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ORIGINAL ARTICLE

Path Analysis of the Effects of Life Stress and Social Support on Rural Adolescents' Quality of Life in Taiwan: Family Hardiness as a Mediator

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Background: Health of the adolescents is an important determinant of adult health. Multiple factors may affect the adolescents' health. **Aim:** This exploratory cross-sectional study was to explore the effects of life stress, social support, and family hardiness on quality of life (QoL) in rural adolescents (15 to 19 years old) whose family had encountered adverse disaster events. **Methods:** Purposive sampling was used to recruit 350 adolescents met study criteria with 265 completing all questionnaires (response rate = 75.71%). Based on stress process model, we hypothesized that life stress and social support would directly and indirectly influence QoL, and family hardiness mediates the effects of life stress on QoL. Path analysis was employed to analyze the association among life stress, social support, family hardiness, and QoL. **Results:** The study showed that life stress, social support and family hardiness are significantly associated with adolescents' QoL: life stress ($\beta = -0.30$, $P < 0.001$), social support ($\beta = 0.18$, $P = 0.010$), and family hardiness ($\beta = 0.21$, $P = 0.002$). Life stress and social support had significant association with family hardiness: life stress ($\beta = -0.23$, $P = 0.001$) and social support ($\beta = 0.29$, $P < 0.001$). **Conclusion:** Life stress directly and indirectly influences QoL through family hardiness. Family hardiness can buffer the effects of life stress. Social support could improve the adolescents' QoL. To promote QoL, it is important for healthcare providers to attend rural adolescents' life stress, and provide psychosocial interventions to enhance family hardiness and social support.

Key words: Family hardiness, life stress, path analysis, quality of life, social support

INTRODUCTION

Health of the adolescents is an important determinant of adult health.[1] During adolescence, the brain is especially sensitive and vulnerable to environmental stressors[2,3] due to its greater responsiveness to stress hormones than the adult brain.[4] Besides these hormonal and neurobiological factors, which significantly influence adolescent health,[5] multiple factors may affect the adolescents' health.[6] The stress process model has served as a framework for understanding mechanisms by which stressors lead to health outcomes.[6] This model distinguishes between three elements of stress process: sources (life events or chronic stressors), outcomes (physical and mental health), and mediators (e.g., self-concept, social support, family hardiness).[6] The more risk factors adolescents are exposed to, the greater the potential impacts on their mental health.[1] However, health care providers could try to find the mediators to buffer the effects of the stress from their life and environment.[7]

Factors that can contribute to stress during adolescence include exposure to adversity (e.g., poverty or disaster event in their life), pressure to conform with peers, and exploration of identity.[1] Adolescents under stress tend to compromise their health.[8] The higher stress the adolescents have, the poorer their physical and mental health is. In this study, the adolescent health outcome is the overall quality of life (QoL). QoL, a

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multidimensional construct comprising one's perceptions of physical, emotional, and social functioning as well as well-being,[9] is considered an indicator of health outcomes.[10] Research suggests that life stressors have negative impacts on QoL in employees.[7] Life stress was a significant predictor of physical health and mental health.[8] The interventions or factors that can improve the adolescents' QoL will reduce their life stress.[11] These findings also underscore the relationship between the adolescents' QoL and their life stress.

Research suggests that appropriate social support can encourage the children with a malignant tumor to take a positive response to their illness, and effectively prevent the occurrence of their stress.[12] Some researchers report that the social support was associated with QoL among nurses, and supportive interventions can promote the nurses' psychological well-beings[13] Other researchers also suggest that social support could enhance the hardiness, and improve the psychological well-being in women with breast cancer.[14]

Furthermore, research suggests that the perceived social support and psychological hardiness had a positive and significant correlation with QoL of nurses.[15] The psychological hardiness is negatively correlated with the stress in school-going adolescents.[16] However, very few studies explore the effects of the life stress and perceived social support on the QoL mediated by family hardiness in rural adolescents whose family had encountered adverse disaster events.

Therefore, the study purpose was to develop a path model that explores the effects of the life stress, perceived social support, and family hardiness on QoL, and whether family hardiness could play a role of a mediator in the rural adolescents who had encountered adverse disaster events. Based on the stress process model and the literature review, we hypothesized that social support and family hardiness protect against life stress, and life stress is a risk factor for adolescents' QoL. Specifically, we proposed a hypothesis: The life stress and perceived social support would directly and indirectly influence the rural adolescents' QoL, and family hardiness mediates the effects of life stress on adolescents' QoL [Figure 1]. Recognizing the factors associated with the better QoL can guide health care providers to develop family hardiness and supportive interventions to promote adolescents' QoL.

