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Four-year trajectory of Korean youth mental health and impacts of school environment and school counselling: a observational study using national schools database

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ABSTRACT

Objectives This study aimed to investigate changes in the mental health status of South Korean adolescents at a school level and identify school-related factors affecting these changes.

Design A retrospective data analysis, population study.

Setting South Korean high schools from 2013 to 2016.

Participants Randomly sampled 827 schools (316 834 boys and 299 304 girls)

Primary outcome measures Mean scores of the Adolescent Mental Health and Problem Behavior Questionnaire-II (AMPQ-II), a school-based mental health screening test, were used to explore changes in youth mental health. Data regarding the school environment and school counselling were gathered from the 'School info' website. A multilevel growth model was used to determine relationships between students' mental health and school-related factors.

Results Students' mental health statuses in South Korea gradually improved over time (coefficient=−1.46 to −1.70, p<0.001). School mobility rates (coefficient=0.93 to 1.00, p<0.05), school dropout rates (coefficient=0.38 to 0.40, p<0.001), school budgets per student (coefficient=−0.05 to −0.06, p<0.01) and number of school counselling sessions (coefficient=0.14, p<0.01) were significantly associated with baseline AMPQ-II scores. The rate of change in AMPQ-II score increased when the number of school counselling sessions was higher (coefficient=−0.03, p<0.05) or the school budget was lower (coefficient=0.02, p<0.001). School environment explained 21.6% of the AMPQ-II baseline score variance and 9.3% of the rate of change variance. School counselling further explained 2.0% of the variance in baseline AMPQ-II scores and 2.3% of the rate of change variance.

Conclusions This study suggests that school environment stability and active provision of school-based mental health services have a positive impact on youth mental health.

INTRODUCTION

Most adolescents acquire knowledge and build social relationships at school and spend much of their time in school-related activities.

Strengths and limitations of this study

► The results of this study can be generalised to all Korean adolescents because it is based on the data of almost all first-year high school students in South Korea.
► The long-term relationship between youth mental health and the school environment, which has rarely been addressed before, is confirmed by advanced statistics.
► Some data that could affect mental health were not included due to restrictions regarding the procurement of the information from the national database.
► In this study, we investigated the relationship between the school environment and student mental health, although further study is needed to identify causality.

Hence, school has a profound influence on the emotional development of adolescents. Academic stress and school violence are well-known risk factors for youth mental problems; some school-related factors, such as good peer relationships, teacher-student interactions and school connectedness, have a protective effect on youth mental health.[1–4] Notably, many previous studies have found a link between the mental health of youth and their experiences within schools.

Students' mental health or perceptions of mental health have been related to the school type, the ratio of females in classrooms and parental involvement in school activities.[5 6] The school environment is also associated with experiences within schools, such as school violence and academic achievement, and is related to students' mental health.[1 4] The numbers of students, socioeconomic statuses of schools and school locations are associated with school violence.[7] Teachers' qualifications and service duration are also associated

with academic achievement.[8] Consequently, there are a variety of school-related factors that can influence youth mental health.

As shown in previous studies, since school-related factors are closely related to youth mental health and experiences, a school's student support policy is vital. To reduce emotional or behavioural problems, and improve the mental health of adolescents, many schools have implemented various school-based mental health interventions. These can proactively respond to students' problems and can also connect at-risk students to necessary services.[9 10] Previous studies have validated the effectiveness of school-based mental health programme.[11] Moreover, programme-specific factors such as programme components and curriculum modalities[12] and the school environment can help sustain programmes that contribute to successful implementation of school-based mental health interventions. Some previous studies have found that the financial stability of the school,[13 14] school mobility,[15] networks with community settings[16–18] and socioeconomic community characteristics[19] are linked to outcomes of school-based mental health interventions.

Therefore, the school environment is an important factor in student mental health and the successful execution of school mental health policies; however, there have been few studies about the relationship between youth mental health and the school environment.[20] Moreover, because most previous studies have only identified cross-sectional effects of school environments on youth mental health, it is difficult to determine the long-term effects. Nevertheless, because it is difficult to identify the impact of the school environment on students during a short period of time, and youth continuously interact with the school environment for extended periods of time, it is necessary to analyse the relationship between youth mental health and school environment in a long-term study.

In South Korea, a nationwide school-based mental health screening test has been conducted by The Ministry of Education annually since 2012. As this test is conducted for all students in grades 1 and 4 of elementary school and in grade 1 for middle and high schools, the youth mental health-related data from this test can be considered representative of the mental health status among all Korean youth. Using these data, we herein investigate which school resources should be supported to effectively improve youth mental health. The aim of this study was to explore changes in the mental health level of South Korean high school students from 2013 to 2016 and to determine the school-related factors that affect changes in student mental health. Furthermore, we investigated how school counselling, a school-based mental health intervention, affects students' mental health through interactions with school environmental factors.

