community and program activities, which may serve as a strong foundation for further examination of the factors that influence engagement in health behaviour.

3.2 Correlation of digital engagement and health behaviour

Correlation analysis indicated significant associations between adolescents' digital engagement and lifestyle behaviour and health behaviour outcomes. Weekly exercise was also positively associated with dietary adherence, sleep quality, and average daily step counts, which means that active adolescents adopt health routines with better regularity. In contrast, higher sedentary hours per day were inversely related with indexes of dietary adherence, sleep quality, and physical activity, which could lead to harmful effects in global health behaviour. Sleep quantity and sleep quality were positively correlated with the average daily step count, indicating combined sleep and physical activity benefits for adherence to health behaviours. Collectively, these results suggest that combining digital engagement tactics to enhance physical activity and monitor sedentary behaviour may amplify healthy behaviours among adolescents. The findings emphasize the necessity for promoting multiple interrelated lifestyle modifications in health promotion programs among adolescents.

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3.3 Logistic regression model Fit

Descriptive statistics for psychosocial measures show that participants demonstrated moderate levels of perceived stress and high levels of resilience, social support, self-efficacy, life satisfaction, and emotional wellbeing. Resilience scores ranged from 3.88 to 4.45, denoting a robust ability to bounce back from challenges while social support ranged from 3.88 to 4.50, indicating vigorous social connections. Self-efficacy and emotional Composite Scores remained high throughout, reflecting confidence in one's abilities and positive emotions. Together, these items provide key predictors of adherence to health behaviours. The score variable distributed in a manner which confirms the use of logistic regression analysis in terms of an acceptable range of variability and predictive capacity. By including these psychosocial factors, the model is able to provide a reasonable assessment of the probability of adherence to optimal health behaviour among adolescents and stronger resilience and support were associated with greater adherence. This initial data substantiates the quality of the dataset and the reliability of subsequent inferential analyses.

3.4 Regression coefficients of predictors

Summary descriptive analysis summary for health knowledge assessment Summary descriptive analysis of health knowledge assessment showed study subjects had very good level of understanding across nutrition, physical activity and chronic diseases awareness domains. Total health knowledge scores ranged between 23.18 and 25.45, thus overall awareness of health topics was high. Nutrition knowledge and physical activity knowledge were positively associated with participation and number of sources, indicating that knowledgeable adolescents may be more likely to engage in structured health activities. The awareness of chronic disease was also found to have a positive relationship with resilience and self-efficacy, indicating the importance of psychosocial aspects in health literacy. The great variability in source diversity (3.2–4.0) point to differing access and use of health communication. The results supporting health knowledge to significantly predict adherence to health behaviours verify that the inclusion of health knowledge in the regression model is appropriate and it is an influential predictor of adherence to health behaviours, which implies the robustness of the logistic regression analysis used to predict health outcomes among adolescents.

3.5 Predictive accuracy of the model

The logistic regression model has good ability to make predictions about all health behaviour outcomes on the part of adolescents. Age also had a strong positive effect ($B = 0.215$, $p < 0.001$, $Exp(B) = 1.24$), reflecting that older individuals were more likely to adopt healthy practices. There was also a borderline effect of gender ($B = -0.312$, $p = 0.091$, $Exp(B) = 0.73$) suggesting *R*time differential influences on gender. Level of education was a strong predictor of health behaviour ($B = 0.145$, $p = 0.012$, $Exp(B) = 1.16$), indicating the role of the knowledge in the support of adherence. Digital literacy ($B = 0.387$, $p < 0.001$, $Exp(B) = 1.47$), community engagement ($B = 0.298$, $p = 0.001$, $Exp(B) = 1.35$), and frequency of program participation ($B = 0.225$, $p = 0.002$, $Exp(B) = 1.25$) significantly increased the probability of engaging in positive health behaviours. In general, the model correctly predicts some determinant of health behaviour underlying the significance of education, digital and social within the adolescent health promotion area.

3.6 Subgroup analysis age and education

The sub-group analyses of heath behaviour, the effects of investigated age and professional education in Sequence I and Model I revealed good model fit and significant predictive validity. Summary of the logistic regression model The summary of the logistic regression model presented in Table 4 shows a -2 Log Likelihood of 27.485, Cox & Snell $R^2 = 0.572$ and Nagelkerke = 0.801, which implies that between 57–80% of the variation in health behaviour is accounted for by the age and educational variables. The calibration of the model was excellent, as the Hosmer-Lemeshow test was not significant (Chi-Square: 6.112, df: 8, $p = 0.632$), indicating no significant difference between observed and predicted rates. High classification accuracy also bolster the predictive performance of the model demonstrating strong sensitivity and specificity for differentiating participants into those with different health studies. These findings

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emphasize the importance of the demographic factors of age and education to the level of adolescent health engagement as well as the appropriateness of including these as factors in targeted health promotion efforts.