MATERIALS AND METHODS

Design, setting, and sample

For this exploratory, correlational cross-sectional study, adolescents were recruited from the students of three senior high schools in the rural area in eastern Taiwan. These schools contained about 600 and more students. Purposive sampling

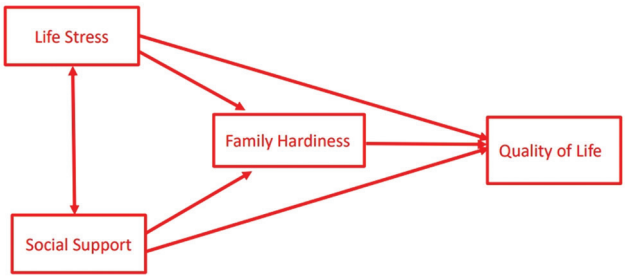

Figure 1: Theoretical hypothesized model

was used to recruit the students who stayed in the mountain areas and whose family had encountered adverse disaster events in the past. We had approached and informed 450 and 350 adolescents who met the study criteria, and 265 completed the questionnaires with the response rate of 75.71% [Figure 2]. The inclusion criteria were: (a) 15 to 19 years old, (b) the student and one parent agreed to participate, (c) able to read and write Chinese, and (d) able to spend 30–45 min completing the questionnaires. The sample size was estimated depending on the model complexity, and a common rule of adequate sample size is that the subject to parameter ratio should be 20 to 1.[17] In this study, a total of four parameters were estimated (20 × 4 variables = 80), as shown in Figure 1, which suggested that 80 subjects were required.

Measures

Family hardiness was measured using the 20-item Family Hardiness Index (FHI).[18] The FHI has three subscales: commitment, challenge, and control. Commitment measures the family's ability to work together as a unit and their perception of internal strengths. Challenge reflects the belief that change is an inevitable part of life and offers an opportunity for stimulation and growth. The control subscale measures the family's sense of being controlled externally or internally and their belief that they have an internal sense of control over situations. FHI items are rated on a 5-point Likert-type scale from 0 (*not applicable*), 1 (*false*), 2 (*mostly false*), 3 (*mostly true*), to 4 (*true*). Higher FHI scores indicate better family hardiness; total scores range from 0 to 80.[18] The reliability and validity of the Chinese-version FHI have been tested in Taiwanese caregivers of patients with schizophrenia.[19] The Cronbach's alphas of the FHI ranged from 0.79 to 0.82.[19] In this study, Cronbach's alpha for the total FHI was 0.83. The Kaiser-Meyer-Olkin (KMO) value was 0.90 (>0.80), eigenvalues >1.0 and Bartlett's test was 1897.95 ($P < 0.001$), which were appropriate for factor extraction.[20] Factor loadings for the FHI were 0.47–0.81, above the criterion of ≥0.4 for retaining an item.

Social support was measured using the 10-item Social Support Rating Scale (SSRS).[21] This scale has three

