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Title page

Validity of the Japanese version of health promoting school implementation questionnaire

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Short Title (Running Title)

Validation of the Japanese HPS Implementation Questionnaire

Table number: 5

Abstract

Background: Despite the global spread of the Health-Promoting School (HPS) framework, few validated instruments assess the depth and quality of its implementation, particularly in non-Western contexts. The Health-Promoting School Implementation Questionnaire (HPSIQ), developed in the Netherlands, has demonstrated sound psychometric properties but has not been validated in Asia.

Objectives: This study tested the factor structure and concurrent validity of the Japanese version of the HPS Implementation Questionnaire (J-HPSIQ) in relation to school health directors' (SHDs') health literacy on social determinants of health (SDH-HL).

Methods: A web-based survey was conducted among 1,295 staff from 174 public high and special needs schools in Japan (2023). The seven-factor structure of the 28-item J-HPSIQ—Adherence, Dose, Participant Responsiveness, Quality of Delivery, Integration, Program Differentiation, and Adaptation—was tested using confirmatory factor analysis (CFA). Convergent and discriminant validity were examined through composite reliability (CR), average variance extracted (AVE), the Fornell–Larcker criterion, and heterotrait–monotrait (HTMT) ratios. To assess concurrent validity, multiple linear regressions examined associations between SHDs' SDH-HL and school-level implementation scores, adjusting for demographic and school-level covariates.

Results: The initial CFA model showed suboptimal fit; however, a theoretically refined structural model demonstrated substantially improved fit indices. A subsequent structural model specified Adherence as a dependent construct predicted by Dose, Participant Responsiveness, Quality of Delivery, and Integration. This model improved fit ($\chi^2(604)=1069.62$, CFI=0.840, TLI=0.820, RMSEA=0.083; $\Delta\chi^2(15)=211.0$, $p<0.001$). All factor loadings were significant (0.34–0.87), with CR>0.80 and AVE≥0.36. SHDs' SDH-HL was positively associated with total implementation ($\beta=0.21$, $p<0.01$), especially with Quality of Delivery ($\beta=0.47$, $p<0.001$), Integration ($\beta=0.23$, $p<0.01$), and Adaptation ($\beta=0.29$, $p<0.01$).

Conclusions: The J-HPSIQ is a psychometrically robust and contextually relevant tool for evaluating school health promotion in Japan. SHDs' health literacy was positively related to effective and adaptive HPS implementation, highlighting the importance of organizational literacy for equitable and sustainable school health systems.

Keywords: School health promotion; Implementation fidelity; Health literacy; Psychometric validation; Japan

Introduction

School-based health promotion has increasingly been recognized as a cornerstone of population health and health equity. The World Health Organization's (WHO) Health-Promoting School (HPS) framework represents a paradigmatic shift from individual health education toward a whole-school approach that embeds health within the educational mission, organizational structures, and everyday ethos of schools (*Making every school a health-promoting school – Global standards and indicators*, 2021; World Health Organization and the UNESCO, 2021). This framework reconceptualizes the school as a key setting for shaping lifelong health behaviors and fostering social inclusion. It rests on six interdependent pillars: (1) comprehensive health education, (2) a safe and supportive environment, (3) access to school health services, (4) family and community partnerships, (5) the development of coherent health policies, and (6) organizational capacity for health promotion (World Health Organization, 2000). A growing body of meta-analytic evidence demonstrates that the HPS approach improves diverse adolescent outcomes—including diet, physical activity, substance use, and mental well-being—across varied sociocultural contexts (Goldberg et al., 2019; Langford et al., 2015; Lekamge et al., 2025). Accordingly, the HPS framework has evolved into a global reference model for equity-oriented, school-based health promotion.

Despite this evidence base, systematic tools for assessing the *depth and quality* of HPS implementation within schools remain limited. As noted by Kazemitabar et al., only 7 of 649 HPS-related studies examined psychometric properties, revealing a striking absence of validated metrics capable of capturing organizational and cultural dimensions of implementation (Kazemitabar et al., 2020). To fill this gap, Vennegoor et al. developed the *Health-Promoting School Implementation Questionnaire (HPSIQ)*—a theoretically grounded, 28-item instrument designed to appraise school-level enactment of HPS principles across domains such as policy, environment, pedagogy, community partnerships, and evaluation (Vennegoor et al., 2023). The HPSIQ demonstrated sound factorial validity and strong internal consistency (Cronbach's α = .71–.91), and has since been adopted across Europe as a diagnostic tool for guiding system-wide health promotion and educational reform. Nevertheless, the cross-cultural transferability of the HPSIQ has not been rigorously tested. Implementation of HPS principles is mediated by national education systems, professional norms, and institutional logics, and therefore requires validation within diverse governance and cultural frameworks. Accordingly, validating the HPSIQ in Japan represents a cross-cultural psychometric evaluation of the instrument rather than a mere linguistic translation.