METHODS
Data collection
In 2013, the total number of high schools in South Korea was 2314 and by 2016 that number had only increased slightly. Almost all high schools (99.9%) participated in the school-based mental health screening test from 2013 to 2016. Of these, 827 high schools (316 834 boys, 299 304 girls), approximately 35% of all schools, were randomly sampled retrospectively. School-related information was coded with the school name removed, and no identifiable personal information of the students was included.

To identify school environment factors affecting changes in youth mental health, we combined the average total scores of the school-based mental health screening test with school-related variables of each school. Data on school-related factors were gathered from the school information disclosure website 'School info'.[21] Enormous amounts of data about students and staff, schools status, educational resources and activities, budget and school-level academic achievements for each school are updated annually on publicly accessible 'School info' websites. Among these school-related factors, we selected physical environments or resources of schools that can affect school climate, such as 'school type' (boys', girls', coeducational), 'school mobility rate', 'school dropout rate', 'number of students per teacher', '1 year budget per student in the school' and 'school counselling sessions during 1 year'.

Patient and public involvement
This study is a retrospective analysis using a national database for school information. Therefore, neither the public nor any patients were directly involved this study.

Measurements
Student mental health status at the school level
The annual school-based mental health screening test in South Korea is conducted using the Adolescent Mental Health and Problem Behavior Questionnaire-II (AMPQ-II) for middle and high school students. The AMPQ-II is a self-report questionnaire and consists of 38 items related to emotional and behavioural problems and adverse life event experiences, including mood changes, suicide ideation, conduct problems, thought problems, anxiety, somatisation, sleep, inattention, impulsivity, peer relationships, family conflicts, violence and bullying victimisation.[22 23] The AMPQ-II measures the severity of these problems during the preceding month. Each item is assessed on a 4-point scale (0=not at all, 1=slightly, 2=quite, 3=very much); the higher is the total score, the greater is the severity of the affective and behavioural problems. The AMPQ-II has high internal consistency and good test–retest reliability (α=0.89 and r=0.57, respectively), and there is a positive correlation between the total AMPQ-II score and the global severity index of the Symptom Checklist-90-Revision (r=0.69, p<0.01).[22]

We used the average AMPQ-II scores as the school's mental health status. This was calculated as the total

AMPQ-II scores of all students participating in the test and divided by the number of participating students. Changes in students' mental health status were investigated based on the mean scores of four measurements over the course of 4 years, from 2013 through 2016. The data of the AMPQ-II are not open to the public. Therefore, we used these data after obtaining permission from the Ministry of Education.

School environment factors and school counselling

This study used the school type, school mobility rate, school dropout rate, number of students per teacher and the 1 year budget per student as school environment factors. The number of school counselling sessions per year was used to measure the amount of mental health services delivered to students throughout the school. All school environment variables comprise data for only the year 2013, when assessment of students' mental health began.

Schools were classified as coeducational, boys' or girls' schools. School mobility rates were calculated by dividing the number of students that entered and left by the total number of students at a school. School mobility rates thus indicate the frequency of changes in members of a school. School dropout rates were calculated by dividing the number of students that quit school by the total number of students. The number of students per teacher was measured by dividing the total number of students by the total number of teachers at the school. The budget per student was calculated by dividing the school's total annual budget by the total number of students.

The number of school counselling sessions was determined as the total number of sessions performed in each school during 2013. The number of school counselling sessions was calculated as the sum of the number of psychological counselling and mental health programme sessions that were performed by in-school counsellors or external counsellors at schools and the number of referrals to external professional mental health services. Since the number of counselling sessions was positively skewed, numbers of school counselling sessions were converted to natural logarithms before further analysis.

Statistical analysis

Descriptive statistics (mean, SD) and frequency analyses were conducted to explore the statuses of school environment factors, school counselling and AMPQ-II scores over time.

To assess changes in AMPQ-II scores at the school level and the relationships between these changes and school environment factors, including school counselling, a multilevel growth model was used. The multilevel growth model is an appropriate method to analyse data with a nested structure, considering individual change trajectories over certain time points within schools. First, the unconditional model was used to estimate the initial status and rate of change of students' mental health over time. After confirming mental health status changes over time in the unconditional model, we added school environment factors as predictors for the initial status and time-dependent changes in students' mental health in the second model. In the third model, the number of school counselling sessions was included to investigate the impact of school counselling on students' mental health, along with school environments. The time variable (year) was centred, so that the first measurement time, 2013, was set as the initial status and the data from 2013 to 2016 were replaced with the values 0, 1, 2 or 3. All continuous variables were centred at mean values; school type was treated as a dummy variable. Additionally, we computed intraclass correlation coefficients (ICCs) to examine within-group and between-group variances in the average AMPQ-II total score.