Examination of digital interaction and participation in health programs has shown a positive association with general health behaviour. Higher scores in digital literacy were correlated with greater program engagement across all participants (Table 3–4) and higher mean weekly exercise, dietary adherence, and step counts. The logistic regression results (in Table 7) further prove influencers in the regression model are also related to digital literacy ($B = 0.387$, $p < 0.001$, $Exp(B) = 1.47$) and program participation frequency ($B = 0.225$, $p = 0.002$, $Exp(B) = 1.25$) as predictors of healthier lifestyle. These results indicate that utilizing technology and delivering organized program components can be effective for improving health status among adolescents. Additionally, the participants with higher community engagement score were associated with a higher adherence to health recommendations ($B = 0.298$, $p = 0.001$, $Exp(B) = 1.35$), indicating the cooperative role of social and digital engagement in health-promoting actions.

In summary, the combined findings reveal a complex interplay between age, years of education, digital literacy, community participation and program involvement on health behaviour among adolescents. Subgroup analysis show that older adolescents and those with higher educational level have better adherence to healthy behaviour (Table 8–10). Psychosocial factors (resilience, social support, and self-efficacy) also augment positive results (Table 5). Health knowledge scores (see Table 6) show strong relations with life style patterns and thus support the predictive validity of the knowledge-based intervention. Taken together, the results support a model of integration in that demographic, cognitive, social, programme correlates come together to shape young people health behaviours. The present analysis supports the regression models presented and highlights the essential value of a multidimensional approach to influencing sustainable health among adolescents.

3.7 Interaction effects between variables

The correlation matrix Table 11. reveals strong (= = +) interrelationships among demographic, psychosocial, and behavioural factors with some moderating effects that are operative in the link between these variables and health-related outcomes. Age and education level show a strong positive correlation ($r = 0.742$, $p < 0.01$), and this implies that older adolescents have higher educational levels, and it has strong positive significance to digital literacy ($r = 0.658$, $p < 0.01$). Digital literacy also significantly associated with community engagement ($r = 0.621$, $p < 0.01$) and program participation ($r = 0.573$, $p < 0.01$), reflecting the combined effect of cognitive and social aspects in health-promotion activities in the community. Health behaviour scores are positively associated with age ($r = 0.525$, $p < 0.01$), education ($r = 0.588$, $p < 0.01$) and digital literacy ($r = 0.634$, $p < 0.01$), indicating that adolescents with greater knowledge and engagement also had better outcome in multiple health care domains. Psychosocial resilience is more strongly correlated with health behaviour ($r = 0.745$, $p < 0.01$) than with health knowledge ($r = 0.712$, $p < 0.01$), which means that those who are more resilient will probably follow positive health behaviour if they have a basic understanding of health. Together, these results suggest complex interactions between demographic, cognitive, social, and psychosocial influences, and point to the importance of combined prevention and intervention efforts across these levels in order to optimize youth health.

3.8 Summary of protective factors

The regression of protective factors and their interaction effects on health behaviors outcomes are shown in Table 12. Resilience is the strongest single predictor ($\beta = 0.512$, $p < 0.001$), which means that adolescents with a higher resilience score are much more likely to participate in healthy behaviors. Digital literacy ($\beta = 0.426$, $p < 0.001$) and community engagement ($\beta = 0.398$, $p < 0.001$) also presented strong direct effects, reinforcing the relevance of cognitive abilities and social insertion in the adoption of healthier habits. Participation in the program has a positive influence ($\beta = 0.328$, $p = 0.001$), highlighting the importance of structured health programs. Interactions terms highlight synergistic effects with resilience such as co-occurring with digital literacy ($\beta = 0.158$, $p = 0.013$), community

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engagement (β = 0.142, p = 0.024), and program participation (β = 0.128, p = 0.039) on improving health behavior outcomes. These results imply that the protective resources do not act separately but the interaction between them magnifies the effects on the health behavior of adolescents. Our findings highlight the complexity of promoting health, when personal resilience, digital skills, social participation, and program participation all contribute to positive behaviors. This broad perspective is supported empirically and the paper discusses consequences for integrated notions of intervention that focus on protective factors to enhance adolescent well-being.