Japan, with its highly institutionalized school health system, provides a particularly instructive case. Japan's school health system is anchored in a dense legal and administrative architecture that integrates health legislation, specialized personnel, national curricula, and formal coordination mechanisms (Tomokawa et al., 2020). Its statutory foundations—the *School Education Act* and the *School Health and Safety Act*—mandate periodic health examinations, infection control, environmental hygiene management, and health instruction. These policies guarantee a national minimum standard for school health practice. Within this framework, the Ministry of Education, Culture, Sports, Science and Technology (MEXT) defines three operational domains: health education, health management, and health organizational activities (Tomokawa, Shirakawa, et al., 2021). Health education cultivates students' knowledge and behaviors through the health and physical education curriculum and guidance from licensed school nurse teachers (*yogo* teachers). Health management encompasses daily monitoring, medical examinations, and infection control led by *yogo* teachers in collaboration with classroom teachers and parents. Health organizational activities include school health planning, teacher training, and intersectoral coordination managed by the school health director (*hoken shuji, SHD*). A distinctive institutional feature is the statutory involvement of the three school health professionals—school physicians, dentists, and pharmacists (*"gakkō sanshi"*). These professionals provide expertise in medical oversight, environmental hygiene, and health education, and their participation in school health committees institutionalizes collaboration between schools and external health systems (Tomokawa, Miyake, et al., 2021). This tripartite system is remarkably rare in global practice, reflecting Japan's historically hybrid model of education and public health governance. While Japan's system aligns structurally with HPS principles, empirical evidence regarding its *functional alignment*—that is, the extent to which schools operationalize these mandates as a holistic HPS approach—remains limited (Japan School Health Association, 2020). Formal compliance (e.g., mandated committees, policy documents) may not necessarily translate into substantive integration of health promotion within curricula, professional practice, or community partnerships. This implementation gap underscores the need for validated, context-sensitive instruments capable of mapping how institutional structures are enacted as lived practices within schools.

The HPSIQ conceptualizes implementation fidelity as a multidimensional construct comprising seven domains: Adherence (the extent to which prescribed activities are implemented as intended), Dose (the amount of intervention delivered), Participant Responsiveness (the engagement of stakeholders), Quality of Delivery (how well activities are delivered), Integration (the embedding of health promotion within school structures), Program Differentiation (the distinctiveness of health-promotion activities), and Adaptation (context-specific modification of implementation). To address both the need for cross-cultural validation of the Health-Promoting School Implementation Questionnaire (HPSIQ) and the need for a contextually grounded instrument to assess the implementation of school health activities in Japan, this study examined the psychometric validity of the Japanese version (J-HPSIQ). Specifically, we (1) tested its factorial structure using confirmatory factor analysis and (2) assessed its concurrent validity in relation to SHDs' health literacy on social determinants of health (SDH-HL).

In this study, SDH-HL was conceptualized as the concurrent construct, extending the notion of health literacy to the structural and societal domains. It encompasses the capacity to recognize, critically appraise, and act upon the social, economic, and environmental conditions that shape health inequities (Matsumoto & Nakayama, 2017). By emphasizing critical awareness of systemic determinants and the ability to translate such understanding into equity-oriented action, SDH-HL provides a framework for understanding how educators and administrators engage with and respond to the broader determinants of health within institutional settings. More broadly, health literacy (HL) has been recognized as a foundational determinant of health behavior, empowerment, and equity across public-health and educational systems. The integrated model proposed by Sørensen et al. defines HL as the ability to access, understand, appraise, and apply health information to make informed decisions regarding health promotion, disease prevention, and care (Sørensen et al., 2012). Importantly, HL is not viewed as a fixed cognitive ability but as a context-embedded social practice, shaped by cultural, institutional, and environmental conditions that influence how individuals and organizations interact with health information. Within schools, HL—and particularly SDH-HL—serves as the cognitive, ethical, and organizational foundation for implementing the Health-Promoting School (HPS) framework, which integrates inclusive education, supportive environments, and intersectoral collaboration. Empirical evidence supports this linkage: Dadaczynski et al. demonstrated that limited HL among school leaders was associated with lower levels of HPS implementation, even after adjusting for attitudes, competencies, and demographic factors (Dadaczynski et al., 2020). Together, these insights indicate that HL functions not only as an individual capability but also as an organizational capacity that enables the integration of health promotion into school governance and practice. Accordingly, examining the relationship between SHDs' SDH-HL and the degree of HPS implementation provides a theoretically grounded test of the concurrent validity of the J-HPSIQ and advances understanding of how equity-oriented health literacy operates as a structural driver of health-promoting education systems.

Methods

Participants

The target population comprised all 175 prefectural schools (148 general, vocational, or university-affiliated high schools; 27 special needs schools) in a large prefecture of western Japan encompassing both urbanized coastal areas and rural mountainous regions (population approximately 5.4 million). Because the Japanese school system is nationally standardized by the Ministry of Education, Culture, Sports, Science and Technology (MEXT)—with uniform curricula, staffing structures, and school health regulations—the participating schools can be regarded as broadly representative of the organizational context of Japanese secondary education. One school was excluded because a member of the research team (KM) was employed there, leaving 174 schools eligible.

Recruitment targeted staff with primary responsibility for school health activities, including principals, heads of the health division SHDs, school management committee members (mainly section heads), *yogo* teachers, and health and physical education teachers. Because organizational structures vary and faculty may hold multiple roles, the exact denominator was indeterminate. A total of 1,295 staff members provided complete data and were included in the analysis (principals, n=144; school management committee members, n=779; SHDs, n=114; health and physical education teachers, n=161; yogo teachers, n=97). Unlike our previous validation focused solely on high schools, the present HPSIQ validation included both high schools and special needs schools to reflect the heterogeneity of school health service delivery in Japan.

Procedure

Prior to data collection, the study protocol was presented to and approved by the Board of the Prefectural School Principals Association. Survey invitations and study information were emailed to each principal. Data were collected between November and December 2023 using an anonymous, self-administered web-based questionnaire (≈20 minutes). Up to three email reminders were sent before the response deadline. Electronic written informed consent was obtained from all participants prior to participation (participants indicated consent by selecting an “I agree” checkbox before accessing the questionnaire), with assurances of anonymity. All participants were adult school staff; therefore, consent from legal guardians was not required. All methods were performed in accordance with the Declaration of Helsinki and with the Ethical Guidelines for Medical and Biological Research Involving Human Subjects in Japan (MEXT/MHLW/METI), and were approved by the Ethics Committee of the Graduate School of Human Development and Environment, Kobe University (approval No. 685-3; revision-685-3).