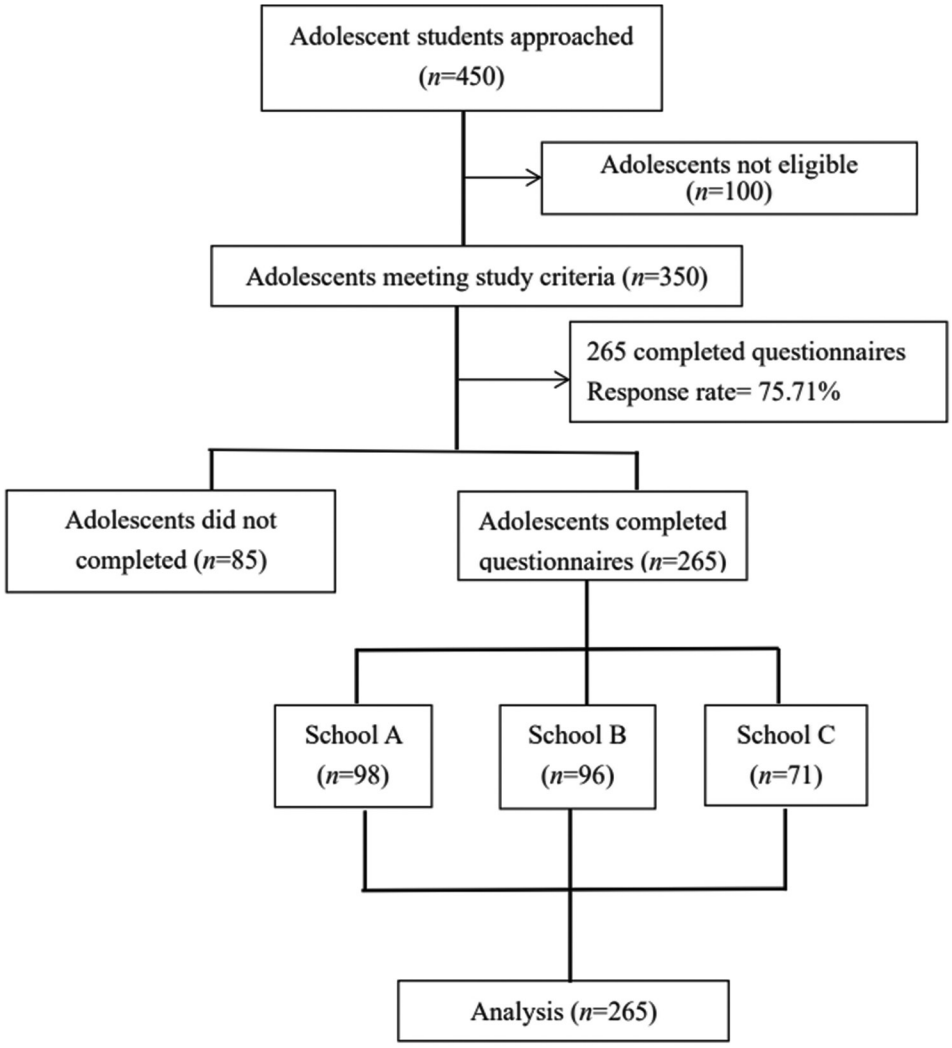

Figure 2: Flowchart of participant recruitment

dimensions: subjective support (4 items), objective support (3 items), and support availability (3 items). The highest possible score for subjective support is 32. The highest possible score for objective support is 22. The highest possible score for support availability is 12. Thus, SSRS scores can range from 0 to 66, with higher scores indicating more support. The validity and reproducibility of the SSRS were shown in Chinese populations.[21] In this study, the Cronbach's alpha of the SSRS was 0.89.

QoL*:* Adolescents' QoL was measured using the 38-item Taiwanese QoL Questionnaire for Adolescents (TQoLQA)[22] developed from the 70-item Chinese-version QoLQA scale[23] translated from the WHO QoL scale.[24] TQoLQA items are rated over the previous 2 weeks on a 5-point Likert scale from 1 (*not at all*) to 5 (*very much*). The TQoLQA has seven subscales: family, residential environment, personal competence, social relationships, physical appearance, psychological well-being, and pain. Cronbach's alpha coefficients for the total scale and each subscale remained above the 0.75 threshold criterion.[22] The higher TQoLQA scores reflect better QoL. The higher TQoLQA scores reflect better QoL. In this study, showed a KMO value of 0.88 (>0.80), eigenvalues >1.0, and Bartlett's test of 5058.97 ($P < 0.001$), which were appropriate for factor extraction.[20] The same seven factors were extracted, explaining 64.40% of the total variance. Factor loadings for TQoLQA items ranged from 0.47 to 0.84. Cronbach's alpha of the TQoLQA was 0.88.

Life stress was measured using an author-developed 17-item scale based on the general strain theory.[25] Items were selected in four dimensions commonly experienced by Taiwanese adolescents at senior high school: (1) stress from school achievement (5 items), (2) stress from life adaptation (4

items), (3) stress from parental relationships (5 items), and (4) stress from peer relationships (3 items). Items were reviewed by a panel of five experts in adolescent counseling. Based on expert suggestions, we revised the item wordings to enhance their relevance, clarity, and comprehensiveness. The five experts reached agreement on items, with a content validity index of 0.92. In this study, Cronbach's alpha was 0.91. Construct validity suggested that the KMO value was 0.88 (>0.80), eigenvalues >1.0 and Bartlett's test was 2697.31 ($P < 0.001$), which were appropriate for factor extraction.[20] Four factors were extracted, explaining 69.56% of the total variance. Factor loadings for the life stress scale ranged from 0.60 to 0.88. Items on this scale are rated on a 5-point Likert-type scale from 0 (*no stress at all*) to 4 (*very much stress*), with total scores ranging from 0 to 68. Higher scores indicate more life stress.

Procedures

After the study was approved by the institutional review board at Tri-Service General Hospital (approval number: IRB 2-103-05-089), the first author and principal investigator (PI) contacted the managers of the study sites, explained the study's purpose and procedures, and obtained permission to conduct this study. Participants and one parent were informed about the study purpose and procedures; adolescents and parents who agreed to participate in this study signed informed consent forms. Participants' anonymity and confidentiality were guaranteed. Participants were informed that they could withdraw from the study at any time when they felt uncomfortable.

