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Different predictors of pain severity across age and gender of a Chinese rural population: a cross-sectional survey

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ABSTRACT

Objectives To investigate a 4-week period of pain prevalence and the risk factors of experiencing pain among a rural Chinese population sample. To explore the psychosocial and health condition predictors of pain severity and the interactions of age and gender with these factors in real-life situations among the general adult population in China.

Methods Data were collected from a random multistage sample of 2052 participants (response rate=95%) in the rural areas of Liuyang, China. Visual analogue scale was used to assess participants' pain experienced and a series of internationally validated instruments to assess their sociodemographic characteristics, self-reported health status, depression symptoms, anxiety symptoms, sleep quality, self-efficacy and perceived stress.

Results The pain prevalence over the 4-week period in rural China was 66.18% (62.84% for men and 68.82% for women). A logistic regression model revealed that being female (adjusted OR=1.58, 95% CI 1.24 to 2.02), age (adjusted OR=1.03, 95% CI 1.02 to 1.05), depressive symptoms (adjusted OR=1.07, 95% CI 1.02 to 1.13) and medium-quality sleep (adjusted OR=2.14, 95% CI 1.26 to 3.64) were significant risk factors for experiencing pain. General linear model analyses revealed that (1) pain severity of rural Chinese was related to self-rated physical health and social health; (2) the interactions of age, gender with employment status, depression symptoms, perceived stress and physical health were significant. Simple effect testing revealed that in different age groups, gender interacted with employment status, depression symptoms, perceived stress and physical health differently.

Conclusions Improving physical and social health could be effective in reducing the severity of pain and the treatment of pain should be designed specifically for different ages and genders among the general population.

INTRODUCTION

Pain is a public and clinical health concern. The annual prevalence of pain and chronic pain has been estimated to be 20% and 10% of the general population, respectively.[1,2] To date, most studies on the prevalence of pain have been conducted in developed countries such as the USA,[3–7] Canada,[8–10] Australia,[11–13] Britain[14] and European countries.[15–18] A few studies on the prevalence of pain in the

Strengths and limitations of this study

► This study established the 4-week prevalence of pain among a Chinese rural population.
► To the best of our knowledge, this is the first study reported which describes the psychosocial and health condition predictors on pain severity and the interactions of ages and genders in real-life situations among the general adult population.
► The cross-sectional design of this study prevented the causes of pain to be determined.

Chinese population have primarily focused on residents in the large cities. For example, Jackson et al[19] reported that the prevalence of pain and chronic pain was 42.2% and 25.8%, respectively, during a 6-month study period of the residents in Chongqing, China. Chen et al studied Chinese from both urban and rural areas and found that the prevalence of chronic pain over the past 6 months among women and men in China was 39.92% and 32.17%, respectively.[20] The rural population in China comprises about half of China's total population and have significantly lower income[21] and inferior medical health services[22 23] compared with the population living in urban areas. However, little is reported regarding the prevalence of pain experienced by the rural population in China.

Experiencing pain is a biopsychosocial process.[1] The risk factors of experiencing pain throughout the general population include physiological and psychosocial factors. The physiological factors include genetics, injury and health status. The psychosocial factors include early life factors,[24] female in gender,[20 25] poor sleep,[26–30] distressed mood (depression, anxiety),[31] psychosocial environment (social suffering setting[32]), perceived stress,[33] religion and self-efficacy (SE).[34 35] The analysis of risk factors of pain among the rural
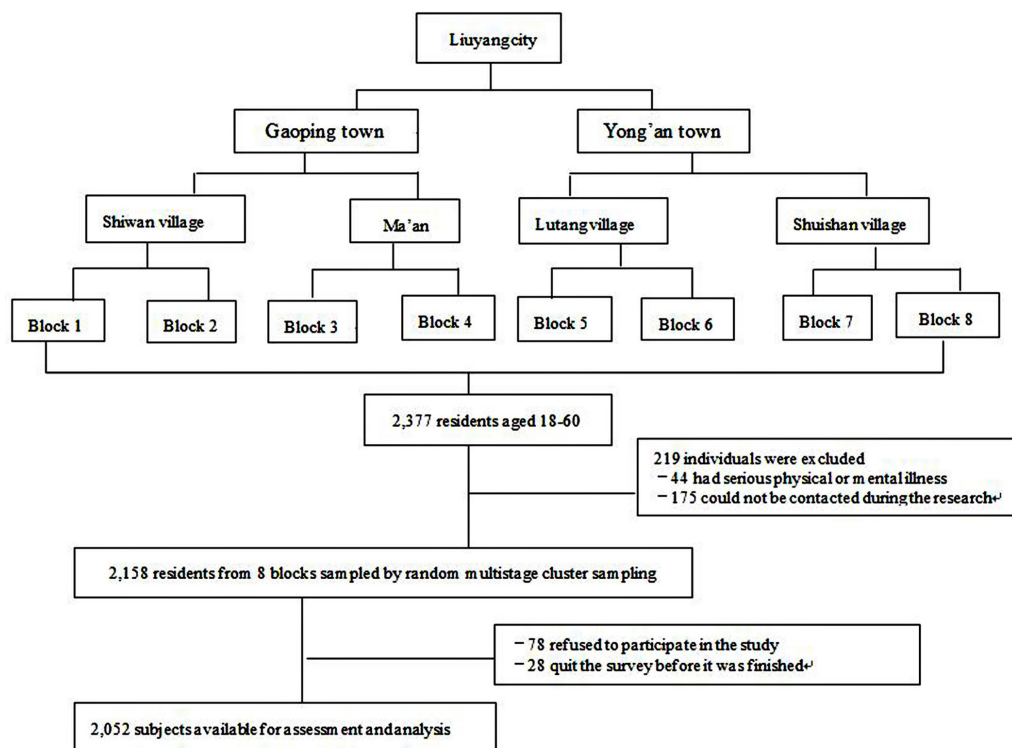
Figure 1 Recruitment and follow-up of study participants.

residents in China is required for target people who are at a greater risk and planning and facilitating treatment across rural areas in China.