Measures

Development of the Japanese Health-Promoting School Implementation Questionnaire (J-HPSIQ)

The J-HPSIQ was developed to assess the degree of school-level implementation of the Health-Promoting School (HPS) framework in Japan. Adaptation from the Dutch *Healthy School Questionnaire* (Vennegoor et al., 2023) followed a forward–backward translation procedure. Two experts in school health/public health (AK, KM) reviewed content validity and cultural relevance, and a pilot test with school management committee members, health and physical education teachers, and yogo teachers confirmed clarity. The final J-HPSIQ comprised 28 items across seven domains: Adherence, Dose, Participant Responsiveness, Quality of Delivery, Integration, Program Differentiation (PD), and Adaptation. Items were scored on a 0–4 Likert scale (0 = not at all to 4 = to a very great extent); higher scores indicate greater implementation. Subscale and total scores were calculated as the mean of available items.

Health Literacy on Social Determinants of Health (SDH-HL)

The explanatory variable was staff health literacy regarding social determinants of health, measured using the Health Literacy on Social Determinants of Health Questionnaire (HL-SDHQ) (33 items; domains: access, understanding, appraisal, application)(Matsumoto & Nakayama, 2017). Example items include "Finding people who are socially isolated and in poor health," "Understanding that people with lower income are more likely to become ill," and "Judging what kinds of social inequalities exist in leading a healthy life." Response options were "very easy," "fairly easy," "fairly difficult," "very difficult," "don't know/not applicable." Scoring followed prior work: 4, 3, 2, 1 points for the four ordered responses; "don't know/not applicable" was replaced with the item mean among all respondents (Matsumoto & Nakayama, 2017). All participating staff completed the HL-SDHQ; no missing data were observed. For each school, item-level means were averaged across staff and then summed over 33 items to yield a school-level total score (range 33–132); higher scores reflect greater SDH-related health literacy.

Covariates

Demographic and occupational characteristics were used as covariates. The demographic factors considered were sex, age, school type, subject specialisation, job title, committee membership, total years of teaching experience, years at the current school, years of managerial experience and years in a managerial role at the current school. School-level covariates included the number of classes and students, and workplace social capital (WSC). WSC was assessed using the validated 8-item WSC scale (Hori et al., 2019; Inoue et al., 2024; Kouvonen et al., 2006; Norikoshi et al., 2020; Suzuki et al., 2010). Responses were given on a 4-point Likert scale (1 = strongly disagree to 4 = strongly agree) and mean scores were calculated, with higher values indicating greater cohesion and trust.

Statistical analysis

Descriptive statistics were calculated for all variables. Means and standard deviations were computed for continuous variables, and frequencies and percentages were reported for categorical variables.

Following all analyses were conducted at the school level using aggregated data. A two-step structural equation modeling (SEM) approach was applied to validate the J-HPSIQ and examine its theoretical structure (Anderson & Gerbing, 1988; Kline, 2016). In the structural component of this SEM, Adherence was modeled as an endogenous construct informed by implementation science frameworks that conceptualize fidelity/adherence as outcomes of upstream implementation processes rather than purely exogenous inputs (Carroll et al., 2007; Durlak & DuPre, 2008). In the first step (measurement model), confirmatory factor analysis (CFA) was performed to test whether the observed indicators adequately represented the seven hypothesized latent constructs—Adherence, Dose, Participant Responsiveness, Quality of Delivery, Integration, PD, and Adaptation. All latent constructs had at least two observed indicators, except for PD and Adaptation, which were modeled as single-indicator latent variables with fixed loadings (1.0) and error variances estimated from an assumed reliability of 0.70 (Bollen, 1989). Items with zero or near-zero variance were excluded. Guided by theoretical considerations and modification indices, a small number of within-construct correlated errors were permitted among conceptually related items (e.g., parallel or sequential questions), whereas cross-construct error covariances were not allowed (Kline, 2016). Parameters were estimated using maximum likelihood with missing values (MLMV), assuming data were missing at random and treating Likert-type items as approximately continuous. We acknowledge that weighted least squares estimators such as WLSMV are commonly recommended for ordinal indicators. We selected MLMV because the J-HPSIQ items were measured on five-point Likert scales and were analyzed at the school level using aggregated mean scores, which can be treated as approximately continuous. In addition, MLMV provides efficient handling of missing data under the missing-at-random assumption and enables likelihood-based comparison of nested models (e.g., LR tests) alongside information criteria (AIC/BIC), which aligned with our model comparison strategy. Model adequacy was evaluated using several indices: the chi-square statistic (χ^2), comparative fit index (CFI), Tucker–Lewis index (TLI), and root mean square error of approximation (RMSEA), along with the Akaike (AIC) and Bayesian (BIC) information criteria. Acceptable model fit was defined as CFI and TLI ≥ 0.90 and RMSEA ≤ 0.08. Nested models incorporating theoretically justified correlated errors were compared using likelihood-ratio (LR) tests and changes in fit indices (ΔCFI, ΔTLI, ΔRMSEA, ΔAIC/BIC). Standardized factor loadings with 95 % confidence intervals and the proportion of variance explained (R^2) were reported. Convergent validity was assessed using composite reliability (CR) and average variance extracted (AVE), with thresholds of CR ≥ 0.70 and AVE ≥ 0.50 indicating adequacy. Discriminant validity was examined using both the Fornell–Larcker criterion—where the square root of each construct's AVE exceeds its inter-construct correlations—and the heterotrait–monotrait (HTMT) ratio, with HTMT < 0.85 considered acceptable. Adjusted CR values accounting for correlated errors were also computed (Fornell & Larcker, 1981; Hair et al., 2022). Detailed model-fit indices, convergent validity results, and the Fornell–Larcker matrix are presented in Supplementary Materials (eTable 1 & 2).

