

BMJ Open Impact of acculturation and psychological adjustment on mental health among migrant adolescents in Guangzhou, China: a cross-sectional questionnaire study

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ABSTRACT

Objectives The aim of this study was to examine the pathway and associations among acculturation (ie, language, social interaction and lifestyle), psychological adjustment and mental health of internal migrant adolescents in China.

Design Cross-sectional questionnaire study.

Setting Six private migrant junior high schools located in Tianhe and Baiyun districts in Guangzhou were chosen as the study sites.

Participants A total of 1122 migrant adolescents aged 11–17 years old completed the study.

Main outcome measures Mental health was measured by using the Social Anxiety Scale for Children (SASC) and major depression disorder (MDD) in a Brief Child and Family Phone Interview. Acculturation and psychological adjustment were measured by a self-designed and verified questionnaire. Multiple regression models and structural equation models were performed to analyse the association among acculturation, psychological adjustment and mental health while controlling for participant demographic characteristics.

Results The average MDD score for boys was 8.78 (SD=2.17) and for girls was 8.56 (SD=2.22), while the average SASC score for boys was 14.67 (SD=3.72) and for girls was 13.41 (SD=4.01). Psychological adjustment had a direct positive effect on MDD ($p<0.001$, $\beta=0.30$) and SASC ($p<0.001$, $\beta=0.28$), and it was the key variable fully mediating the impact of acculturation components on MDD and partly mediating the impact of acculturation on SASC, whereas lifestyle showed a direct negative effect ($p=0.003$, $\beta=-0.17$) on SASC. Of the three acculturation components, lifestyle had the strongest influence on psychological adjustment ($p<0.001$, $\beta=0.37$ and 0.51), followed by social interaction ($p<0.001$, $\beta=0.24$ and 0.13) and language ($p<0.001$, $\beta=0.17$ and 0.11).

Conclusions The association between acculturation and the mental health of internal migrant adolescents was complex and could be mediated by psychological adjustment. Interventions such as promoting local language and social interaction are needed to enhance psychological adjustment and further improve the mental health of migrant adolescents.

Strengths and limitations of this study

- This is the first known study to investigate the applicability of acculturation theory in understanding mental health problems among migrant adolescents in China. Our findings provide new ways to improve the mental health of migrant adolescents in China.
- The underlying mechanism of the effects of acculturation on the mental health of migrant adolescents was not comprehensively analysed in previous studies, and we used structural equation modelling to clearly quantify the integrated effect of various acculturation dimensions on mental health, which will provide evidence for improving the psychological intervention strategy for migrant adolescents.
- The reliability and validity of the scale for measuring the acculturation of migrant adolescents need to be further improved.
- The results of this cross-sectional study cannot be used to make causal inferences regarding acculturation and mental health because it did not control for all possible confounding variables.

INTRODUCTION

The United Nations reported a 49% increase in international migration between 2000 and 2017, resulting in an estimated 258 million international migrants.¹ Internal migrant populations worldwide are even larger, and a quarter of this total was accounted for by China's 245 million internal migrants.² According to a national report in 2014, 62.5% of internal migrants in China were accompanied by their families.³ As a result, there were 35.81 million internal migrant adolescents <17 years old in China in 2010, up by 41.37% since 2005,⁴ and they accounted for 12.8% of the overall adolescent population in China.⁵

Concerns for the welfare of these internal migrant adolescents were exacerbated in China by the household registration (hukou in Chinese) system, which would traditionally

block migrant adolescents who do not have a city registration from getting an education in urban public schools.⁶⁻⁸ In addition, similar to international migrant adolescents worldwide, internal migrant adolescents also had to adjust to significant differences in dialects, culture, economic development and social environment across different regions of China.⁹ Poor educational investment and the acculturation pressure could have a negative influence on migrant adolescents' overall well-beings, especially putting stress on their mental health.^{10 11}

Findings from global studies on the mental health of migrant and non-migrant adolescents have been contradictory.¹² Some studies have found that migrant adolescents had better mental health outcomes than adolescents in the host community.^{13 14} In contrast, others have shown that migrant adolescents had poorer mental health outcomes than their non-migrant counterparts.^{15 16} These contradictory results could be a result of differences in migrant characteristics and methods of measurement in these studies.¹² However, a literature review showed that the mental health of internal migrant adolescents in China was inferior compared with that of local adolescents in the majority of studies due to the influence of the hukou system.¹⁷ In particular, a study in Guangzhou showed that the detection rate of depressive symptoms in migrant adolescents was 21.8%, far higher than in local adolescents (11.2%),¹⁸ which was also higher than in local adolescents in other countries.¹⁹ Mental problems in childhood and adolescence have been associated with many negative outcomes, including impaired social, work and family functioning in adolescence and into adulthood.²⁰ Therefore, a better understanding of the risk factors for mental health within this vulnerable population is important for the public health of internal migrant adolescents in China.