4. Discussion

4.1 Predictors of adherence to health behaviour

Logistic regression and correlation analyses revealed that age, years of education and digital literacy, community mobilization and programme participation significantly predicted health behaviour adherence. These results are consistent with recent evidence supporting the influence of higher education, and digital literacy on the capacity to adopt precautionary and curing measures (Li et al., 2023; Sharma & Gupta, 2022; Kim et al., 2021; Osei et al., 2020). More specifically, participants with higher digital literacy scores exhibited better adherence, thereby fulfilling the notion that digital health instrumentation facilitates self-care through real-time monitoring, feedback, and engagement (Wang et al., 2022; Smith & Brown, 2021). Social networks were also found to be a strong predictor, in line with previous research suggesting that one's social environment promotes behaviour change and behavioural maintenance across health promotion behaviours (Nguyen et al., 2021; Lee et al., 2022; Patel et al., 2020).

4.2 Interactions between Resilience and Behaviour

Interaction analysis showed that the impact of psychosocial resilience on health behaviour was significantly moderated by digital literacy, program participation, and community engagement. The positive spared relationship suggests that these external resources augment the function of resilience in terms of the social-ecological model of health behaviour, in particular, which emphasizes processes of the relations between the individual and the environment (Bronfenbrenner, 2020; Kumar et al., 2021). Recent evidence is consistent with the idea that structured program participation and peer support may facilitate the transformation of resilience into positive health behaviours (Rodriguez et al., 2022; Chen et al., 2021). Especially, those with high resilience and high engagement either in digital platforms or community programs showed the strongest adherence to health behaviours, meaning the compensation effects of individual and environmental protective factors.

4.3 Implications for Psychological and Educational Programmes

The research shows the importance of psychosocial resilience in health. Youth with higher resilience scores also reported better adherence, and this study replicates the results of Garcia et al. (2022), Huang et al. (2021), and Li et al. (2023). Thus, interventions should target resilience and environmental support such as technology empowered education, community-based activities, and health participatory programs. Further, curricula in schools can infuse modules on building resilience into students, increasing self-efficacy and problem-solving skills, as per a recent reference focusing on interventions in schools as successful models for promoting health among adolescents (Sharma & Gupta, 2022; Kim et al., 2021).

4.4 Novelty and research gaps

This study fills several voids in the literature. First, unlike previous studies that only considered either psychosocial resilience or digital literacy as independent variables (Nguyen et al., 2021; Patel et al., 2020; Chen et al., 2021; Lee et al., 2022), this study explores the joint impact of psychosocial resilience and digital literacy on adolescent health behaviour, a subject that has rarely been studied. Second, the studies on program participation and community

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engagement have shown inconsistent results, with four studies finding no effects (Rodriguez et al., 2022; Huang et al., 2021; Smith & Brown, 2021; Osei et al., 2020) and another four indicating positive impacts (Li et al., 2023; Sharma & Gupta, 2022; Kim et al., 2021; Wang et al., 2022). The internalized qualities of resilience, digital literacy and active community engagement all interact by entering into a sum that falls outside of their linear contributors. Third, although health promotion studies are usually context dependent, few have examined integrated predictive models simultaneously involving demographic, psychosocial, and environmental factors (Garcia et al., 2022; Kumar et al., 2021). Fourth, the interaction terms indicate that external supports greatly amplify the effect of internal resilience on behaviour, a nuance seldom measured in previous research. It is the combination of these moderators that creates novelty in this field by providing empirically based framework that can inform more broadly geographically intervention strategies at multiple levels of analysis.

4.5 Limitations and considerations

The study, however, has several limitations. The sample was moderate in size, which could limit generalizability; effect sizes, however, were substantial and robust. Self-reported measures may be subject to bias, even though validated instruments were used. Future research may consider enhancing sample diversity, incorporating longitudinal designs, and supplementing with objective digital tracking data to further the robustness of evidence on the causal pathways between resilience, digital engagement, and health behaviour. However, the results do offer a strong economic basis for implementation planning, especially within environments that prioritize adolescent health thinness using psychosocial empowerment and digital tools (Wang et al., 2022; Kim et al., 2021; Li et al., 2023).

5. Conclusion

The results of this study suggest the determinants of adolescent health behaviour adoption was psychosocial resilience and digital literacy, access to education and engagement in community. The results suggest also that internal resources, such as problem-solving, persistence, and self-efficacy, and external resources, such as program participation and social support, and, all together, enhance the likelihood of maintaining healthy behaviours. The results demonstrate the need to couple online tools with community mobilization efforts to foster a context that enables resilient-related behaviour change. At the international level, we hope this work is useful to motivate multilevel interventions to enhance adolescent health, leveraging individual assets and macro contextual resources to mitigate risk of poor health outcomes across adolescence type and across diverse communities.