Data were collected when participants were available and could fill the questionnaires Before collecting data, the PI elaborated how many questionnaires the participants needed to complete, the number of items in each scale, and how to complete the questionnaires. Participants spent 30–45 min in completing all the questionnaires.

Statistical analyses

Questionnaire data were analyzed using IBM SPSS version 22.0 (SPSS, Inc., Chicago, IL) at a significance level of $P < 0.05$ (two-tailed). All data were checked for accuracy before analysis. Demographic data were analyzed using descriptive statistics (means, standard deviations, percentages, and frequencies). Correlations among variables were analyzed using Pearson's correlation for continuous variables. Path analysis was employed to analyze the mediation association of family hardiness on the relationships (direct and indirect paths) among life stress, social support, and QoL. We used multiple linear regression to analyze the data. The regression/path coefficients were all in a standardized form (β). A structural equation modeling approach using the maximum-likelihood estimation was applied for the path analysis in this study.[17]

RESULTS

Sample characteristics

Our sample of 265 adolescents had a mean age of 16.73 ± 0.62 years (range = 15–19), 124 males (46.8%) and 141 (53.2%) females. The largest proportions of participants were in the first year of high school ($n = 104$, 39.2%), of Han ethnicity ($n = 104$, 39.2%), and came from families whose economic status could sustain life ($n = 139$, 52.5%), [Table 1]. There were no significant differences in demographic characteristics between the participants and those who declined to participate in this study.

Correlations among study variables

As shown in Table 2, all the correlation coefficients of study variables were significant (all $P < 0.001$). We found that life stress was negatively correlated with social support, family hardiness and QoL (all $P < 0.001$). Result indicated that family hardiness was positively correlated with social support ($r = 0.37$, $P < 0.001$) and QoL ($r = 0.38$, $P < 0.001$), but negatively correlated with life stress ($r = –0.33$, $P < 0.001$). Furthermore, social support was positively correlated with family hardiness ($r = 0.37$, $P < 0.001$) and QoL ($r = 0.36$, $P < 0.001$), but negatively correlated with life stress ($r = –0.33$, $P < 0.001$).

Path analysis of the hypothesized model

Path analysis results showed that life stress, social support, and family hardiness are significantly associated with the QoL: life stress (β = –0.30, $P < 0.001$); social support (β = 0.18, $P = 0.010$); and family hardiness (β = 0.21, $P = 0.002$). Life stress and social support had significant association with family hardiness: life stress (β = –0.23, $P = 0.001$) and social support (β = 0.29, $P < 0.001$). There was a significant association between life stress and social support (β = –0.41, $P < 0.001$), [Figure 3].

The standardized coefficients of life stress, social support, and family hardiness on QoL and the standardized coefficients of life stress and social support on family hardiness are summarized in Table 3. Direct positive predictors of QoL included social support and family hardiness, and life stress

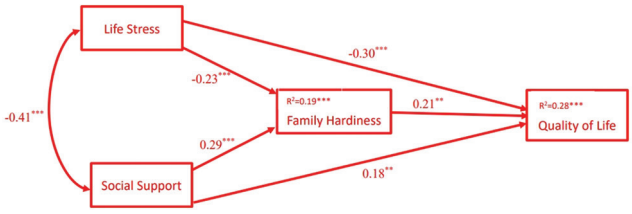

Figure 3: Path analysis model ** $P < 0.01$; *** $P < 0.001$

Table 1: Sample characteristics (*n*=265)

Variable	*n* (%)
Gender	
Male	124 (46.8)
Female	141 (53.2)
Ethnicity	
Taiwanese	95 (35.8)
Han	104 (39.2)
Aboriginal origin	66 (24.9)
High school grade	
First	104 (39.2)
Second	97 (36.6)
Third	48 (18.1)
Missing	16 (6.0)
Illness	
Yes	17 (6.4)
No	247 (93.2)
Missing	1 (0.4)
Religious beliefs	
Yes	168 (63.4)
No	97 (36.6)
Family economic status	
Well-off	43 (16.2)
Sustaining life	139 (52.5)
Low income	83 (31.3)
Mother's education (years)	
≤9	78 (32.2)
9-12	115 (47.5)
12-16	43 (17.8)
≥16	6 (2.5)
Missing	23 (8.7)
Father's education (years)	
≤9	64 (27.5)
9-12	122 (46.0)
12-16	42 (15.8)
≥16	5 (1.9)
Missing	32 (12.1)
Disaster damage	
Yes	45 (17.0)
No	219 (82.6)
Missing	1 (0.4)

was a negative predictor of QoL. The negative influence of life stress (direct effect = –0.30) was adjusted by family hardiness to be much less (indirect effect = –0.05) on QoL. However, the effect of social support did not increase a lot through family hardiness (indirect effect = 0.06) on QoL; therefore, family hardness modified effect of life stress on QoL, and social support and family hardiness were identically important on the effects of the QoL in rural adolescents.