Studies have shown that among many factors that affect adolescents' mental health, acculturation is uniquely relevant to migrant adolescents.²¹ Acculturation has been conceived as a dynamic process involving multiple aspects in which individuals gradually adjust to a new environment.²² In this process, migrants had to face psychological distress brought on by major life changes that might lead to deterioration in mental health.²³ Many studies have found acculturation to be associated with mental health in various types of immigrants,^{24 25} but there were no obvious or consistent patterns of findings that could be identified.²⁶ While acculturation appeared inversely related to morbidity in some populations,^{27 28} psychiatric disorders increased with acculturation in others.^{29 30}

Due to the uncertain nature of these findings, they have seldom been brought to bear on prevention or intervention-oriented programmes in mental health-related areas.³¹ These contradictory findings might result from disparities between measurement instruments because there was no generally accepted acculturation model, and these studies adopted different dimensions to measure acculturation.²⁶ On the other hand, many studies have combined acculturation into a composite

score to explore its relationship with health,^{27 32 33} which might blur the potentially variable effects of different acculturation dimensions on mental health.³⁴ In addition to these limitations, the mechanism of acculturation affecting the mental health of migrant adolescents has not been well investigated. Previous studies have shown that psychological adjustment is one of the main outcomes of acculturation,^{35 36} while psychological adjustment reflected migrants' cognitive, emotional and perceptual responses in new life circumstances.^{37 38} Meanwhile, psychological adjustment was indicated to be closely related to mental health.³⁹ Therefore, psychological adjustment might play an important role in the relationship between acculturation and mental health. Finally, the majority of studies examining the association between acculturation and mental health in ethno-cultural groups were conducted with Latino and Asian samples,⁴⁰ but few studies have focused on internal Chinese migrants, especially on adolescents. Thus, we hypothesised that acculturation of adolescents could affect their mental health directly and indirectly via psychological adjustment.

Therefore, the primary aim of this study was to confirm this hypothesis using a structural model analysis with data from a cross-sectional study in Guangzhou, China. Specifically, we aimed to (1) assess the status of mental health and acculturation of migrant adolescents and (2) test the aforementioned hypothesised structural relationship among acculturation, psychological adjustment and mental health of migrant adolescents, and explore the impact of each acculturation dimension on mental health.

METHODS

Study sites

This cross-sectional survey study was conducted in Tianhe and Baiyun districts in Guangzhou, China, from April to May 2016. Guangzhou is the capital city of Guangdong Province with a population of 12.7 million, and has led the economic reform and openness in China since the 1980s. Guangzhou has also become a major receiving city with 0.6 million internal migrant adolescents.^{4 5}

As the capital city of Guangdong province, Guangzhou has its distinctive Cantonese culture, language and customs. The primary dialect spoken in Guangzhou, Cantonese, is unique to Guangdong province and its adjacent areas including Hong Kong and Macau. This unique language environment adds significant barriers for migrant adolescents' adaptation to the social and cultural environment of Guangzhou compared with other regions of China. Tianhe and Baiyun districts were chosen to be the study sites due to their large migrant populations. Since 95% of migrant adolescents in Guangdong province are studying in schools,⁴¹ using a purposive sampling method, we chose three private junior high schools with large numbers of migrant students in each district.

Study participants and sampling

All migrant students in grades 7–8 from these six schools participated in the study. All eligible students completed a self-administered questionnaire. The study inclusion criteria were as follows: (1) students in the chosen grade of the school did not have hukou in Guangzhou, (2) at least one of the students' parents did not have hukou in Guangzhou and (3) students were <18 years old.

The survey took 20–30 minutes for each student to complete. Meanwhile, to ensure the independence and anonymity of the survey, the research assistants were required to wait for completion of the questionnaires outside the classroom. After collecting each questionnaire, the research assistants would check it carefully and contact the adolescent immediately if they found an important answer in the questionnaire missing. Research assistants received standardised training by the research team, and quality control was implemented during data collection.

Each adolescent was asked to give informed consent form to their parents or guardians and have them sign it before filling out the questionnaire.

Patient and public involvement

No patients were involved in this study. Study participants were offered feedback of the study results and will be informed of this publication.

Measurement

Dependent variables: mental health

The indicators of mental health included anxiety and depression indices. Anxiety was measured by the Social Anxiety Scale for Children (SASC), and depression was measured by the dimension of major depression disorder (MDD) in the Brief Child and Family Phone Interview. The SASC was developed to measure social anxiety among American adolescents between 7 and 16 years of age, and it included 10 items yielding two dimensions, including fear of negative evaluation and social avoidance and distress. The response to each item is scored on a 3-point scale (0=always, 1=sometimes, 2=never), with total scores ranging from 0 to 20, and higher scores indicated less anxiety.⁴² The MDD was developed to measure major depression among Ontario adolescents between 6 and 18 years of age, and it consisted of six items scored on a 3-point scale (0=always, 1=sometimes, 2=never), with a total score ranging from 0 to 12. Higher scores indicated less depression.⁴³ The Cronbach's alpha of SASC applied to normal Chinese adolescents was 0.79,⁴⁴ and the Cronbach's alpha of MDD applied to Ontario adolescents was 0.86.⁴³