In the second step (structural model), the validated measurement model was used to test the structural relationships between latent constructs and to examine the concurrent validity of the J-HPSIQ. Specifically, school-level multiple linear regression analyses were conducted to assess the associations between SHDs' health literacy on social determinants of health (SDH-HL) and J-HPSIQ implementation scores. Two models were estimated: Model 1 (unadjusted) and Model 2 (adjusted for SHD characteristics—sex, age, teaching experience, years in current role—and school-level covariates including WSC, school type, number of classes, and number of students). All continuous predictors were standardized before analysis. Regression coefficients (β) and 95% confidence intervals (CIs) were reported. Heteroskedasticity-consistent (HC3) robust standard errors were applied, and statistical significance was set at $p < 0.05$ (two-tailed).

All analyses were conducted using Stata version 19.5 (StataCorp LLC, College Station, TX, USA).

Results

Table 1 presents the descriptive characteristics of participants and schools. A total of 1,295 school staff from 174 schools participated, including principals (n = 144), school management committee members (n = 779), SHDs (n = 114), health and physical education teachers (n = 161), and yogo teachers (n = 97). The mean age of SHDs was 50.2 years (SD = 9.9), with an average of 25.2 years of teaching experience and 4.1 years in their current role. At the school level, the mean total J-HPSIQ score was 1.8 ± 0.7. Among subscales, Participant Responsiveness (2.1 ± 0.8) and Adaptation (2.0 ± 0.9) showed the highest implementation levels, while Adherence was lowest (1.3 ± 0.7). Workplace social capital (WSC) scores were similar across occupational groups (mean ≈ 24.9).

Following the two-step SEM procedure, the hypothesized measurement model (CFA) comprising seven latent constructs—Adherence, Dose, Participant Responsiveness, Quality of Delivery, Integration, Program Differentiation, and Adaptation—was first evaluated. Of the original indicators, three items within the Adherence domain (wellbeing, media literacy, and hearing health) showed zero variance across schools and were excluded from analysis. The CFA yielded moderate-to-fair fit ($\chi^2(619)=1280.55$, CFI=0.773, TLI=0.760, RMSEA=0.097, AIC=9934.26, BIC=10265.34). Subsequently, a structural model was specified in which Adherence was regressed on Dose, Participant Responsiveness, Quality of Delivery, and Integration, reflecting the theoretical framework of program implementation (Figure 1). Program Differentiation and Adaptation were retained as single-indicator latent constructs in the overall SEM but were not specified as predictors of Adherence. This model demonstrated improved fit (χ^2 (604) = 1069.62, CFI = 0.840, TLI = 0.820, RMSEA = 0.083, AIC = 9753.33, BIC = 10125.46). A likelihood-ratio test indicated that the structural model fit the data significantly better than the measurement model ($\Delta\chi^2$ (15) = 211.0, $p < 0.001$), accompanied by an increase in CFI (+0.07) and a substantial reduction in AIC (−180.93). Detailed model-fit indices for the CFA (measurement) and SEM (structural) models are provided in Supplementary eTable 1. Table 2 presents standardized factor loadings from the CFA of the J-HPSIQ. The proportion of variance explained (R^2) for each latent factor ranged from 0.29 to 0.72. All standardized factor loadings were significant (0.34–0.87, $p < 0.001$). Composite reliability (CR) values exceeded 0.80, and adjusted CR values remained above 0.80 for all constructs. Average variance extracted (AVE) ranged from 0.36 to 0.63 (Table 3), supporting convergent validity. Discriminant validity was generally supported by the HTMT ratios (Table 4), with one pair (Adherence–Quality of Delivery) exceeding 0.85; additional evidence based on the Fornell–Larcker criterion is presented in Supplementary eTable 2, where the same pair violates the criterion. The largest inter-construct association was observed between Adherence and Quality of Delivery (HTMT = 0.884).

Table 5 shows the associations of SHD health literacy with overall and domain-specific implementation of HPS activities. Multiple linear regression analyses revealed that higher SHDs' SDH-HL scores were significantly associated with stronger overall HPS implementation (Model 1: $\beta = 0.20$, $p < 0.001$; Model 2: $\beta = 0.21$, $p < 0.01$), even after adjusting for workplace social capital, demographic, and school-level covariates. The adjusted model accounted for approximately 18% of the variance in total implementation (adjusted $R^2 = 0.18$). At the domain level, SDH-HL showed the strongest associations with Quality of Delivery ($\beta = 0.47$, $p < 0.001$), Integration ($\beta = 0.23$, $p < 0.01$), and Adaptation ($\beta = 0.29$, $p < 0.01$). Associations with Dose and Participant Responsiveness were smaller and non-significant for Adherence.