The exploration of differences in pain experienced across age groups and gender has been recommended by the International Association for the Study of Pain.[36] However, different predictors of pain severity across age groups and genders have received little attention. Most epidemiological and experimental studies have indicated that older people[11 37 38] and women[39–41] are at greater risk of experiencing pain. However, the potentially different interactions of ages and genders with psychosocial status and health conditions on the severity of pain in real-life situation have not been adequately studied. To the best of our knowledge, few studies have been reported that consider the socioeconomic status (eg, employment vs unemployment) and mental health (such as depression symptoms, perceived stress) may interact differently across ages and genders, contributing to the severity of pain experienced.

This study reports a population-based survey across the rural areas of Liuyang City, Hunan province, China. The prevalence of pain among rural Chinese over a 4-week period was explored, and the risk factors of experiencing pain among this population were investigated. Further, the main effects and interactions of gender and age with psychosocial variables and three-dimensional health conditions on the severity of pain in real-life situation were explored. Significant differences of pain severity across ages and genders were hypothesised.

METHODS

Patient and public involvement

No specific kinds of patients were involved. All the participants were general adult population in the rural areas of Liuyang. The informed consent was interpreted to the rural participants by the local guide and the survey was conducted with their agreement of the informed consent orally. The participants agreed that results of this study will be published in the form of essays or articles, and no personal information will be disclosed in any report.

Study design

Liuyang is a representative rural city of the Hunan province, China, and classified as one of the national development and reform pilot cities.[42] Liuyang County, located in the centre of Hunan province, has a total population of 1.4235 million including people of Han nationality and 34 ethnic minorities. Liuyang has industries in grain production, raising pigs and black goats, and is the centre of fireworks production in China, with a history of fireworks production greater than 1400 years.[43] Administratively, Liuyang is divided into four districts in the urban areas and 33 towns in the rural areas. Rural towns in Liuyang are similar to each other in respect of geography, population sizes, gender and age distributions, social structure, public health and healthcare services, making residents in these rural towns comparable.

A cross-sectional survey of rural residents in Liuyang City was conducted from November 2010 to August 2011. As figure 1 showed, a three-stage stratified sample was used, consisting of (1) random sampling to select two

Table 1 Sociodemographic characteristics of the sample (n=2052)

Characteristics	n (%)
Gender	
Male	987 (48.10)
Female	1065 (51.90)
Age (years)	
18–44	796 (38.79)
45–59	977 (47.61)
60 and above	279 (13.60)
Ethnicity	
Han	2042 (99.51)
Non-Han	10 (0.49)
Education	
Illiterate	47 (2.30)
Primary school or lower	767 (37.40)
Middle school	925 (45.10)
High school	268 (13.10)
College or above	45 (2.20)
Employment	
Unemployed	797 (38.84)
Employed	1254 (61.11)
Agriculture	891 (43.42)
Non-agriculture	363 (17.69)
Annual income (person/¥)	
1992 or less	241 (11.74)
1993–5523	513 (25)
5524 or greater	1298 (63.26)
Marital status	
Never married	145 (7.07)
Married/cohabiting	1867 (90.98)
Divorced/separated/widowed	40 (1.95)
Religion	
Yes	205 (9.99)
No	1847 (90.01)

towns from the 33 towns of Liuyang City according to the list of villages; (2) random sampling of two villages from each town; and (3) random sampling of two geographically natural blocks. Natural blocks were used to identify subjects. The target sample for this study comprised residents from eight geographically natural blocks. All adults in all households of the eight natural blocks were included in the final sample, with 2158 residents in total. The sample size is representative of the rural counties in Liuyang.

Participants

The current household registration system (known as the Hukou System) implemented in China divides the residents into agricultural and non-agricultural residencies and established a rural-urban division.[44] A household registration record officially identifies a person as a resident to be rural or urban according to the inheritance and geographic location. Rural areas are less developed in many ways, compared with urban areas, such as infrastructure, education and healthcare.

The target population in this study was rural residents aged above 18 years who had lived in the Liuyang County for over 6 months. We excluded subjects (1) they could not be contacted after three attempts by the local investigators sent by the research team; or (2) had a serious physical or mental illness that influenced the experience of pain. A total of 2377 participants were initially included in the study, of whom 219 were excluded. Seventy-eight people (2.8%) refused to participate, and 28 (1.3%) dropped out of the survey before it was completed. Therefore, 2052 valid responses (response rate=95%) were analysed.

Quality control

Interviewers included 12 graduates and three undergraduates from Central South University, all of whom underwent 2 days of centralised and unified training. The training included the content of the questionnaire, public health knowledge, and psychiatry and communication skills. All interviewers received this training so that they could administer the interview to the same standards.

Procedure

The investigation team visited each household and conducted face-to-face interviews. Each interview was comprised an initial interview and self-reported survey, and lasted approximately 1 hour for each participant. At the end of the survey, each participant received a thank you gift, such as a kitchen utensil. At the end of each day of interviews, a meeting was held to review the process, to check the quality of the questionnaires and to discuss any problems that had emerged during the interviews. All questionnaires were double-checked by two

Table 2 Psychological characteristics of the participants (n=2052)

Variable	Mean	SD
Sleep quality	7.28	2.55
PHQ-9	3.64	3.92
GAD-7	2.73	3.56
Health status		
Physical health	142.58	18.68
Mental health	117.17	21.44
Social health	85.12	18.76
Self-efficacy	27.09	4.36
Perceived stress	18.33	6.47

GAD-7, 7-item Generalized Anxiety Disorder scale; PHQ-9, Patient Health Questionnaire Depression Module.