Independent variables: acculturation and psychological adjustment

Gordon described acculturation, or cultural and behavioural assimilation, as a phase of assimilation, which was the foundation of unidimensional acculturation theory.⁴⁵ In this theory, individuals were placed on a continuum of identities ranging from exclusively

heritage culture to exclusively mainstream culture. More recently, Berry put forward the bidimensional acculturation theory,⁴⁶ which suggested that both heritage and mainstream cultural identities were free to vary independently, and acculturation strategies could be divided into four categories: separation, integration, assimilation and marginalisation. Despite some evidence in favour of bidimensional acculturation,⁴⁷ the majority of self-report acculturation scales reflected a unidimensional framework in public health studies.⁴⁸ The majority of these studies showed that a linear relationship between acculturation and psychological distress was better demonstrated by the unidimensional model,³¹ while only a few studies showed a curvilinear relationship that was better demonstrated by the bidimensional model.²⁶ On the other hand, the measurement of unidimensional acculturation was simpler than that of bidimensional acculturation and convenient for young adolescents to understand in the data collection process.⁴⁷ Therefore, the unidimensional acculturation theory was adopted in this study. Based on a comprehensive literature review,^{49 50} the research team designed the questionnaire to measure acculturation, which consisted of 11 items with a total score ranging from 11 to 45 (see table 1). Higher scores indicate individual's higher acceptance of the host culture. Acculturation was measured by three latent variables: social interaction (two items), lifestyle (five items) and language (four items). Lifestyle consists of questions about preferences for food (two items), clothing (two items) and social custom (one item). Each item had three to five choices. Some questions were rated on a scale ranging from 1 ('No') to 3 ('Yes'), some questions were rated on a scale ranging from 1 ('Completely not/Never') to 4 ('Completely/Usually'), and some questions were rated on a scale ranging from 1 ('Never') to 5 ('Always').

Psychological adjustment focused on emotional reactions during cross-cultural transitions,⁵¹ and it was measured by four questions that asked about 'sense of belonging'⁵² and 'satisfaction of urban life'⁵³ in this study. Sense of belonging was assessed by one question with a scale ranging from 1 ('outsiders') to 4 ('Guangzhou people'). Satisfaction of urban life was assessed by three questions with a scale ranging from 1 ('Very not') to 5 ('Very sure').

Demographic and other covariates

To better understand the association between acculturation and mental health, we also included demographics that were reported to be associated with mental health in children and adolescents. These adjustment variables included age (in years), gender (male or female), place of origin (Guangdong province or other provinces in China) and length of stay in Guangzhou (in years).^{19 54}

Data processing and statistical analysis

Statistical analyses were performed using the software IBM SPSS V.20.0 and IBM Amos V.24.0. Descriptive statistics including the mean, SD, frequency and proportion

Table 1 Psychological adjustment and acculturation of migrant adolescents

Items	N (%)	Mean (SD)	Item-total r	Cronbach's α
<i>Psychological adjustment</i>				0.665
1. Where do you think you belong to?		1.89 (1.02)	0.66	
Outsiders	575 (51)			
Unknown	170 (15)			
Both	297 (27)			
Guangzhou people	80 (7)			
2. Do you like Guangzhou?		3.91 (0.75)	0.86	
Very not	9 (1)			
Not	19 (2)			
Unclear	254 (23)			
Like	619 (55)			
Very like	221 (20)			
3. Are you satisfied with your life in Guangzhou?		3.87 (0.72)	0.80	
Very not	8 (1)			
Not	29 (3)			
Unclear	237 (21)			
Sure	677 (60)			
Very sure	171 (15)			
4. Would you like to live in Guangzhou always?		3.59 (0.95)	0.60	
Very not	16 (1)			
Not	176 (16)			
Unclear	203 (18)			
Sure	582 (52)			
Very sure	145 (13)			
<i>Lifestyle</i>				0.524
5. Do you like to celebrate the Spring Festival in Guangzhou?		2.16 (0.93)	0.49	
Very not	341 (30)			
Not	331 (30)			
Average	379 (34)			
Sure	71 (6)			
6. Do you think Guangzhou people dressed nice?		2.29 (0.49)	0.60	
Not	20 (2)			
Average	758 (68)			
Yes	344 (31)			
7. Do you like the clothes in Guangzhou?		3.06 (1.17)	0.57	
Very not	33 (3)			
Not	429 (38)			
Unclear	252 (23)			
Sure	242 (22)			
Very sure	166 (15)			
8. Do you eat Cantonese cuisine?		2.88 (0.84)	0.30	
Always	55 (5)			
Usually	99 (9)			
Sometimes	703 (63)			
Once in a while	188 (17)			

Continued

Table 1 Continued

Items	N (%)	Mean (SD)	Item-total r	Cronbach's α
Never	77 (7)			
9. Do you like to eat Cantonese cuisine?		1.75 (0.84)	0.41	
No	571 (51)			
Average	261 (23)			
Yes	290 (26)			
<i>Social interaction</i>				0.553
10. Where did your major good friends come from?		1.61 (0.66)	0.50	
Outside	543 (48)			
Both place	470 (42)			
Local	109 (10)			
11. Do you hope your classmates and friends to be local children?		1.89 (0.57)	0.74	
No	247 (22)			
Average	749 (67)			
Yes	126 (11)			
Language				0.811
12. Can you understand Cantonese?		2.69 (0.93)	0.87	
Completely	268 (24)			
Mostly	335 (30)			
A little	419 (37)			
Completely not	100 (9)			
13. Can you speak Cantonese?		2.00 (0.94)	0.82	
Completely	110 (10)			
Mostly	159 (14)			
A little	470 (42)			
Completely not	383 (34)			
14. Do you watch TV programmes in Cantonese?		2.38 (0.97)	0.63	
Usually	181 (16)			
Sometimes	280 (25)			
Once in a while	441 (39)			
Never	220 (20)			
15. Do you listen to Cantonese songs?		2.48 (0.94)	0.51	
Usually	185 (17)			
Sometimes	338 (30)			
Once in a while	426 (38)			
Never	173 (15)			