Table 2: Mean, standard deviation, and correlation among study measures (*n*=265)

	Mean±SD	QOL	Life stress	Family hardiness	Social support
QOL	81.43±12.85	1			
Life stress	27.53±12.18	−0.43***	1		
Family hardiness	36.13±7.05	0.38***	−0.33***	1	
Social support	23.69±5.76	0.36***	−0.33***	0.37***	1

**P<0.01, ***P<0.001. SD=Standard deviation, QOL=Quality of life

DISCUSSION

This study contributes to knowledge on how life stress, social support, and family hardiness influence QoL of the rural adolescents whose families had encountered disaster events in the past. Life stress was negatively associated with social support, family hardiness, and QoL in the rural adolescents. Social support and family hardiness were positively associated with QoL of the rural adolescents. The path analysis suggests that family hardiness mediated the effect of life stress and social support on QoL of the rural adolescents. Life stress was reduced the effect on QoL through the mediate effect of family hardiness. However, social support was enhanced the effects on QoL through the mediate effect of family hardiness. The findings support our hypothesis that the effects of the life stress and perceived social support would directly and indirectly influence the QoL of the rural adolescents through the mediate effect of family hardiness. Furthermore, the study findings are in line with the stress process model that the rural adolescents' life stress influenced their health.[6] In the path analysis model, the three elements of stress process include life stress, outcomes (QoL), and the mediator (family hardiness).[6]

Our findings that life stress significantly lowered the QOL of the rural adolescents could echo reports that the negative association between life stress and QoL in university students through the deterioration of various aspects related to physical and mental health.[7,8,26]

Our findings also support reports family hardiness buffers the effect of life stress on QoL.[27] Family hardiness is an internal family strength and resource that both buffer children' stress from the negative effects of adverse life events.[27] Our study also suggests that the effect of social support did not increase a lot through family hardiness on QoL. Social support could directly improve the QoL of the rural adolescents. Effects of

Table 3: Standardized regression coefficients (beta weights) for family hardiness and Quality of life equations (n=265)

	Family hardiness	QoL
Life stress	−0.23***	−0.30***
Social support	0.29***	0.18**
Family hardiness	-	0.21**
Coefficient of determination (R^2)	0.19***	0.28***

**P<0.01, ***P<0.001. QoL=Quality of life

social support and family hardiness were identically important on the rural adolescents' QoL. Some researchers proposed that QOL is an important indicator of adolescents' mental health and health service effectiveness.[28] The findings echo a study report that psychological hardiness had a positive relationship with mental health[29] and social support was a protective factor for mental health.[30] High levels of social support can increase the adults' psychological hardiness.[29,30] Taken together, these findings remind health care providers to pay attention to adolescents' life stress from their school achievement, life adaptation, parental relationships, and peer relationships. Furthermore, it is important for healthcare providers to provide psychosocial interventions to enhance family hardiness and social support to reduce the rural adolescents' life stress and promote the QoL.

Strengths and limitations

The main strength of this study was the use of path analysis, a powerful method for analyzing the hypothesized relationships among variables. Our findings offer evidence for the healthcare providers to develop the psychosocial interventions to increase the adolescents' social support and family hardiness, and reduce their life stress. However, this study had some limitations. First, although the sample size was adequate for our analyses, it included only adolescents in rural areas. We did not examine the relationships among life stress, social support, and QoL through family hardiness of the adolescents in urban areas, making it difficult to generalize our findings to those residing in urban areas. Second, all study variables were measured only by self-report questionnaires. Future studies should recruit adolescents from different areas, and used multiple methods to collect data to increase the validity.

CONCLUSION

The path analysis suggests that the rural adolescents' life stress directly influences QoL, and indirectly influences QoL through family hardiness. Family hardiness can buffer the negative effects of life stress on the rural adolescents' QoL. The effects of social support did not increase a lot through family hardiness on QoL. Social support could directly improve the QoLof the rural adolescents. To promote rural adolescents' QoL, healthcare providers should pay attention to their life stress, and provide the psychosocial interventions to increase their social support and family hardiness. The study findings also are in line with the stress process model including three elements: stress sources, health outcome (QoL), and mediators (family hardiness).

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Conflicts of interest

There are no conflicts of interest.

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