Table 3 Pain prevalence over the past 4 weeks according to different ages

Age	Gender	Pain free	Experienced pain	4-week prevalence rate	Pain severity	
					Mean	SD
18–44 (n=796)	Male	157	170	51.99	5.08	2.70
	Female	182	287	61.19	4.51	2.46
	Sum	339	457	57.41	4.72	2.57
45–59 (n=977)	Male	147	318	68.39	5.06	2.33
	Female	155	357	69.73	4.99	2.37
	Sum	302	675	69.09	5.02	2.35
60 and above (n=279)	Male	33	82	71.30	5.29	2.53
	Female	20	144	87.80	5.00	2.60
	Sum	53	226	81.00	5.11	2.57
All ages	Male	337	570	62.84	5.10	2.47
	Female	357	788	68.82	4.82	2.45
n=2052	Total	694	1358	66.18	4.94	2.47

quality control specialists to ensure that there were no inconsistencies, missing items or errors, and then handed to one quality control specialist for a final check.

The survey
Initial interview
A short interview conducted for approximately 15 min consisted of the two parts:

Sociodemographic status
The participant was interviewed about his/her gender, age, highest level of education completed, employment status (unemployment denoted with 1, employment with 2), income and religion. Education was divided into 1=primary school or lower, 2=middle school,

Table 4 Risk factors of experiencing pain

Variables	OR	aOR	aOR (95% CI)		P values
Gender	1.31	1.58	1.24	2.02	0.00
Age	1.03	1.03	1.02	1.05	0.00
Education	0.77	1.14	0.95	1.37	0.15
Employment condition	0.87	1.26	0.98	1.62	0.08
Annual income	1.00	1.00	1.00	1.00	0.65
Religion	0.59	0.93	0.62	1.38	0.71
Physical health	0.92	0.92	0.90	0.93	0.00
Mental health	0.96	0.99	0.99	1.00	0.16
Social health	0.98	1.01	1.00	1.01	0.08
Depressive symptoms	1.21	1.07	1.02	1.13	0.01
Anxiety symptoms	1.18	0.99	0.94	1.05	0.77
Self-efficacy	1.02	1.02	0.99	1.04	0.28
Perceived stress	1.06	0.99	0.97	1.02	0.56
Sleep quality					
Poor-quality sleep	4.04	1.49	0.87	2.53	0.15
Medium-quality sleep	2.25	2.14	1.26	3.64	0.01

aOR, adjusted OR; OR, crude OR.

3=high school and above. Employment was divided into two categories: employed and unemployed. Income was measured annually. Religion was defined as 1=religious, 2=non-religious.

Pain
Participants were asked by the interviewer whether they had experienced an episode of pain within the past 4 weeks (yes/no). If they were pain free, the interviewer recorded '0'. If they had experienced pain, their pain intensity over the past 4 weeks was assessed using a visual analogue scale (VAS), with ratings from 0 (no pain at all) to 10 (the worst pain imaginable) along a straight line. The VAS is a widely used measurement for the severity of pain and subjective experience[45 46] and its reliability and validity have been tested and verified.[47–49] The participant recalled the mean level of their pain severity during the past 4 weeks and selected the level that could best represent his/her pain severity on VAS. It has been reported in the literature that when recalled over a period of 1 or 4 weeks, the outcome was well correlated with daily momentary assessments.[50–52] Long-term recall is significantly influenced by recall bias.[53 54] Therefore, the participants were not asked to recall the severity of pain over a 4-week period. The recollection of pain across a 4-week period is an indicator of acute pain, which indicates the demands of public health concern and clinical health treatment.

Self-administered assessment
After the interview, each participant filled out the following questionnaires.

Perceived health status
The Self-Rated Health Measurement Scale (SRHMS), developed and revised by Xu et al,[55] includes 48 items, and has a Cronbach's α coefficient of 0.93.[56] The SRHMS assesses three dimensions of health: physical, mental and social. Physical health indicates one's physical function.

Table 5 Tests of between-subjects effects

Source	Type III sum of squares	df	Mean square	F	Significance
Corrected model	2451.13	117	20.95	4.57	0.00
Intercept	772.01	1	772.01	168.31	0.00
Gender	7.87	1	7.87	1.72	0.19
Age	14.79	2	7.40	1.61	0.20
Education	0.49	2	0.24	0.05	0.95
Employment	3.56	1	3.56	0.78	0.38
Annual income	10.29	2	5.15	1.12	0.33
Religion	2.14	1	2.14	0.47	0.49
Depression	8.99	3	3.00	0.65	0.58
Anxiety	3.90	3	1.30	0.28	0.84
Sleep	14.44	2	7.22	1.57	0.21
P-health	684.25	1	684.25	149.18	0.00
M-health	14.54	1	14.54	3.17	0.08
S-health	31.94	1	31.94	6.96	0.01
Stress	0.01	1	0.01	0.00	0.97
SE	3.07	1	3.07	0.67	0.42
Age*gender*education	36.39	10	3.64	0.80	0.64
Age*gender*employment	53.72	5	10.75	2.34	0.04
Age*gender*income	63.99	10	6.40	1.40	0.18
Age*gender*religion	1.65	5	0.33	0.07	0.99
Age*gender*depression	131.14	14	9.37	2.04	0.01
Age*gender*anxiety	53.80	14	3.84	0.84	0.63
Age*gender*sleep	37.94	10	3.79	0.83	0.60
Age*gender*P-health	65.66	5	13.13	2.86	0.01
Age*gender*M-health	44.62	5	8.92	1.95	0.08
Age*gender*S-health	10.06	5	2.01	0.44	0.82
Age*gender*stress	52.68	5	10.54	2.30	0.04
Age*gender*SE	22.68	5	4.54	0.98	0.42

income, annual income; M-health, mental health; P-health, physical health; S-health, social health; SE, self-efficacy.