were used to summarise the demographics, acculturation, psychological adjustment and mental health of the study participants. Differences in mental health by demographic variables were assessed using t-test or F-test. Multivariate regression models were conducted to assess the association between latent variables of acculturation and mental health. The latent variables of acculturation were the independent variables, and the scores of SASC and MDD were the dependent variables. Demographic variables were used as confounding factors. Structural equation model (SEM) was used to assess the proposed

structural relationship among the acculturation dimensions, psychological adjustment and mental health. Data-model fitting in the SEM analysis was assessed using the following four indices: goodness of fit index (GFI) (>0.9), comparative fit index (CFI) (>0.9), root mean square error of approximation (RMSEA) (<0.05) and the X^2 associated with each degree of freedom (CMIN/df) (<3). Cronbach's alpha was computed to assess the reliability of the latent variables. The construct validity of the acculturation measurement was evaluated by the model fitting indices of confirmatory factor

Table 2 Demographic characteristics by anxiety (SASC) and major depression (MDD) scales among 1122 migrant adolescents in Guangzhou, China, in 2016

Variables	N (%)	MDD Mean (SD)	P value	SASC Mean (SD)	P value
Gender			0.097		<0.001
Boys	621 (55)	8.78 (2.17)		14.67 (3.72)	
Girls	501 (45)	8.56 (2.22)		13.41 (4.01)	
Age (years)			0.003		0.043
11–12	75 (7)	9.01 (2.30)		14.47 (4.09)	
13	391 (35)	8.97 (2.10)		14.51 (3.89)	
14	452 (40)	8.49 (2.28)		13.86 (3.91)	
15–16	204 (18)	8.47 (2.07)		13.77 (3.80)	
Place of origin			0.318		0.525
Guangdong province	592 (53)	8.75 (2.16)		14.04 (3.75)	
Other province	530 (47)	8.62 (2.23)		14.19 (4.08)	
Length of stay in Guangzhou			0.132		0.444
<5 years	241 (22)	8.57 (2.18)		14.24 (3.94)	
5–10 years	317 (28)	8.56 (2.16)		14.29 (3.69)	
>10 years	540 (48)	8.83 (2.22)		13.97 (4.04)	

MDD, major depressive disorder; SASC, Social Anxiety Scale for Children.

analysis (CFA) and the composite reliability of each latent variable.

RESULTS

A total of 1233 adolescents completed the questionnaire in this survey. The response rate was 92.1%; 83 were excluded because of contradictions in the information provided, 28 were excluded because of incomplete data for several key variables (eg, questions about acculturation and mental health), yielding 1122 participants (91.0%) for analysis. **Table 2** demonstrates that among the 1122 participants, there were more boys (55%) than girls (45%), and most of them (93%) were aged 13–16 years old, nearly half of them (47%) came from other provinces, and many of them (78%) have lived in Guangzhou for more than 5 years. There were significant differences between boys' scores (14.67±3.72) and girls' scores (13.41±4.01) on the anxiety scale ($p<0.001$). The boys' MDD mean score was 8.78±2.17, and the girls' MDD mean score was 8.56±2.22. The mean scores of SASC and MDD for participants were significantly different by age ($p<0.05$; $p<0.01$). Students who were younger had better mental health compared with older students.

Table 1 shows that in psychological adjustment, only 7% of the surveyed adolescents considered themselves to be Guangzhou people, but the ones who loved and were willing to live in Guangzhou accounted for >60% of these adolescents. In the lifestyle dimension, 98% of adolescents had acceptance of urban clothing, and many of the adolescents preferred the lifestyle in their hometown in terms of traditional customs and diet. In

the social interaction dimension, many of migrant adolescents (48%) failed to interact with local adolescents. In the language dimension, 54% of the adolescents could understand the local language (item score≥2), but only 24% of the adolescents could speak the local language (item score≥2). The mean scores of these questions were computed for modelling analysis.

Table 3 shows that multiple regression analysis indicated a positive relationship among the total MDD score, total SASC score and psychological adjustment after controlling for age, gender, place of origin and residence time ($p<0.001$), while the total SASC score had a negative relationship with lifestyle ($p=0.03$). The language and social interaction had no significant correlation with total MDD score and total SASC score ($p>0.05$).

SEM was used to explore the internal relationships among the latent variables of acculturation, psychological adjustment and their impact on mental health.

Figure 1 shows that psychological adjustment had a direct effect on MDD ($\beta=0.30$), and it was the key variable fully mediating the impact of acculturation components on MDD. Of the three acculturation components, lifestyle had the strongest influence on psychological adjustment ($\beta=0.37$), followed by social interaction ($\beta=0.24$) and language ($\beta=0.17$). The data-model fit indices were GFI=0.97, CFI=0.96, RMSEA=0.03, and CMIN/df=2.1. **Figure 2** also shows that psychological adjustment had a direct effect on SASC ($\beta=0.28$) and that it fully mediated the impact of two acculturation components (ie, language and social interaction) on SASC, whereas lifestyle showed both a direct negative effect

Table 3 Associations between acculturation dimensions, psychological adjustment and mental health scales (MDD and SASC) after the adjustment of demographic characteristics among 1122 migrant adolescents in Guangzhou, China, in 2016