Discussion

This study demonstrated the construct and concurrent validity of the Japanese version of the Health-Promoting School Implementation Questionnaire (J-HPSIQ). The J-HPSIQ demonstrated a stable seven-factor structure with acceptable fit indices following theoretical refinement and high internal consistency (CR > 0.80). Although the initial measurement model reproduced the original seven-domain structure (Vennegoor et al., 2023), its fit indices suggested room for improvement. A theoretically informed structural model, in which Adherence was specified as an endogenous construct, demonstrated substantially improved fit. This specification was theoretically informed by implementation science (Carroll et al., 2007; Durlak & DuPre, 2008), which increasingly conceptualizes adherence or fidelity as an emergent outcome of upstream implementation processes rather than a purely exogenous input. In this perspective, adherence reflects the extent to which activities are delivered with sufficient dose, responsiveness, quality, and organizational integration. In highly institutionalized systems such as Japan's, adherence is therefore better understood as the culmination of coordinated implementation efforts rather than as an independent starting condition. One notable exception was the Adherence–Quality of Delivery pair, which exceeded the HTMT threshold and did not satisfy the Fornell–Larcker criterion, suggesting partial conceptual overlap (Fornell & Larcker, 1981; Hair et al., 2022). In addition, the average variance extracted (AVE) for the Adherence subscale was below the conventional threshold (AVE = 0.36). While an AVE of 0.50 or higher is often recommended, Fornell and Larcker note that convergent validity may still be acceptable when composite reliability is high (Fornell & Larcker, 1981), as observed for Adherence in this study (CR = 0.88). Substantively, Adherence encompasses a broad range of mandated school-health activities (e.g., infection control, nutrition, physical activity, and substance use) rather than a narrowly defined behavioral domain. In a highly standardized system such as Japan's, this structural breadth and limited between-school variability likely attenuate shared variance among indicators, resulting in lower AVE values despite strong internal consistency. In addition, several Adherence indicators in our dataset exhibited zero or near-zero variance and were excluded from the measurement model, suggesting that some mandated activities may be implemented almost universally in this setting. Such restricted variability—together with the breadth of the Adherence domain spanning heterogeneous mandated practices—likely reduces shared variance among indicators and can attenuate AVE even when internal consistency remains high. This pattern may therefore reflect limited discriminative capacity under strong policy mandates rather than substantive failure of the construct. This pattern indicates that in Japanese schools procedural adherence and perceived delivery quality often coincide, as both may be regarded as indicators of professionalism and accountability. At the school level, higher SDH-HL among SHDs was positively associated with overall implementation and, in particular, with the domains of Quality of Delivery, Integration, and Adaptation, whereas associations with Adherence were small or nonsignificant. This pattern may reflect Japan's highly standardized and mandate-driven school health system, in which Adherence—and, to some extent, Dose—function largely as baseline requirements with limited discretionary variation across schools. Where activities are widely implemented due to legal and administrative mandates, SDH-HL may have less room to explain between-school differences in these "fidelity" dimensions. In contrast, SDH-HL may be more strongly related to implementation domains that depend on leadership-driven coordination and contextual tailoring.

These findings are consistent with the European validation of the original HPSIQ (Vennegoor et al., 2023) and with research linking organizational health literacy to the quality and sustainability of implementation (Dadaczynski et al., 2020; Sørensen et al., 2012). In Japan's highly standardized school health system—where compliance with policy mandates is embedded in administrative routines—adherence functions largely as a baseline requirement rather than a marker of excellence (Japan School Health Association, 2020; Tomokawa, Shirakawa, et al., 2021). SHDs occupy a pivotal role within this system: they coordinate health policy, facilitate staff collaboration, and liaise with external professionals such as school physicians and pharmacists (Japan School Health Association, 2020). Their ability to interpret information and foster coordination helps determine how schools translate national standards into context-specific and collaborative practice. Consequently, variation in SHDs' SDH-HL may influence how effectively schools integrate health promotion into daily operations and respond to community needs.

The modest discriminant validity between Adherence and Quality of Delivery, as indicated by the elevated HTMT ratio, may further reflect Japan's administrative culture, in which procedural correctness and performance quality are closely intertwined. Therefore, distinctions between Adherence and Quality of Delivery may be less empirically separable in highly regulated contexts, and comparisons between these constructs should be interpreted with caution. Within this framework, schools that demonstrate procedural thoroughness are also perceived as delivering high-quality practice, blurring the conceptual boundary between compliance and quality. From a cross-cultural validation perspective, this overlap suggests that theoretically distinct implementation domains may become empirically intertwined in centralized governance systems rather than indicating construct redundancy. More specifically, future work could evaluate a refined or short-form version of the J-HPSIQ by prioritizing indicators with sufficient between-school variability and by emphasizing discretionary and qualitative aspects of implementation (e.g., reflective evaluation practices and participatory decision-making) that may better distinguish adherence from perceived delivery quality and strengthen convergent validity in highly regulated systems. Clarifying this distinction in future applications—by emphasizing qualitative aspects of delivery such as participatory decision-making, staff engagement, and reflective evaluation—could enhance interpretability without altering the instrument's underlying structure.

The J-HPSIQ retained the conceptual integrity of the original tool while revealing contextual nuances in how implementation domains interrelate. These nuances likely stem from Japan's institutional configuration, where specialized roles (e.g., yogo teachers, school physicians, and pharmacists) and centralized governance define the structure of school health activities (Japan School Health Association, 2020; Tomokawa, Miyake, et al., 2021). Yogo teachers manage daily health guidance and student monitoring, while external professionals provide mandated oversight and technical guidance (Tomokawa et al., 2020; Tomokawa, Shirakawa, et al., 2021). This multilayered governance structure ensures procedural rigor and accountability but tends to limit bottom-up flexibility. As a result, schools in Japan exhibit Japan-specific patterns of coordination and adaptation—characterized by hierarchical decision-making and role specialization—compared with the more participatory approaches observed in decentralized education systems.

The observed associations between SHDs' SDH-HL and the domains of Quality of Delivery, Integration, and Adaptation underscore the importance of organizational health literacy within leadership roles. Although causal inference cannot be drawn from this cross-sectional design, SHDs with stronger literacy regarding the social determinants of health may be better able to interpret contextual factors, mobilize collaboration, and align school initiatives with local priorities. Professional development programs that integrate social-determinants thinking into school management and teacher training could therefore strengthen schools' capacity for equitable and context-responsive implementation of the HPS framework (Jourdan et al., 2016; Samdal & Rowling, 2011). Policymakers may also employ the J-HPSIQ as a diagnostic tool to monitor implementation progress and to guide targeted capacity-building at prefectural or national levels.