Strengths and Limitations

Another notable contribution of this study is the strong incorporation of internal and external resources such as digital skills, and community involvement, to produce a more robust predictive model of adolescent health behaviour compliance. The provision of tested tools, as well as multivariate analyses, increases the credibility and representativeness of the results in similar settings. Nevertheless, some limitations should be considered, such as the moderate sample size and the use of self-reported measures, as well as the cross-sectional nature of the design, which precludes causal interference. Longitudinal designs, larger samples, more diverse samples, and objective digital tracking would be well-served to explore the relationships observed here to refine evidence-based public health-promotion strategies for adolescents worldwide.

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adolescent healthy behaviours and resiliency study. We especially thank the research assistants for their careful attention to detail in achieving data quality and participant retention.

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Data Availability

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request. For ethical reasons with adolescent participants, data is not publicly available to maintain confidentiality.

Contributions

Author 1: Conceptualization, methodology, data curation, formal analysis.

Author 2, Literature review, Manuscript and visualization.

Author 3: Supervision, validation and critically revising the manuscript.

Second author: Data collection, statistical analysis and interpretation.

Author 5: Project administration, obtaining of funding and final approval of the manuscript.

All authors have read and approved the final manuscript, and have agreed to be accountable for all aspects of the work.

Competing Interests

Competing interest The authors have no financial, professional or personal competing interests relevant to the work presented in this paper.

Disclaimer

The opinions expressed in this manuscript are solely those of the authors and do not represent an official policy or position of the funding agency or the affiliated institutions.

Availability of Data and Materials

Table 1. Demographic Characteristics of Participants

Participant ID	Years	Gender	Grade	Community Program Participation	Family Support Level	Digital Device Use
P1	12	F	7	Yes	High	Moderate
P2	13	M	8	Yes	Moderate	High
P3	14	F	9	No	Low	Moderate
P4	15	M	10	Yes	High	High
P5	16	F	11	No	Moderate	Low
P6	17	M	12	Yes	High	High

Table 2. Research instrument and measurement

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Variable	Measurement Tool	Scale/Unit	Cronbach α	Data Type	Frequency/Range	Notes
Digital Literacy	Digital Literacy Questionnaire	1–5 Likert	0.88	Ordinal	1–5	Adapted from Van Deursen & Van Dijk, 2020
Health App Usage	Mobile Health Engagement Survey	Frequency/week	0.85	Ratio	0–14	Self-reported app interactions
Community Engagement	Community Participation Index	1–5 Likert	0.82	Ordinal	1–5	Participation in local health programs
School Programs	School Health Participation Checklist	Count	0.8	Ratio	0–10	Attendance in school health activities
Health Behaviour Change	Health Behaviour Scale	1–5 Likert	0.87	Ordinal	1–5	Behaviour change indicators
Mental Health Integration	Mental Health Awareness Scale	1–5 Likert	0.84	Ordinal	1–5	Assessing emotional well-being focus

Table 3. Participant Demographics and Baseline Characteristics

Participant Code	Age (Years)	Gender	Education Level	Digital Literacy	Community Engagement	Program Participation Frequency (per week)	Health Behaviour
P001	12.7	F	7	3.52	4.1	2.25	4.12
P002	13.3	M	8	4.18	3.28	3.17	3.92
P003	14.1	F	9	3.87	4.05	4.08	4.03
P004	15.6	M	10	4.52	5	3.25	4.31
P005	16.2	F	11	3.28	3.15	2.08	3.81
P006	17.4	M	12	4.73	5	4.17	4.53
P007	12.9	F	7	3.45	3.92	2.5	3.88
P008	13.7	M	8	4.05	3.7	3	3.95
P009	14.4	F	9	3.95	4.2	3.92	4.1
P010	15.1	M	10	4.6	4.9	3.42	4.35

Table 4. Correlation Between Independent Variables and Health Behaviour

Participant Code	Weekly Exercise	Sedentary Hours/Day	Dietary Adherence Score	Sleep Duration	Sleep Quality Score	Step Count Average/Day
P001	4.25	5.5	4.12	7.85	4.1	9,256
P002	3.75	6.2	3.88	7.45	3.92	8,742
P003	4.8	4.95	4.05	8	4.03	9,510
P004	5.1	4.3	4.31	8.15	4.25	10,125
P005	3.2	6.5	3.81	7.25	3.88	8,410
P006	5.5	3.9	4.53	8.5	4.45	10,350
P007	4.1	5.8	4	7.9	4.05	9,012
P008	3.9	6.1	3.92	7.7	3.95	8,865
P009	4.6	5.2	4.1	8.05	4.12	9,480
P010	5.2	4.5	4.35	8.2	4.3	10,200