We used Cohen's f^2 as a useful measure of local effect size appropriate for multilevel data.[24] The proportion of variance of the outcome explained by all the predictors in a full model is represented as R_{ab}^2, including the predictor variable 'b'. The denominator, $1 - R_{ab}^2$, represents the proportion of variance of the outcome not explained by the full model. The term R_a^2 represents the proportion of variance of the outcome explained by the predictors in a reduced model with all fixed effects from the full model except for the effect of 'b', and random effects constrained to be the same as those from the full model. The numerator, $R_{ab}^2 - R_a^2$, is the additional proportion of outcome variance solely attributable to 'b'. According to Cohen's guidelines, $f^2 \geq 0.02$, $f^2 \geq 0.15$ and $f^2 \geq 0.35$ represent small, medium and large effect sizes, respectively.[25]

$$f_b^2 = \frac{R_{ab}^2 - R_a^2}{1 - R_{ab}^2}$$

There were no missing data in this study. The STATA V.13.1 software package was used for these analyses.

RESULTS

School characteristics

The averages of the AMPQ-II total score decreased gradually from 2013 to 2016 (table 1). The total number of high schools was 827; of these, 71.6% were coeducational, 13.5% were boys' schools and 14.9% were girls' schools. The average school mobility rate was 2.8% and the average dropout rate was 2.2%. The average number of students per teacher was 12.52 and the average 1-year budget per student was 5 230 000 won for Korean money (about US$4630). An average of 232.20 school counselling sessions were conducted during 1 year in each high school.

Model analyses

The ICC of the unconditional model is 0.30. This means that about 30% of the total variation in a particular outcome lies between individual schools. Table 2 shows the results of the multilevel growth model of high schools. In the unconditional model (model 1), the estimated intercept coefficient was 14.93 (p<0.001) at baseline and the change rate of the total AMPQ-II scores was

Table 1 Status of youth mental health, school environment factors and school counselling

Variables		Values
AMPQ-II	Mean (SD)	
2013		13.94 (2.74)
2014		11.40 (2.7)
2015		10.33 (2.76)
2016		9.42 (2.64)
School type	No (%)	827 (100)
Coeducational school		592 (71.6)
Boys' school		112 (13.5)
Girls' school		123 (14.9)
School mobility rate (%)	Mean (SD)	2.8 (3.0)
School dropout rate (%)	Mean (SD)	2.2 (2.5)
Number of students per teacher	Mean (SD)	12.52 (3.31)
School budget per student (million)	Mean (SD)	5.23 (8.15)
Number of counselling sessions	Mean (SD)	232.20 (224.69)

AMPQ-II, Adolescent Mental Health and Problem Behavior Questionnaire-II.

−1.47 ($p<0.001$, $f^2=0.112$). Notably, the average scores on the AMPQ-II decreased by 1.47 points every year, beginning at 14.93; thus, students' mental health gradually improved from 2013 to 2016. The level 2 variances in the initial status and linear rate of change were statistically significant ($p<0.001$). Additionally, between-school variation (5.56) was greater than between-year variation (0.22). These values indicate that the baseline scores and the rates of change in AMPQ-II scores vary between schools, and differences between schools did not change much over time.

In model 2, girls' schools had higher average scores on the AMPQ-II than boys' schools (coefficient=0.93, $p<0.05$, $f^2=0.002$) at baseline. The school mobility and dropout rates were positively associated with baseline average scores on the AMPQ-II (coefficient=0.08, $p<0.05$, $f^2=0.001$; coefficient=0.40, $p<0.001$, $f^2=0.002$). The budget per student had a negative effect on baseline scores on the AMPQ-II (coefficient=−0.06, $p<0.05$, $f^2=0.004$). The change rate in total AMPQ-II scores increased after controlling for school environment factors (coefficient=−1.70, $p<0.001$, $f^2=0.024$). Among school environment factors, the budget per student had a significant positive effect on the change rate of AMPQ-II scores (coefficient=0.02, $p<0.001$, $f^2=0.007$). In this model, a greater budget per student was associated with a lower rate of change in AMPQ-II scores; in other words, schools with higher budgets had lower rates of mental health improvement. Model 2 explained 21.6% of the AMPQ-II baseline score variance and 9.3% of the variance in the AMPQ-II rate of change.