Variables	MDD		SASC	
	β (95% CI)	P value	β (95% CI)	P value
Language	0.04 (−0.02 to 0.08)	0.194	0.04 (−0.03 to 0.14)	0.219
Social interaction	−0.05 (−0.24 to 0.01)	0.085	−0.04 (−0.39 to 0.07)	0.178
Lifestyle	−0.03 (−0.08 to 0.03)	0.404	−0.07 (−0.21 to 0.01)	0.030
Psychological adjustment	0.28 (0.19 to 0.32)	<0.001	0.19 (0.20 to 0.42)	<0.001
Gender				
Boy (ref)				
Girl	−0.07 (−0.57 to 0.06)	0.015	−0.17 (−1.81 to 0.89)	<0.001
Place of origin				
Guangdong province (ref)				
Other province	0.02 (−0.19 to 0.37)	0.532	0.04 (−0.23 to 0.78)	0.287
Age (years)				
11–12 (ref)				
13	0.01 (−0.49 to 0.56)	0.893	0.03 (−0.72 to 1.18)	0.630
14	−0.09 (−0.93 to 0.12)	0.132	−0.05 (−1.31 to 0.58)	0.446
15–17	−0.07 (−0.95 to 0.19)	0.194	−0.05 (−1.57 to 0.50)	0.309
Length of stay in Guangzhou				
<5 years (ref)				
5 to 10 years	−0.05 (−0.58 to 0.14)	0.235	−0.01 (−0.77 to 0.53)	0.711
>10 years	−0.01 (−0.40 to 0.28)	0.737	−0.06 (−1.08 to 0.14)	0.130

β , standardised regression coefficient; MDD, major depressive disorder; SASC, Social Anxiety Scale for Children.

(β =−0.17) and an indirect positive effect via psychological adjustment on SASC. Of the three acculturation components, lifestyle had the strongest influence on psychological adjustment (β =0.51), followed by social interaction (β =0.13) and language (β =0.11). The data-model fit indices were GFI=0.97, CFI=0.97, RMSEA=0.03 and CMIN/df=2.2. In total, psychological adjustment had the greatest impact on both MDD and SASC. A higher level of language and social interaction indicated less anxiety and depression, while a lifestyle towards mainstream culture indicated more anxiety and less depression. The influence coefficients of each latent variable on mental health are shown in [table 4](#).

We evaluated the scales to confirm their reliability and validity. In our study, SASC demonstrated a Cronbach's α coefficient of 0.82, and MDD demonstrated a Cronbach's α coefficient of 0.78. Even though the scales of acculturation and psychological adjustment were self-developed, most correlation coefficients of each question's score and the total score of the dimension exceeded 0.5, and the Cronbach's α of each latent variable exceeded 0.5 while the Cronbach's α of the overall scale exceeded 0.7 (see [table 1](#)). This indicated that the questionnaire had acceptable reliability. In [figure 1](#), the composite reliability results for the latent variables are 0.8082 (language), 0.5616 (social interaction), 0.5952 (lifestyle) and 0.8233 (psychological adjustment) and those in [figure 2](#) are

0.8028 (language), 0.5935 (social interaction), 0.5176 (lifestyle) and 0.8134 (psychological adjustment). These indices all exceed 0.5. On the other hand, the results for the CFA of the acculturation measurement showed good data-model fit indices: p =0.129>0.05, CMIN/df=1.26, GFI=0.992, CFI=0.996, RMSEA=0.015 (see [figure 3](#)). This indicated that the scale of acculturation had acceptable construct validity.⁵⁵

DISCUSSION

Results and discussion

This was the first known study to investigate the applicability of acculturation theory in understanding the mental health problems among the internal migrant adolescents in China. We found that language and social interaction were positively correlated with mental health, while lifestyle showed mixed correlations with mental health. The underlying pathway of this relationship was explored. Three latent variables of acculturation indirectly affect mental health through psychological adjustment, of which lifestyle had the greatest impact on psychological adjustment, followed by social interaction and language.

A total of 1122 valid samples were included in the analysis. The sample size met the requirement for multivariable analysis, which should be 10 times more than the number of variables.⁵⁶ Anxiety and depressive symptoms