Mental health denotes emotional and cognitive health. Social health refers to social relationships and social networks, such as the level of communication between family members or the availability of a support network during times of need. The highest possible scores for physical, mental and social health are 170, 150 and 120, respectively, and a maximum overall score of 440.[57] The higher the score obtained by a participant, the better his or her health was concluded to be. The SRHMS is not a diagnostic instrument, and there are no cut-points for delineating the different levels of health conditions.

Psychological variables

Depression symptoms were assessed using the Patient Health Questionnaire Depression Module (PHQ-9), a 9-item scale, with each item based on the criteria for depressive disorders listed in the Diagnostic and Statistical Manual of Mental Disorders (DSM-V).[58 59] Each item is rated on a scale from 0 ('not at all') to 3 ('nearly every day')[60] and the total score ranges from 0 to 27. The Chinese version of the PHQ-9 has a Cronbach's α of 0.86.[61] The results of the PHQ-9 may be used for the screening of depression severity with the scores of 0–4, 5–9, 10–14, 15–19 and 20–27, indicating none-minimal, slight, moderate, moderately severe and severe depression according to DSM-IV.

Anxious symptoms were assessed using the Generalized Anxiety Disorder scale (GAD), a 7-item scale developed by Spitzer et al.[62] Each item is rated on a scale from 0 ('not at all') to 3 ('nearly every day').[62] The scale was found to have excellent internal consistency, with a Cronbach's α coefficient of 0.92.[62] The GAD-7 has been used widely and well validated in general populations[63] as well as psychiatric settings.[64] Scores of 0–4, 5–9, 10–14 and ≥15 indicate none, slight, moderate and severe anxiety symptoms according to DSM-IV.
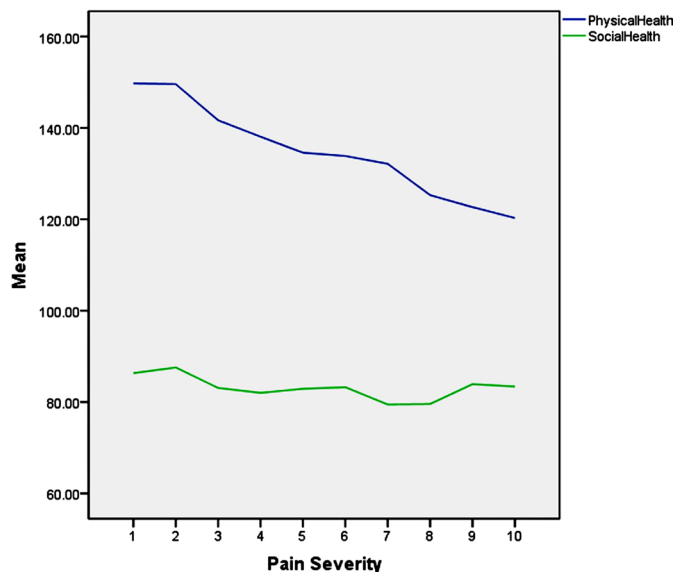
Figure 2 The relationship between physical, social health and pain severity.

Figure 3 Gender-employment effects on pain severity in youth.

Global sleep quality was assessed by the VAS. The participant selected the point along a 10 cm horizontal line that best represented his/her overall sleep quality with '0' (indicating the worst sleep quality) and '10' (indicating the best sleep quality). The distance is measured from the left edge to the participant's mark to reflect the subjective quality of sleep. We divided sleep quality into three categories based on the ratings: 0–3.33 defined as group 1 (poor sleep quality); 3.34–6.67 defined as group 2 (medium sleep quality); 6.68–10 (high sleep quality) defined as group 3.

SE was assessed using the General Self-Efficacy Scale (GSES), originally developed in German by Schwarzer and Jerusalem in 1979 and has been confirmed validated in multicultural settings.[65 66] The scale consists of 10 statements, and the Cronbach's α coefficient of the Chinese GSES was found to be between 0.89 and 0.92.[67]

Perceived stress was assessed using the Chinese edition of the Perceived Stress Scale (CPSS). Cohen *et al* developed the Perceived Stress Scale (PSS) as a stress measure.[68] Originally, this self-reported scale comprised 14 items. A shortened 10-item version (PSS-10) is reported which is psychometrically superior to the original 14-item version, as it had higher validity and internal reliability compared with the PSS-14.[69] The CPSS-10 was found to have a stable two-factor structure of satisfactory internal consistency

and construct validity, with a Cronbach's α coefficient of 0.70.[70] Each item of the CPSS was rated on a 5-point scale, ranging from 1 to 5. The total scores of the CPSS were calculated by adding four reverse items and another six items. The possible total scores ranged from 10 to 50 (higher score indicating greater stress). There are no cut-points of the CPSS that indicate different levels of perceived stress.

Statistical analysis

Sample characteristics were described using basic descriptive statistics. Logistic regression analysis was used to identify the risk factors of experiencing pain. The dependent variable was experiencing pain versus being pain free. P values smaller than 0.05 were considered significant. Analyses were performed using SPSS V.18.0. Independent variables included: (1) sociodemographic variables, gender, age, income, degree of education, religious belief and employment status; (2) health condition status: physical, mental and social health; (3) psychological variables: PHQ-9 score, GAD-7 score, SE, perceived stress and sleep quality. Logistic regression was used to explore the factors

Table 6 Pairwise comparisons, youth group—employment

Dependent variable: pain severity

Employment	(I) Gender	(J) Gender	Mean difference	SE	Significance
Employed	1	2	0.49	0.32	0.12
Unemployed	1	2	0.95*	0.43	0.03