Table 5. Psychosocial measures

Participant Code	Perceived Stress	Resilience	Social Support	Self-Efficacy	Life Satisfaction	Emotional Wellbeing
P001	2.85	4.1	4.25	4	4.15	4.05
P002	3.2	3.92	3.88	3.95	3.9	3.88
P003	2.95	4.03	4.05	4.12	4.1	4

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Participant Code	Perceived Stress	Resilience	Social Support	Self-Efficacy	Life Satisfaction	Emotional Wellbeing
P004	2.7	4.25	4.3	4.28	4.35	4.22
P005	3.4	3.88	3.92	3.95	3.9	3.85
P006	2.65	4.45	4.5	4.48	4.55	4.42
P007	3.05	4	4.1	4.05	4.08	4.02
P008	3.25	3.95	3.98	3.98	4	3.97
P009	2.9	4.12	4.2	4.15	4.22	4.12
P010	2.75	4.3	4.35	4.38	4.4	4.35

Table 6. Health Knowledge Assessment

Participant Code	Nutrition Knowledge	Physical Activity Knowledge	Chronic Disease Awareness	Total Health Knowledge	Information Source Diversity	Engagement in Health Programs
P001	8.25	7.85	8.1	24.2	3.5	4
P002	7.88	7.4	7.95	23.23	3.25	3.92
P003	8.12	7.95	8.05	24.12	3.6	4.05
P004	8.35	8.15	8.25	24.75	3.85	4.28
P005	7.8	7.5	7.88	23.18	3.2	3.88
P006	8.5	8.4	8.55	25.45	4	4.48
P007	8.05	7.8	8	23.85	3.55	4.05
P008	7.95	7.65	7.9	23.5	3.4	3.95
P009	8.25	7.95	8.15	24.35	3.65	4.1
P010	8.4	8.2	8.35	24.95	3.85	4.3

Table 7. Logistic Regression Model Summary

Predictor Variable	B	S.E.	Wald	df	Sig.	Exp(B)
Age	0.215	0.052	17.09	1	0	1.24
Gender	-0.312	0.185	2.85	1	0.091	0.73
Education Level	0.145	0.058	6.24	1	0.012	1.16
Digital Literacy	0.387	0.095	16.61	1	0	1.47
Community Engmt	0.298	0.087	11.71	1	0.001	1.35
Program Partic.	0.225	0.072	9.77	1	0.002	1.25

Table 8. Health Behaviour by Age and Education

Step	-2 Log Likelihood	Cox & Snell R^2	Nagelkerke R^2
1	27.485	0.572	0.801

Table 9. hosmer-lemeshow test

Step	Chi-Square	df	Sig.
1	6.112	8	0.632

Table 10. Classification Accuracy

Step	Chi-Square	df	Sig.
1	6.112	8	0.632

Table 11. Correlation Matrix

Variable	1	2	3	4	5	6	7	8
1. Age	1							

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Variable	1	2	3	4	5	6	7	8
2. Education Level	0.742**	1						
3. Digital Literacy	0.605**	0.658**	1					
4. Community Engagement	0.432**	0.495**	0.621**	1				
5. Program Participation	0.388*	0.412**	0.573**	0.647**	1			
6. Health Behaviour Score	0.525**	0.588**	0.634**	0.692**	0.705**	1		
7. Psychosocial Resilience	0.498**	0.551**	0.612**	0.678**	0.689**	0.745**	1	
8. Health Knowledge Score	0.467**	0.532**	0.589**	0.611**	0.622**	0.701**	0.712**	1

Table 12. Interaction Effects Regression Model

Predictor/Interaction	B	S.E.	t	df	Sig.	Beta
Resilience	0.415	0.058	7.16	59	0	0.512
Digital Literacy	0.318	0.062	5.13	59	0	0.426
Community Engagement	0.295	0.06	4.92	59	0	0.398
Program Participation	0.212	0.057	3.72	59	0.001	0.328
Resilience × Digital Literacy	0.108	0.042	2.57	59	0.013	0.158
Resilience × Community Engagement	0.095	0.041	2.32	59	0.024	0.142
Resilience × Program Participation	0.082	0.039	2.1	59	0.039	0.128

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