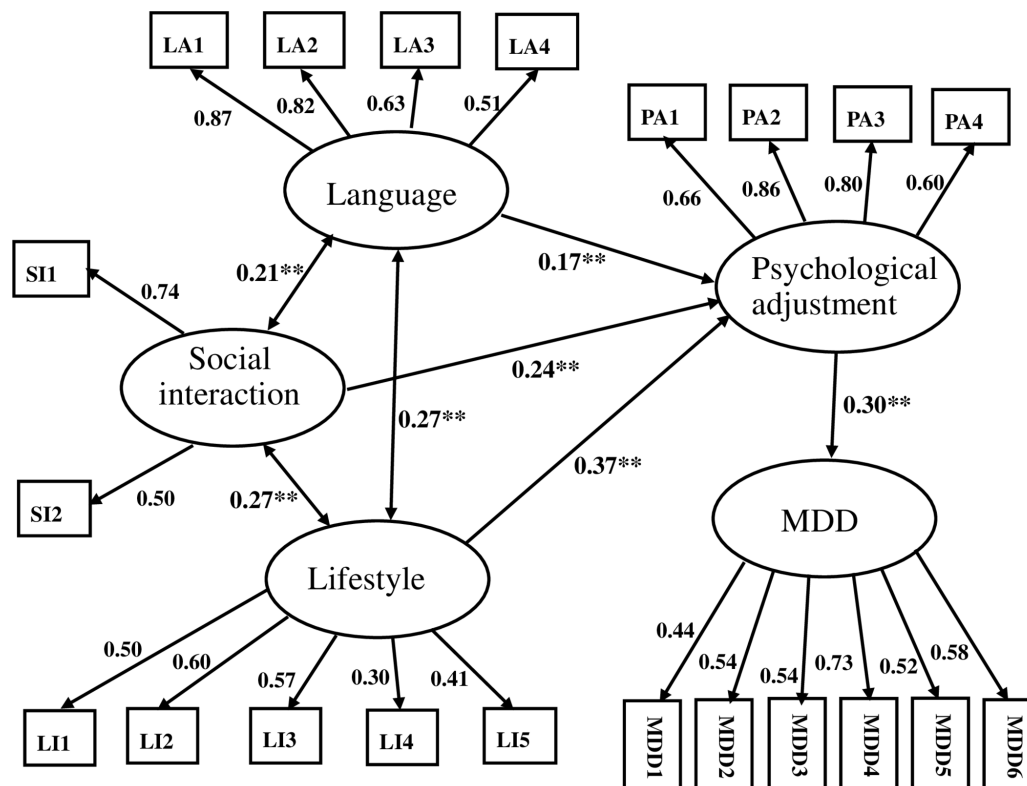


Figure 1 Structural equation modelling of acculturation, psychological adjustment and MDD. Standardised path coefficients were reported, and only significant paths are depicted in the figure. The data-model fit indices are GFI=0.97, CFI=0.96, RMSEA=0.03, CMIN/df=2.1. ** $p < 0.001$. CFI, confirmatory fit index; GFI, goodness of fit index; LA1–LA4, the four items measuring respondents' language; LI1–LI5, the five items measuring respondents' lifestyle; MDD1–MDD6, the six items measuring respondents' major depression; PA1–PA4, the four items measuring respondents' psychological adjustment; RMSEA, root mean square error of approximation; SI1–SI2, the two items measuring respondents' social interaction.

among migrant adolescents between 11 and 17 years of age were found to be relatively serious in this study. The mean MDD scores of boys and girls were 8.78 and 8.56, respectively, very close to the mean score of 8.11 of adolescents referred to mental health outpatient services in Ontario.⁵⁷ The average SASC scores of migrant adolescents were significantly lower than the scores of normal Chinese adolescents aged 13–16 years old (boys: 14.67 vs 16.34, respectively; girls: 13.41 vs 15.59, respectively).⁴⁴ In addition, migrant girls experienced more anxiety than boys, and older adolescents experienced more anxiety and depressive symptoms than their younger peers. These results are consistent with the previous literature.¹⁹ All these findings emphasised the urgent need for improvement in migrant adolescents' mental health, especially among older girls. The average acculturation score of migrant adolescents was in the middle. It showed that the level of acculturation of migrant adolescents had much room for improvement.

The findings from the multiple regression analysis and SEM largely supported our hypothesis as when the important role of psychological adjustment on acculturation manifested in the model. Psychological adjustment directly and positively affected the level of mental health ($\beta=0.30$ and 0.28), and it was considered to be the higher level of integration and also to be the outcome

of acculturation.³⁶ Thus, this view was verified among Chinese migrant adolescents in our study.

The indirect relationships between acculturation components (ie, language, social interaction and lifestyle) and mental health via psychological adjustment were also significant. Although language was found to be an important factor in acculturation among international immigrants⁵⁸ and international students,⁵⁹ it had the least influence on psychological adjustment in this study. This difference was mainly because Mandarin was widely used at school, which diminished the language barrier. Compared with language, social interaction had a larger influence on psychological adjustment ($\beta=0.24$ and 0.13). Previous research showed a similar conclusion that fewer mental health problems were found among adolescents making friends from their own and other cultures.⁶⁰ Unfortunately, the cross-cultural friendships of immigrant adolescents were less reciprocal than the same culture friendships.⁶¹ The same situation also occurred in our study; 48% of migrant adolescents had no friends among the local adolescents, and only 11% of migrant adolescents hoped to make friends with local adolescents. Hence, further understanding of the persistence of traditional social groups and identities was crucial for the development of psychological adjustment that will ensure mental health. In contrast to the other two, lifestyle