Practical implications for policy and system implementation are threefold. First, MEXT and prefectural boards can use the J-HPSIQ as a diagnostic instrument to identify domain-specific strengths and gaps across schools (e.g., distinguishing leadership-dependent domains such as Quality of Delivery, Integration, and Adaptation from more mandate-driven domains). Second, the results can inform targeted capacity-building (e.g., professional development for SHDs and school health committees) by prioritizing domains that require coordination with external professionals and cross-sector collaboration. Third, when Health-Promoting School initiatives or related policy programs are introduced or scaled, repeated administration of the J-HPSIQ can support routine monitoring and evaluation of implementation progress over time at the prefectural or national level.

This study has several strengths, including the large, multi-occupational sample, rigorous translation and cultural adaptation process, and integration of both individual- and school-level covariates. The J-HPSIQ also demonstrated consistent reliability and theoretically coherent construct validity within the Japanese school context. However, several limitations should be acknowledged. First, the sample was limited to prefectural high and special-needs schools within a single prefecture. Although this yielded a relatively large and organizationally homogeneous dataset, the findings may not generalize to other regions or to different school types, particularly elementary and junior high schools where health promotion activities are often more systematically institutionalized. However, because the Japanese school health system is nationally standardized in terms of curriculum, staffing, and statutory health activities, the present findings may still be informative for understanding implementation patterns in similar institutional contexts. Broader validation across diverse educational settings is therefore recommended. Second, the cross-sectional design limits interpretation regarding temporal stability or predictive validity. Longitudinal or repeated-measure studies are needed to assess score stability over time and to evaluate the instrument's utility for monitoring and guiding Health-Promoting School initiatives. From a measurement perspective, although the Adherence subscale demonstrated high reliability, future studies may consider refining or reducing items that show minimal variance due to universal policy mandates. Such refinement may enhance convergent and discriminant validity, particularly in highly regulated educational systems, without compromising the conceptual coverage of implementation fidelity. Finally, all measures relied on self-report data, which may introduce social-desirability or common-method bias, although anonymity and multi-role participation likely mitigated this risk. Despite these limitations, the study provides a robust foundation for future longitudinal and multi-site validation of the J-HPSIQ.

Conclusions

The J-HPSIQ demonstrated satisfactory reliability and validity for assessing school-level implementation of the Health-Promoting School framework in Japan. The observed associations between SHDs' health literacy and key implementation domains highlight the relevance of organizational literacy for promoting effective, adaptive, and equity-oriented school health systems, while underscoring the value of capacity building within school leadership.

Author statements

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Ethical approval

The study was approved by the Ethics Committee of the Graduate School of Human Development and Environment, Kobe University (approval number 685-3; revision-685-3).

Data availability

The J-HPSIQ validated in this study will be considered for open release after further validation studies are completed. At this stage, the scale can be provided upon reasonable request to the corresponding author.

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Competing interests

The authors declare no other conflict of interests.

Authors contribution

All authors contributed to the concept or design of the study, the acquisition, analysis, or interpretation of data for the work. A.K. drafted the manuscript. K.M and M.T. critically revised the manuscript. All authors gave final approval and agreed to be accountable for all aspects of work, thus ensuring integrity and accuracy.

Declaration of generative AI and AI-assisted technologies in the manuscript preparation process

During the preparation of this work the authors used ChatGPT (OpenAI) in order to assist with language editing and improving clarity of expression. After using this tool, the author(s) reviewed and edited the content as needed and take full responsibility for the content of the published article.

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Table 1. Descriptive characteristics of participants and schools (n = 1,295)

	Principal	SMCM	SHD	HPE teacher	Yogo teacher
Participants, n (% within role)	144 (100.0)	779 (100.0)	114 (100.0)	161 (100.0)	97 (100.0)
Sex, n (% within role)					
Male	125 (86.8)	602 (77.3)	41 (36.0)	127 (78.9)	1 (1.0)
Female	17 (11.8)	157 (20.2)	69 (60.5)	34 (21.1)	94 (96.9)
No answer	2 (1.4)	20 (2.6)	4 (3.5)	0 (0.0)	2 (2.1)
Age (years), mean (SD)	59.0 (1.6)	50.3 (8.2)	50.2 (9.9)	38.6 (10.5)	41.7 (10.7)
Teaching experience of SHD (years), mean (SD)	-	-	25.2 (10.6)	-	-
Current-role experience of SHD (years), mean (SD)	-	-	4.1 (5.4)	-	-
Workplace social capital, n	144	134	114	85	87
Workplace social capital, mean (SD)	24.1 (3.3)	24.9 (1.9)	24.9 (1.9)	24.9 (1.6)	24.9 (1.6)
SDH-HL (school level), mean (SD)			3.2 (0.6)		
J-HPSIQ (SHD-only), mean (SD)					
Total score	-	-	1.8 (0.7)	-	-
Adaptation	-	-	2.0 (0.9)	-	-
Adherence	-	-	1.3 (0.7)	-	-
Dose	-	-	1.7 (0.7)	-	-
Participant Responsiveness	-	-	2.1 (0.8)	-	-
Integration	-	-	1.6 (0.8)	-	-
Program Differentiation	-	-	1.9 (0.9)	-	-
Quality of Delivery	-	-	1.6 (0.9)	-	-

Values are school-level means (SD). HPE = Health & Physical Education teacher, SDH-HL = health literacy on social determinants of health, SMCM= School Management Committee Members, WSC = workplace social capital, SHD = school health director.