Based on estimated marginal means.
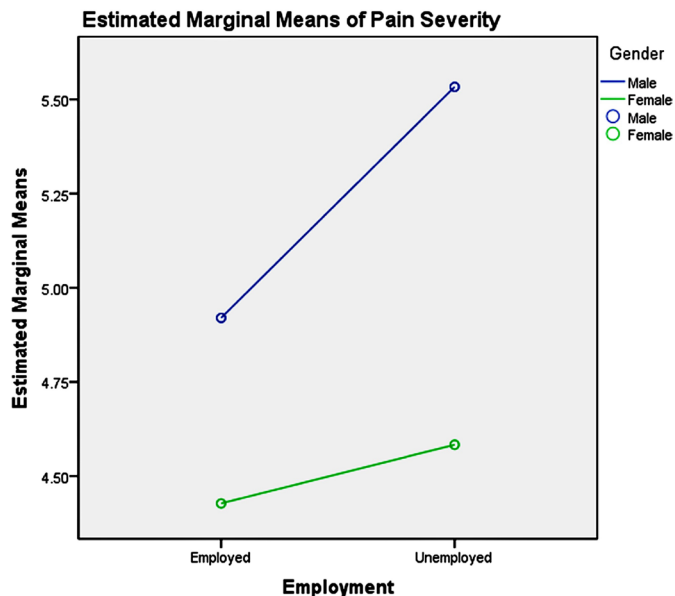Note: simple effect analysis of gender and employment of youth group.

Table 7 Pairwise comparisons, youth group—depression

Dependent variable: pain severity

Depression	(I) Gender	(J) Gender	Mean difference	SE	Significance
Severe	1	2	0.21	1.56	0.89
Moderate	1	2	0.31	0.77	0.69
Slight	1	2	−0.36	0.42	0.43
None	1	2	1.21*	0.32	0.00

Based on estimated marginal means.
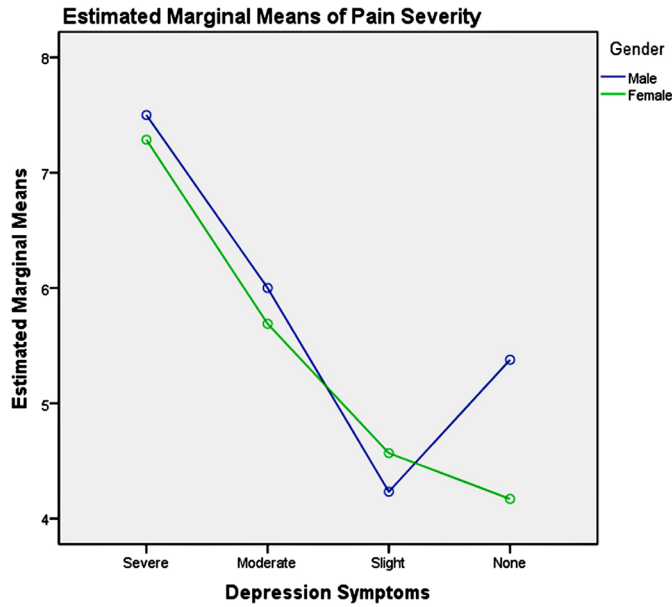Note: simple effect analysis of gender and depression symptoms of youth group.

Figure 4 Gender and depression symptom effects on pain severity in youth.
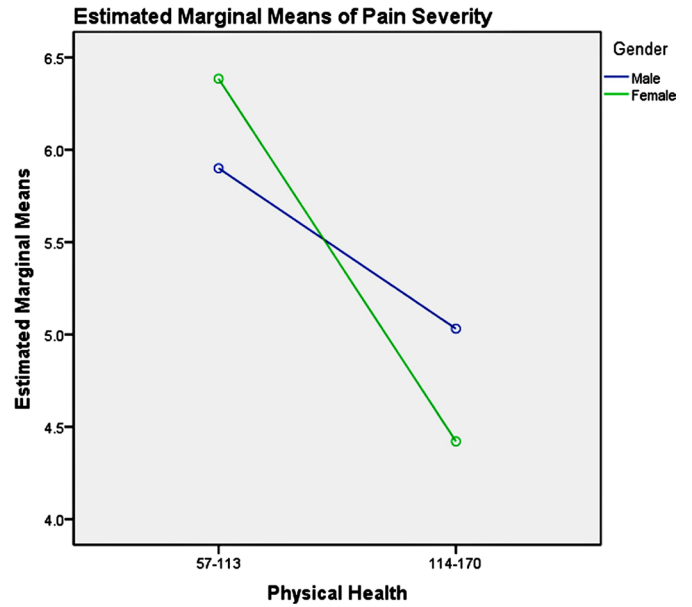

Figure 5 Gender and physical health effects on pain severity in youth.

related to experiencing pain. Sleep quality was set as the category variable.

A general linear model was used to explore the main effects and interactions of age and gender with other predictors on the severity of pain. The dependent variable was pain severity (y=1–10). The independent variables were the same as those in the logistic regression model. Any interactions found between age, gender and another predictor were further studied using simple effect tests. Age was divided into three groups (youth, middle aged and elderly). In each age group, the interactions between gender and other predictors were tested using pairwise comparisons.

RESULTS
Sample characteristics
A total of 2052 participants (987 male, 1065 female) completed the interview process, with an overall response rate of 95.09%. The demographic characteristics of the sample are shown in table 1. There were more female (51.90%) participants than male participants (48.10%). In terms of age groups, 38.79% were young, 47.61% were middle aged and 13.60% were elderly. Most of the sample was of Han ethnicity (99.51%), married (90.98%) and

non-religious (90.01%), while 90.9% was married/cohabiting; 84.75% of the sample was of low education (middle school and below) and 61.11% was employed full-time (43.42% employed in agriculture, 17.69% in non-agriculture). In 2009, the national rural poverty line was defined as below ¥1992/year. In the Hunan province in 2010, the average income per farmer was ¥5523/year. Income level was divided into three groups: low (¥1992/year or less), medium (¥1993–¥5523/year) and high (above ¥5524/year). A total of 241 participants (0.25%) were below the poverty level, 513 participants (25%) had medium income and 1298 (63.26%) had high income.