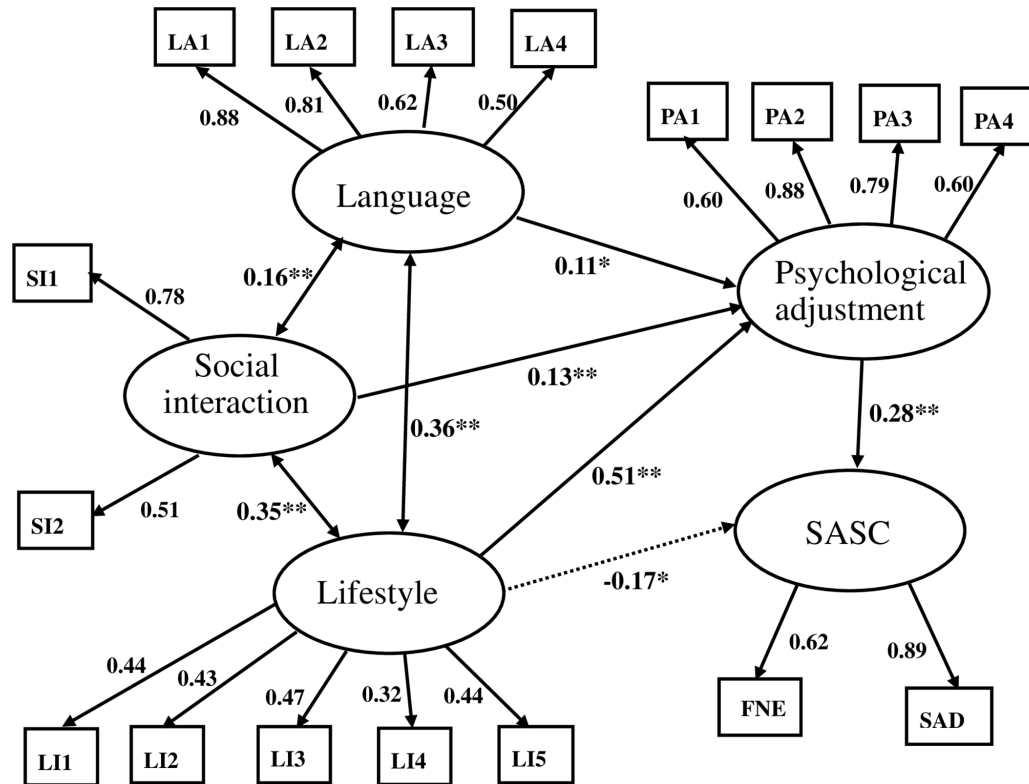


Figure 2 Structural equation modelling of acculturation, psychological adjustment and SASC. Standardised path coefficients were reported, and only significant paths are depicted in the figure. Dotted line represents negative relationship. The data-model fit indices are GFI=0.97, CFI=0.97, RMSEA=0.03, CMIN/df=2.2. *p<0.05 **p<0.001. CFI, confirmatory fit index; FEN, fear of negative evaluation; GFI, goodness of fit index; LA1–LA4, the four items measuring respondents’ language; LI1 – LI5, the five items measuring respondents’ lifestyle; MDD1 –MDD6, the six items measuring respondents’ major depression; PA1 – PA4, the four items measuring respondents’ psychological adjustment; RMSEA, root mean square error of approximation; SAD, social avoidance and distress; SASC, Social Anxiety Scale for Children; SI1–SI2, the two items measuring respondents’ social interaction.

had the largest influence on psychological adjustment ($\beta=0.37$ and 0.51), and it also directly aggravated the symptoms of anxiety ($\beta=-0.17$). On the one hand, adopting the mainstream lifestyle may aggravate the stress related to facing new dress, diets and social custom,⁶⁰ which may have a negative impact on the mental health of migrant adolescents. On the other hand, adjusting oneself to the mainstream lifestyle will promote cultural communication with local adolescents,⁶² thereby improving psychological adjustment. Therefore, the results showed that lifestyle had both positive and negative effects on

mental health. This phenomenon was also found in other studies.⁶³ These results suggested that despite the impact of lifestyle on mental health being somewhat uncertain, improving language skills and communicating with local adolescents could effectively improve the mental health of internal migrant adolescents in Guangzhou. This also explained to some extent why previous studies on acculturation and mental health had not reached a consistent conclusion.²⁶ Because the dimensions used to measure acculturation were not completely consistent in different studies,⁴⁸ the impacts of different dimensions on mental

Table 4 Effects of acculturation dimensions and psychological adjustment on mental health in the SEM

Latent variables	SASC			MDD		
	Direct effect (95% CI)	Indirect effect (95% CI)	Total effect (95% CI)	Direct effect (95% CI)	Indirect effect (95% CI)	Total effect (95% CI)
Language	ns	0.03 (0.01 to 0.05)	0.03 (0.01 to 0.05)	ns	0.05 (0.04 to 0.06)	0.05 (0.04 to 0.06)
Social interaction	ns	0.04 (0.02 to 0.06)	0.04 (0.02 to 0.06)	ns	0.07 (0.03 to 0.11)	0.07 (0.03 to 0.11)
Lifestyle	-0.17 (-0.29 to -0.05)	0.15 (0.07 to 0.23)	-0.03 (-0.05 to -0.01)	ns	0.11 (0.06 to 0.16)	0.11 (0.06 to 0.16)
Psychological adjustment	0.28 (0.23 to 0.33)	-	0.28 (0.23 to 0.33)	0.30 (0.27 to 0.33)	-	0.30 (0.27 to 0.33)

MDD, major depression disorder; ns: non-significant; SASC, Social Anxiety Scale for Children; SEM, structural equation model.