Table 2. Standardized factor loadings for the seven-factor J-HPSIQ model (final SEM model)

Factor	Indicator	Standardized Factor loading	95% CI
Adherence			
	Acted on evaluation findings	0.725	[0.615, 0.834]
	Annual evaluation of HPS initiatives	0.595	[0.462, 0.728]
	HPS coordination in place	0.74	[0.640, 0.841]
	Regular survey: hygiene / infection control	0.608	[0.478, 0.738]
	Regular survey: nutrition	0.5	[0.348, 0.652]
	Regular survey: physical activity	0.695	[0.586, 0.804]
	Regular survey: physical environment	0.523	[0.375, 0.670]
	Regular survey: relationships & sexuality	0.615	[0.487, 0.742]
	Regular survey: sleep	0.535	[0.391, 0.679]
	Regular survey: students requiring special support	0.539	[0.396, 0.682]
	Regular survey: tobacco/alcohol/drugs	0.336	[0.160, 0.513]
	Sufficient funding for HPS	0.597	[0.462, 0.732]
	Sufficient staff time for HPS	0.696	[0.580, 0.812]
Dose			
	Behavioral guidelines in place (staff/students/parents)	0.704	[0.597, 0.810]
	Early identification & discussion of student issues	0.561	[0.424, 0.698]
	Formal lessons implemented (health topics)	0.742	[0.648, 0.836]
	Policy includes topic: parents	0.822	[0.746, 0.899]
	Policy includes topic: staff	0.847	[0.780, 0.913]
	Policy includes topic: students	0.79	[0.703, 0.877]
	Supplementary activities (campaigns/trips/guests)	0.417	[0.255, 0.579]
Participant Responsiveness			
	Stakeholder participation: education board	0.634	[0.518, 0.750]
	Stakeholder participation: external advisors (public health/child services)	0.727	[0.634, 0.820]
	Stakeholder participation: external partners (physician/dentist/pharmacist)	0.749	[0.661, 0.836]
	Stakeholder participation: management	0.869	[0.816, 0.921]
	Stakeholder participation: parents	0.793	[0.719, 0.867]
	Stakeholder participation: school health coordinator	0.815	[0.745, 0.884]
	Stakeholder participation: students	0.823	[0.756, 0.889]
	Stakeholder participation: support staff	0.685	[0.580, 0.789]

	Stakeholder participation: teachers	0.843	[0.783, 0.903]
Quality of Delivery			
	Active communication: staff/students/parents	0.807	[0.731, 0.883]
	Core values/mission align with HPS	0.67	[0.556, 0.783]
	Health considered in activities/environment	0.801	[0.724, 0.878]
	Healthy choices encouraged in school	0.622	[0.496, 0.747]
	Staff are role models for health	0.828	[0.758, 0.897]
Integration			
	External experts' competence for HPS	0.845	[0.771, 0.920]
	Regular contact with external supporters	0.773	[0.684, 0.863]
	Teacher competence for HPS implementation	0.749	[0.653, 0.845]
Program Differentiation		1.000	(Fixed)
Adaptation		1.000	(Fixed)

Factor loadings are completely standardized estimates from the final structural equation model (SEM). Program Differentiation and Adaptation were modeled as single-indicator latent variables with their loadings fixed to 1.00 and error variances constrained based on an assumed reliability of $\rho = 0.70$. All other latent constructs were identified by at least two observed indicators.

Table 3. Convergent validity of the J-HPSIQ constructs

Construct	CR	AVE	CR_adj
Adherence	0.877	0.362	0.819
Dose	0.874	0.507	0.811
Participant Responsiveness	0.930	0.599	0.927
Quality of Delivery	0.864	0.563	0.864
Integration	0.833	0.625	0.833

CR = composite reliability; AVE = average variance extracted; CR_adj = composite reliability adjusted for correlated errors.

Table 4. Discriminant validity based on heterotrait–monotrait ratio of correlations.

	Adherence	Dose	*Participant Responsiveness*	*Quality of Delivery*	*Integration*
Adherence	1	0.589	0.629	0.884	0.744
Dose	0.589	1	0.815	0.699	0.761
Participant Responsiveness	0.629	0.815	1	0.689	0.716
Quality of Delivery	0.884	0.699	0.689	1	0.812
Integration	0.744	0.761	0.716	0.812	1

Diagonal values = 1 by definition.

Table 5. Associations of SHDs' health literacy with overall and domain-specific HPS implementation (school-level regressions)

	HPS total					Adherence					Dose					Participant Responsiveness			
	β	95%CI	β	95%CI		β	95%CI	β	95%CI		β	95%CI	β	95%CI		β	95%CI	β	95%CI
Constant	1.456***	[1.352,1.559]	1.547***	[1.121,1.974]		1.226***	[1.106,1.346]	1.565***	[1.117,2.013]		1.720***	[1.598,1.842]	1.774***	[1.298,2.251]		1.616***	[1.460,1.772]	1.618***	[0.981,2.254]
SDH-HL (z)	0.197***	[0.099,0.295]	0.209**	[0.086,0.332]		0.238**	[0.092,0.384]	0.241*	[0.055,0.428]		0.102	[-0.032,0.235]	0.108	[-0.036,0.252]		0.162*	[0.009,0.315]	0.172	[-0.010,0.354]
WSC (z)			0.051	[-0.064,0.166]				0.085	[-0.026,0.196]				0.053	[-0.094,0.200]				0.004	[-0.183,0.191]
Sex (SHD)			-0.038	[-0.270,0.194]				-0.204	[-0.455,0.048]				-0.019	[-0.274,0.235]				0.065	[-0.270,0.400]
Age			0.045	[-0.226,0.316]				0.06	[-0.255,0.376]				0.123	[-0.190,0.437]				0.346*	[0.035,0.657]
Teaching experience (SHD, z)			0.066	[-0.180,0.312]				-0.036	[-0.347,0.276]				0.088	[-0.202,0.377]				-0.229	[-0.504,0.046]
Current role experience (SHD, z)			-0.07	[-0.226,0.086]				-0.054	[-0.221,0.113]				-0.13	[-0.291,0.031]				-0.083	[-0.318,0.152]
Number of Classes (z)			0.084	[-0.110,0.278]				0.036	[-0.204,0.277]				0.073	[-0.133,0.279]				0.142	[-0.133,0.418]
Number of Students (z)			0.028	[-0.141,0.198]				0.057	[-0.143,0.257]				-0.009	[-0.204,0.186]				-0.063	[-0.318,0.192]
School type 1			ref					ref					ref					ref	
School type 2			-0.01	[-0.451,0.432]				0.077	[-0.442,0.596]				0.062	[-0.417,0.540]				-0.111	[-0.676,0.455]
School type 3			-0.232	[-0.899,0.435]				-0.012	[-0.874,0.850]				-0.131	[-0.974,0.713]				-0.687	[-1.817,0.444]