The psychological characteristics of the 2052 participants are presented in table 2. The participants' mean score of sleep quality was 7.28±2.55. Their mean score for depression symptoms was 3.64±3.92, and a mean score of anxiety symptoms was 2.73±3.56. The mean±SD scores for physical, mental and social health were 142.58±18.68, 117.17±21.44 and 85.12±18.76, respectively. The mean scores for SE and perceived stress were 27.09±4.36 and 18.33±6.47, respectively.

Table 8 Pairwise comparisons, youth group—P-health

Dependent variable: pain severity

P-health	(I) Gender	(J) Gender	Mean difference	SE	Significance
57–113	1	2	−0.49	1.07	0.65
114–170	1	2	0.61*	0.25	0.02

Based on estimated marginal means.
Note: simple effect analysis of gender and physical health of youth group.

Table 9 Pairwise comparisons, youth group—perceived stress

Dependent variable: pain severity

Perceived stress	(I) Gender	(J) Gender	Mean difference	SE	Significance
10–22	1	2	0.35	0.42	0.40
23–37	1	2	0.67*	0.31	0.03
38–50	1	2	†	–	–

Based on estimated marginal means.
†The level combination of factors in (I) is not observed.
Note: simple effect analysis of gender and perceived stress of youth group.
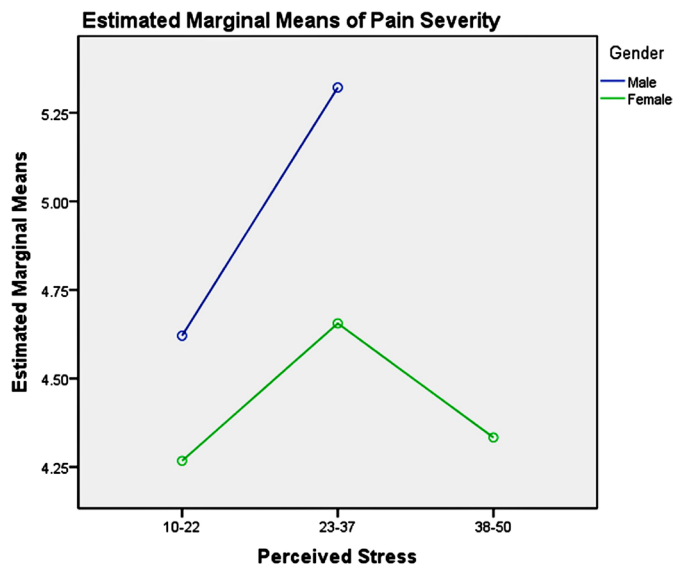
Estimated Marginal Means of Pain Severity

Figure 6 Gender and perceived stress effects on pain severity in youth.

Estimated Marginal Means of Pain Severity

Figure 7 Gender-employment effects on pain severity in the middle aged.

Pain prevalence over the past 4 weeks in rural China

As the table 3 illustrated, the prevalence of experiencing pain across the 4-week period was 66.18% overall, 62.84% for men and 68.82% for women. The prevalence peaked at 81.00% in the oldest age group (60 years and above) with 71.30% for men and 87.80% for women. The average pain severity for men was 5.10, with an SD of 2.47. The average pain severity for women was 4.82, with an SD of 2.45. The oldest groups of both genders had the most intense pain severity.

Risk factors for experiencing pain

The independent variable was pain free versus experiencing pain. The dependent variables include: health status (physical, mental and social health); sociode-mographic cofounders and psychological cofounders. Crude ORs and adjusted ORs for experiencing pain were calculated. Sleep has been divided into a categorical variable, included as a dummy variable, and high-quality sleep was set as the reference group. As shown in table 4, gender (adjusted OR=1.58, 95% CI 1.24 to 2.02), age (adjusted OR=1.03, 95% CI 1.02 to 1.05), depressive symptoms (adjusted OR=1.07, 95% CI 1.02 to 1.13) and medium-quality sleep (adjusted OR=2.14, 95% CI 1.26 to 3.64) were significant risk factors for experiencing pain.

Physical health (adjusted OR=0.92, 95% CI 0.90 to 0.93) was a protective factor against experiencing pain.

Predictors of pain severity across different age groups and genders

A general linear model was used to explore the main effects and interactions of age and gender with other predictors on the severity of pain. The dependent variable was pain intensity. The independent variables were the same as those used in the above logistic models. The results suggest that physical health and social health significantly influenced pain severity (table 5), while age, gender with employment status, depression symptoms, physical health and perceived stress interacted significantly. As figure 2 showed, physical health and social health related with pain severity negatively in the overall condition.

The three-factor interactions present were age*gender*employment, age*gender*depression, age*gender*p-health and age*gender*stress. The age was split into three groups and the simple effects of gender within each significant interaction of the other variables were

Table 10 Pairwise comparisons, middle-aged group—employment

Dependent variable: pain severity

Employment	(I) Gender	(J) Gender	Mean difference	SE	Significance
Employed	1	2	−0.19	0.23	0.39
Unemployed	1	2	1.32*	0.37	0.00

Based on estimated marginal means.
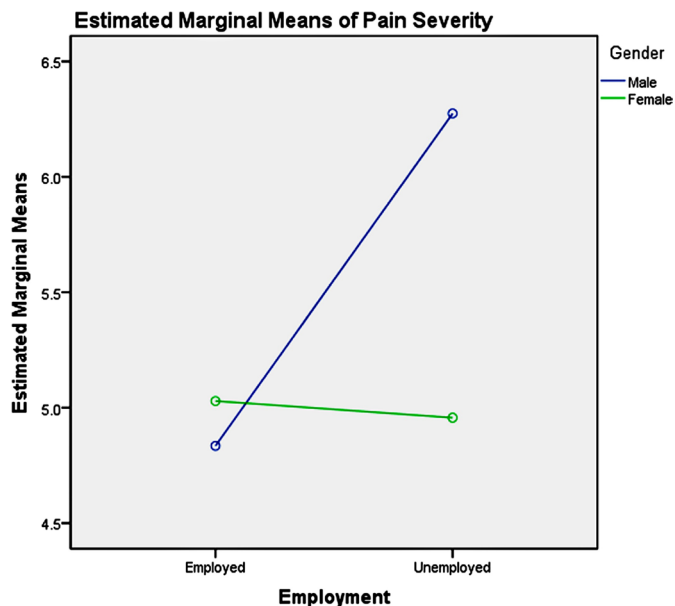Note: simple effect analysis of gender and employment of middle-aged group.