In model 3, as the number of counselling sessions increased, both the baseline AMPQ-II score and the rate of change increased (coefficient=0.14, $p<0.01$, $f^2=0.004$; coefficient=−0.03, $p<0.05$, $f^2=0.001$). This means that as the number of counselling sessions increased by 1%, the decrease rate increased by 0.03. Furthermore, there were slight changes in the influence of school environment factors on AMPQ-II scores when the number of counselling sessions was inserted in the model. However, school type, mobility rate, dropout rate and budget per student still had significant impacts on AMPQ-II scores.

There was a significant difference between models 2 and 3 (likelihood ratio test=9.82, $p<0.01$). Model 3 explained 23.5% of the variance in baseline scores on the AMPQ-II and 11.7% of the variance in the rate of change on the AMPQ-II. Of all the models, models 2 and 3 had a similar fit, based on values of the Akaike Information Criterion and Bayesian Information Criterion.

DISCUSSION

The mental health of adolescents is known to be greatly influenced by individual factors such as biological vulnerability, personality, family environment or stressful events, as determined by previous studies.[26 27] However, there have been few studies regarding how a school's characteristics (where youth spend the most time outside the home), affect their mental health. Importantly, our findings show that school environment factors and school counselling contribute to students' mental health. Baseline mental health level of girls' schools was worse than boys' schools. Mobility rate and dropout rate of schools were negatively correlated with baseline mental health level, which means schools with lower mobility or dropout rate had better mental health level of students. School budget was positively correlated with baseline mental health level and the rate of change in students' mental health over time. The number of counselling sessions had a positive association with the severity of mental health problems, and a greater number of counselling sessions was associated with an increased rate of improvement in youth mental health.

Coeducational schools and single-sex schools have unique climates that have different effects on academic performance or emotional status, depending on sex.[28 29] In our study, baseline mental health was good in (in descending order) boys' schools, coeducational schools, and girls' schools; this result suggests that the type of school has an impact on the mental health of students. However, emotional problems such as depression and anxiety are more common in girls than boys.[30] Therefore, it is reasonable to interpret that the AMPQ-II scores are more relevant to the percentage of girls than the school type.

School mobility, dropout rate and school budget had also significant impacts on the baseline mental health of students; these factors represent the stability of the school environment. Schools with high mobility or high dropout

Table 2 Results of the multilevel growth model for mean scores of the Adolescent Mental Health and Problem Behavior Questionnaire-II (high schools in South Korea, n=827, year 2013–2016)

		Model 1 (coef (SE))	Model 2 (coef (SE))	Model 3 (coef (SE))
Fixed effects				
Baseline status	Intercept	**14.93 (0.11)***	**14.38 (0.65)***	**13.87 (0.67)***
	School type (ref: boys' schools)			
	Coeducational schools		0.39 (0.31)	0.33 (0.31)
	Girls' schools		**0.93 (0.40)***	**1.00 (0.39)***
	School mobility rate (%)		**0.08 (0.04)***	**0.09 (0.04)***
	School dropout rate (%)		**0.40 (0.05)***	**0.38 (0.05)***
	Number of students per teacher		−0.05 (0.04)	−0.06 (0.04)
	School budget per student (million)		**−0.06 (0.02)****	**−0.05 (0.02)****
	Number of counselling sessions (ln)			**0.14 (0.05)****
Linear rate of change	Intercept	**−1.46 (0.03)***	**−1.70 (0.20)***	**−1.59 (0.21)***
	School type (ref: boys' schools)			
	Coeducational schools		0.09 (0.10)	0.10 (0.10)
	Girls' schools		−0.12 (0.12)	−0.14 (0.12)
	School mobility rate (%)		−0.02 (0.01)	−0.02 (0.01)
	School dropout rate (%)		−0.02 (0.02)	−0.02 (0.02)
	Number of students per teacher		0.01 (0.01)	0.02 (0.01)
	School budget per student (million)		**0.02 (0.01)***	**0.02 (0.01)***
	Numbers of counselling sessions (ln)			**−0.03 (0.01)***
Random effects				
Level 1	Temporal variation	3.21 (0.11)***	3.20 (0.11)***	3.20 (0.11)***
Level 2	Initial status	5.56 (0.54)***	4.36 (0.48)***	4.25 (0.48)***
	Linear rate of change	0.22 (0.05)***	0.20 (0.05)***	0.19 (0.05)***
	Covariance (initial status, linear rate of change)	−0.58 (0.14)	−0.50 (0.13)	−0.48 (0.13)
Model information				
	R^2 (baseline status)	–	21.6%	23.5%
	R^2 (rate of change)	–	9.3%	11.7%
	AIC	14 983.63	14 804.35	14 798.53
	BIC	15 020.25	14 914.22	14 920.62
	Wald χ^2 (df)	2061.98 (1)***	2248.11 (8)***	2363.14 (15)***
	LR test		203.28 (12)***	9.82 (2)**