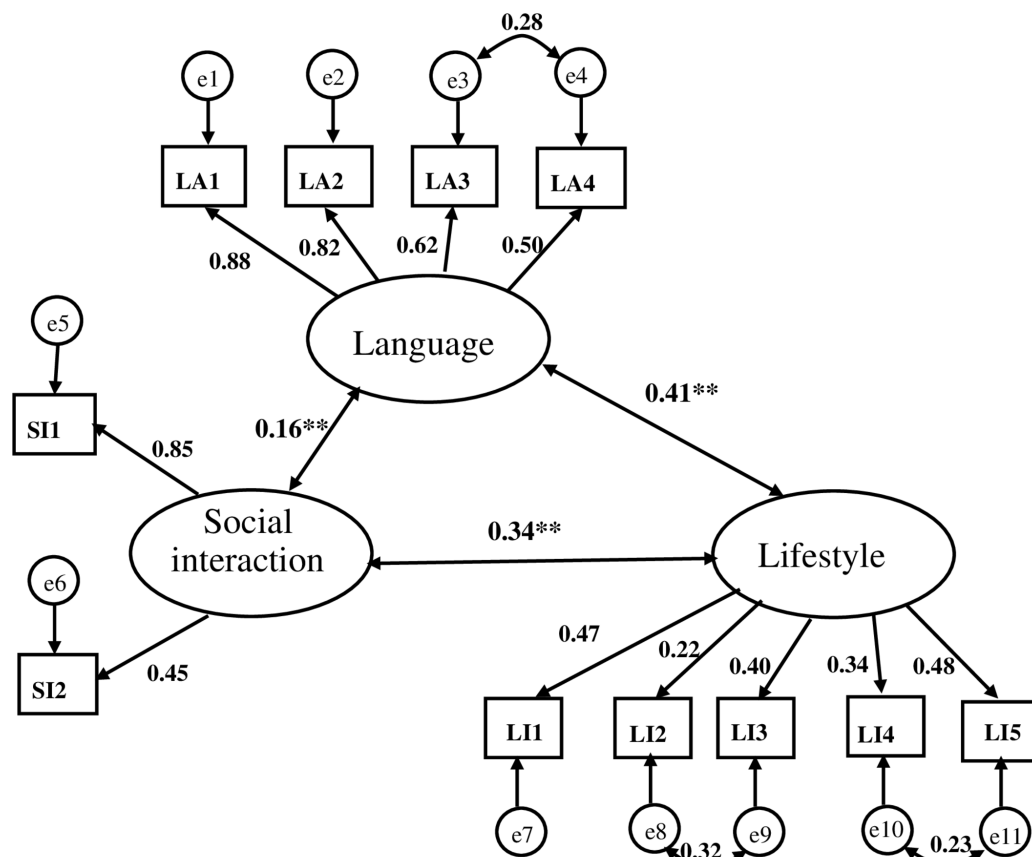


Figure 3 The confirmatory factor analysis model of acculturation. Standardised path coefficients were reported. The data-model fit indices are $p=0.129>0.05$, $\text{CMIN}/\text{df}=1.26$, $\text{GFI}=0.992$, $\text{CFI}=0.996$, $\text{RMSEA}=0.015$. ** $p<0.001$. CFI, confirmatory fit index; GFI, goodness of fit index; LA1–LA4, the four items measuring respondents' language; LI1 – LI5, the five items measuring respondents' lifestyle; RMSEA, root mean square error of approximation; SI1–SI2, the two items measuring respondents' social interaction.

health may be much different or even opposite. Therefore, further research should adopt unified acculturation measurement and explore the relationship between single dimension of acculturation and mental health.

Methodological discussion

Both multiple regression analysis and SEM were performed in this study. The multiple regression had only one dependent variable, while the SEM could include one variable as both an independent variable and a dependent variable. Thus, we found a mediating effect of psychological adjustment on the relationship between acculturation and mental health. In addition, the SEM could directly show us the impact of different dimensions of acculturation on mental health; thus, we could find the most influential dimensions and propose corresponding interventions.

Policy recommendations

Based on the results of our study, we suggested that the impact of acculturation on mental health should be considered when psychological interventions are implemented with migrant adolescents of different cultural backgrounds. For example, schools with migrant students scale up the efforts to prevent mental health problems

among migrant adolescents by adding content of local language and regional culture to mental health education programmes. Activities, including extracurricular programmes with local adolescents that could enhance social interaction, should also be encouraged at the schools.

Our study also had some limitations. First, although a self-designed multidimensional scale measured acculturation with an acceptable overall Cronbach's α of 0.70, two dimensions had Cronbach's α of 0.52 and 0.55. The factor loadings of some items were also relatively low. This indicated that the reliability of measurement was reluctantly accepted but need to be further improved. Future research may improve the reliability of the developed acculturation scale by modifying some items. Second, the MDD had not been used in Chinese adolescents before, so the validity of this scale may be affected, and we could not get the results of the scale applied to Chinese normal adolescents. Third, some confounding factors that might influence the mental health of adolescents were not included in this study, such as the parental mental health. Fourth, data used for this study were collected through a cross-sectional survey. A longitudinal study may be necessary to verify the observed relationship between acculturation and mental health.

CONCLUSION

Findings suggest that there was a strong association among acculturation, psychological adjustment and mental health. Psychological adjustment played an important mediating role between acculturation and mental health. A higher level of language and social interaction indicated less anxiety and depression, while a higher level of mainstream lifestyle indicated more anxiety and less depression. We should pay attention to the impact of acculturation on mental health when psychological interventions are implemented with migrant adolescents of different cultural backgrounds.

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Contributors LS participated in data analysis and wrote the manuscript. WC and JB contributed to revision of the manuscript. YL participated in study design and data collection. LL contributed to the design of the project and the supervision of project implementation. All authors read and approved the final manuscript.

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