Table 11 Pairwise comparisons, middle-aged group—depression

Dependent variable: pain severity

Depression	(I) Gender	(J) Gender	Mean difference	SE	Significance
Severe	1	2	−2.52*	1.06	0.02
Moderate	1	2	0.55	0.62	0.38
Slight	1	2	−0.37	0.36	0.30
None	1	2	0.14	0.22	0.53

Based on estimated marginal means
Note: simple effect analysis of gender and depression symptoms of middle-aged group.
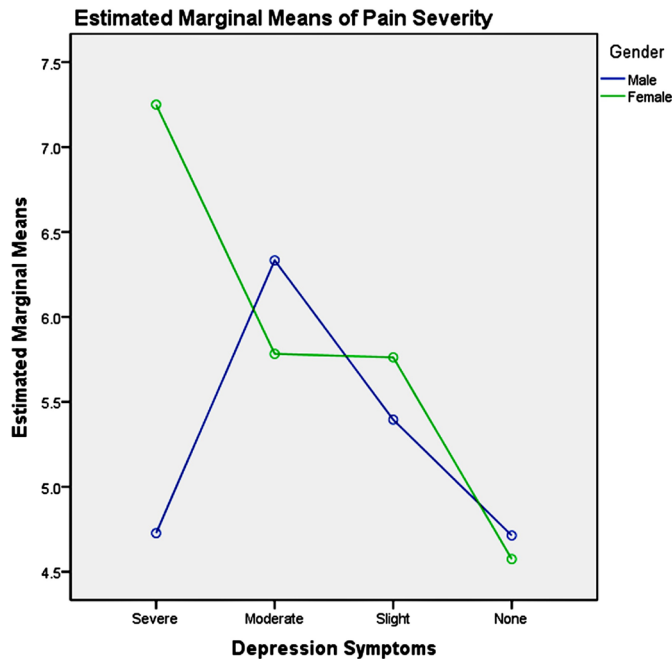
Estimated Marginal Means of Pain Severity

Figure 8 Gender and depression symptom effects on pain severity in the middle aged.

Estimated Marginal Means of Pain Severity

Figure 9 Gender and perceived stress effects on pain severity in the middle aged.

explored in each age group. These tests are based on the estimable independent, linear pairwise comparisons between the estimated marginal means.

The divisions of age groups were made according to the WHO report from World Health Day 2012: Ageing and Health.[71] Participants were divided into three groups: youth group (18–44 years old), middle-aged group (45–59 years old) and elderly group (60 and above years old). Depression symptoms were coded from y=1–4, based on moderate and above moderately severe, mild, slight and no depression symptoms. Anxiety symptoms were divided into y=1–4, based on moderate and above severe, mild, slight and no anxiety severity. Physical health was divided into three categories based on the scores: (1) scores of 0–56 were defined as 1 denoting poor physical health; (2) scores of 57–113 were defined as 2 denoting average physical health; (3) scores of 114–160 were defined as 3 denoting good physical health. Perceived stress was divided into three groups and scores of 10–22 represented

lower stress, scores of 23–37 represented average stress and scores of 38–50 represented high stress.

Among the youth group, pairwise comparisons revealed: (1) unemployment influenced men and women differently, as shown in table 6 and figure 3, which increased men's pain intensity significantly; (2) the absence of depression could significantly decrease the pain severity in the young women, compared with men, as presented in table 7 and figure 4; (3) good physical health influenced women's pain severity negatively, greater effect than that seen in men's, which is shown in table 8 and figure 5; (4) average level stress increased young men's pain intensity more dramatically than in women's as shown in table 9 and figure 6.

Among the middle-aged group, pairwise comparisons revealed: (1) unemployment influenced men and women differently, as table 10 and figure 7 showed, which significantly increased men's pain severity; (2) severe depression symptoms could significantly increase the pain severity of the mid-aged women, compared with the men as shown in table 11 and figure 8; (3) the influence of physical health on gender in the middle-aged group was not significant as illustrated in table 12; (4) high stress could significantly

Table 12 Pairwise comparisons, middle-aged group—P-health

Dependent variable: pain severity					
P-health	(I) Gender	(J) Gender	Mean difference	SE	Significance
0–56	1	2	*	–	–
57–113	1	2	−1.02	0.60	0.09
114–170	1	2	0.07	0.18	0.71

Based on estimated marginal means.
*The level combination of factors in (I) is not observed.
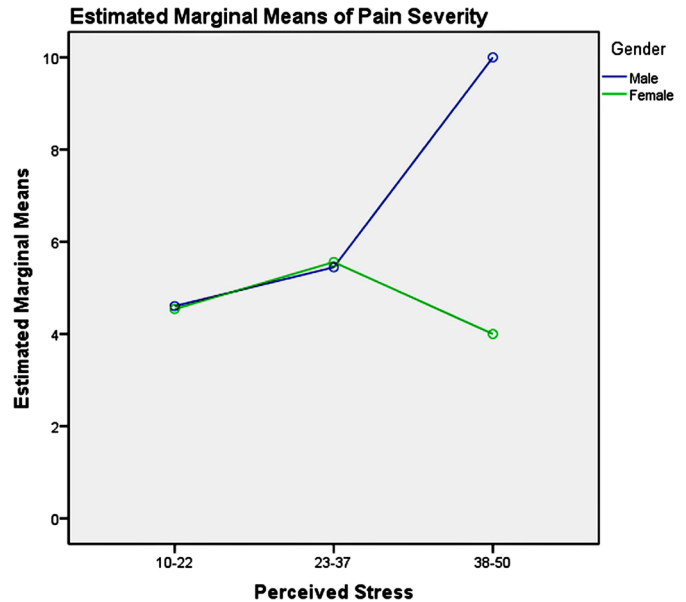Note: simple effect analysis of gender and physical health of middle-aged group.