*p<0.05; **p<0.01; ***p<0.001.
AIC, Akaike Information Criterion; BIC, Bayesian Information Criterion; coef, intercept coefficient; ln, factor converted to natural logarithm; LR, Likelihood Ratio.

rates are likely to belong to regions where community members move frequently, with corresponding unstable socioeconomic statuses.[31] An unstable educational environment was associated with a risk of adverse life events for adolescents, such as poverty, bullying or legal problems, which negatively affect youth mental health.[15 17 32–35] In this study, school mobility and dropout rates were negatively correlated with the baseline status of youth mental health. These results support previous findings that there is a positive association between school stability and student mental health. However, school stability did not significantly affect the rate of mental health changes. School transfers and dropouts can be the result of mental health problems of adolescents, which should be verified

through subsequent studies regarding whether improvements in youth mental health reduces school mobility or dropout rates.

Among all the school environment factors, only the school budget per student correlated with a lower rate of mental health improvement; this is presumably because the baseline mental health status is better in schools with higher budgets, so there may be smaller changes since students already exhibit good mental health, compared with schools where students exhibit poor mental health. However, school financial stability is an important factor affecting the quality and sustainability of school-based mental health services.[13 14] As school budgets increase, there is a greater possibility that larger investments will be made in student mental health that can lead to consistent and stable school-based mental health services.

Notably, in this study, the number of counselling sessions contributed significantly to the improvement of student mental health statuses; this single factor, school counselling, further explained 2.33% of the variance in the rate of change. Psychological counselling in school is an important resource in that it is easily accessible when needed; thus, students can maintain ongoing counselling while attending school. Previous studies have reported that school-based mental health services positively affect students' mental health.[36] Although many schools have mental health programmes for students, there have been few studies that demonstrate the effectiveness of psychological counselling, which is the most important daily work of school-based mental health programmes.

In high schools, an increased number of counselling sessions was associated with a worse baseline status regarding student mental health; however, it reinforced the tendency for mental health improvements and effects that were independent of the school's environmental constraints. In schools where many students experience mental health problems, school-level intervention is more likely; thus, baseline mental health and school counselling may be proportionate. However, this study shows the potential for active interventions to improve overall students' mental health problems, even in schools where students are struggling with mental health problems. Furthermore, because the number of counselling sessions is a mixture of counselling in the school and by external experts, the effects of professional treatment should also be considered. School-based mental health services promote the involvement of students with emotional or behavioural problems in external treatment processes,[9 10 37] thereby increasing the effectiveness of mental health policies for students.[16 17] The results of this study indicate that school-level primary interventions and connecting to a community network are effective for improving students' mental health. A school-based mental health service is a gateway to professional counselling; hence, its importance should be further emphasised.

This study has the following limitations. Considering the nature of the school-based mental health assessment and the fact that the AMPQ-II questionnaire represents a self-report assessment, it is possible that the magnitude of mental health problems, especially externalising symptoms, was underestimated due to factors such as respondents' social desirability bias. In addition, our analysis does not include factors related to school climate or individual and regional characteristics such as socioeconomic status or urbanisation level that can affect one's mental health status. This was due to limitations regarding the available information and the methodological difficulty of finding and analysing data of over 800 schools manually. In future studies, these limitations should be considered. Additionally, the school counselling variable included counselling conducted by external institutions, which could not be separated from school-based counselling. This problem was related to the original form of the raw data from the 'School info' websites; therefore, caution is needed to carefully interpret the effects of school counselling. In addition, it was difficult to establish a causal relationship between students' mental health and school factors because there was no control group.

Despite these limitations, this study provides direction for effective school-based mental health policies, based on results derived by applying advanced statistical analyses to data from nearly all high schools in South Korea. School stability and students' mental health exhibit a significant correlation, and the mental health of students can be supported by a stable financial and physical school environment. Moreover, active school-level interventions promote long-term improvements in students' mental health. In the future, national-level and school-level efforts should be made to identify and improve additional school environment factors that may affect the mental health of adolescents; further studies are needed to prove the effectiveness of linking external mental health resources in the context of school-based mental health services.

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