Coefficients are school-level OLS estimates with HC3 robust SEs. SDH-HL (z) = standardized school-level health literacy on social determinants of health; WSC (z) = standardized workplace social capital. Reference = category reference for school type.
p<0.05, p<0.01, p<0.001.

Table 5. continued

	Quality of Delivery					Integration					Program Differentiation					Adaptation			
	β	95%CI	β	95%CI		β	95%CI	β	95%CI		β	95%CI	β	95%CI		β	95%CI	β	95%CI
Constant	1.609***	[1.449,1.769]	1.946***	[1.287,2.605]		2.052***	[1.911,2.194]	2.047***	[1.492,2.601]		1.882***	[1.710,2.053]	1.737***	[1.027,2.446]		2.005***	[1.837,2.172]	2.169***	[1.466,2.872]
SDH-HL (z)	0.421***	[0.282,0.560]	0.465***	[0.273,0.657]		0.214**	[0.075,0.354]	0.229**	[0.062,0.397]		0.270**	[0.080,0.459]	0.270*	[0.041,0.498]		0.271**	[0.093,0.449]	0.287**	[0.074,0.500]
WSC (z)			0.063	[-0.101,0.227]				0.083	[-0.077,0.244]				0.099	[-0.071,0.269]				0.038	[-0.149,0.224]
Sex (SHD)			-0.164	[-0.510,0.182]				0.002	[-0.323,0.327]				0.107	[-0.295,0.510]				0	[-0.387,0.388]
Age			-0.063	[-0.530,0.404]				-0.127	[-0.484,0.229]				-0.03	[-0.368,0.307]				-0.054	[-0.424,0.316]
Teaching experience (SHD, z)			0.192	[-0.283,0.668]				0.212	[-0.096,0.520]				0.242	[-0.063,0.547]				0.181	[-0.171,0.532]
Current role experience (SHD, z)			-0.091	[-0.287,0.104]				-0.069	[-0.307,0.169]				-0.103	[-0.394,0.188]				-0.09	[-0.371,0.192]
Number of Classes (z)			0.223	[-0.054,0.500]				0.041	[-0.156,0.238]				-0.061	[-0.404,0.281]				0.146	[-0.269,0.562]
Number of Students (z)			0.045	[-0.223,0.313]				0.137	[-0.065,0.339]				0.004	[-0.270,0.278]				0.044	[-0.242,0.330]
School type 1			ref					ref					ref					ref	
School type 2			0.187	[-0.448,0.823]				0	[-0.597,0.598]				-0.166	[-0.845,0.514]				-0.399	[-1.054,0.255]
School type 3			-0.582	[-1.742,0.578]				0.191	[-0.576,0.958]				-0.055	[-1.290,1.181]				-0.748	[-2.067,0.571]

Coefficients are school-level OLS estimates with HC3 robust SEs. SDH-HL (z) = standardized school-level health literacy on social determinants of health; WSC (z) = standardized workplace social capital. Reference = category reference for school type.
p<0.05, p<0.01, p<0.001.

Figure legends

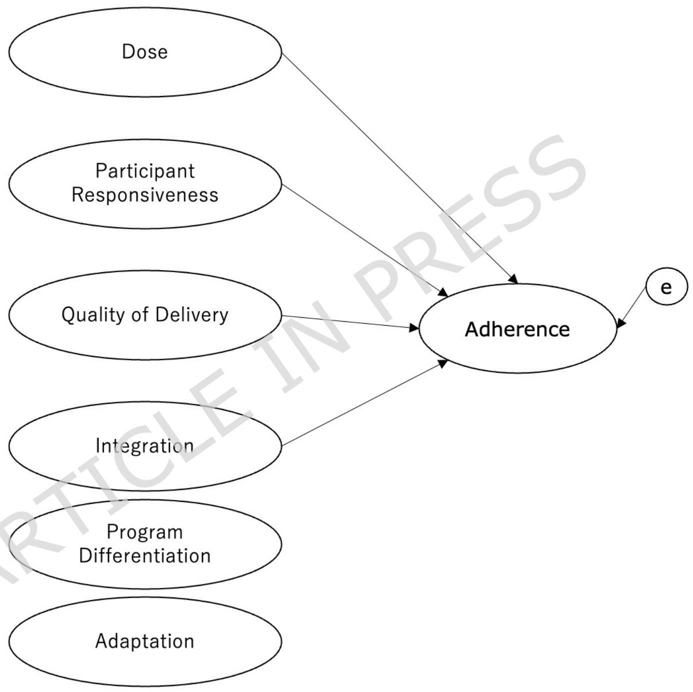
Figure 1. Structural model of the final seven-factor J-HPSIQ SEM (schematic).

Solid arrows indicate regression paths specified in the structural model (Adherence regressed on Dose, Participant Responsiveness, Quality of Delivery, and Integration).

Covariances among exogenous latent factors were freely estimated but are omitted for clarity.

Indicator-level standardized loadings are reported in Table 2.

Program Differentiation and Adaptation were modeled as single-indicator latent variables with factor loadings fixed to 1.0 and error variances constrained based on an assumed reliability of $\rho = 0.70$.


Dose
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