Table 13 Pairwise comparisons, middle aged group—perceived stress

Dependent variable: pain severity					
Perceived stress	(I) Gender	(J) Gender	Mean difference	SE	Significance
10–22	1	2	0.06	0.25	0.79
23–37	1	2	−0.11	0.26	0.66
38–50	1	2	6.00*	2.29	0.01

Based on estimated marginal means.

Table 14 Pairwise comparisons, elderly group—employment

Dependent variable: pain severity

Employment	(I) Gender	(J) Gender	Mean difference	SE	Significance
Employed	1	2	−0.35	0.47	0.46
Unemployed	1	2	1.66*	0.65	0.01

Based on estimated marginal means.
Note: simple effect analysis of gender and employment of elderly group.

increase middle-aged men's pain severity, compared with that in women's, which is shown in table 13 and figure 9.

Among the elderly group, pairwise comparisons revealed that unemployment influenced men and women differently, as shown in table 14 and figure 10, which significantly increased men's pain severity. The influence of depression symptoms, physical health and perceived stress on gender in the elderly group was not significant, which was shown in tables 15–17, respectively.

DISCUSSION
Pain prevalence in rural China
This study indicates that the pain prevalence among rural Chinese over a 4-week period was to be 66.18%, or 62.84% for men and 68.82% for women. The prevalence for both genders peaked in the oldest group (60 years and above). The pain prevalence of rural Chinese appeared to be higher than that previously reported for urban Chinese population,[19 20] and higher than the pain prevalence of adults in the USA,[7] Canada[8] and Britain.[14] However, the cited studies examined chronic pain (pain lasting ≥3 months) and could produce substantially lower prevalence rates compared with pain over a 4-week period.
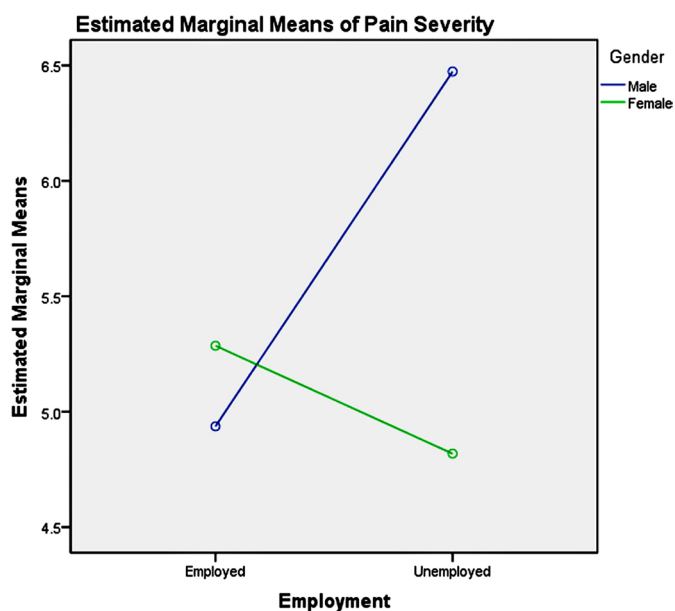
Figure 10 Gender-employment effects on pain severity in the elderly.

Table 15 Pairwise comparisons, middle-aged group—depression

Dependent variable: pain severity

Depression	(I) Gender	(J) Gender	Mean difference	SE	Significance
Severe	1	2	−*	−	−
Moderate	1	2	−0.57	0.98	0.56
Slight	1	2	0.63	0.64	0.33
None	1	2	0.12	0.47	0.81

Based on estimated marginal means.
Note: simple effect analysis of gender and depression symptoms of middle-aged group.

Risk factors of experiencing pain
Being female, older age, reported depression symptoms and medium-quality sleep were found to be risk factors for experiencing pain. In this study, women were more likely to report experiencing pain, which is in agreement with the majority of reported studies.[3 13 39 72–81] From social psychology and culture psychology perspectives, most men have internalised a pressure to invoke stereotypical masculine behaviours to maintain a sense of power and control when they encounter actual or perceived threats to their masculine status.[82–84] Therefore, they may under-report their pain experiences when compared with women. Older participants were also more likely to experience pain, which may be due to their worse physical condition[85] than younger participants. The result suggested that more attention should be focused on the treatment of pain in the elderly. Depressive symptoms were also a risk factor for experiencing pain, which is consistent with previous studies[86 87] and suggests that more focus should be given to rural Chinese with depression symptoms. Medium-quality sleep improved the risk of experiencing pain, which suggests having sufficient and efficient sleep would be helpful of decreasing the risk of experiencing pain.

Factors related to pain severity across ages and genders
In this study, physical health and social health significantly impacted pain severity among the general population in rural China. Physical health significantly influenced pain intensity, which is in agreement with previous studies[1 88 89] and common sense. The predictive role of social health on pain severity has not attracted attention by clinicians

Table 16 Pairwise comparisons, middle-aged group—P-health

Dependent variable: pain severity

P-health	(I) Gender	(J) Gender	Mean difference	SE	Significance
57–113	1	2	−0.04	0.95	0.97
114–170	1	2	0.51	0.36	0.16

Based on estimated marginal means.
Note: simple effect analysis of gender and physical health of middle-aged group.

Table 17 Pairwise comparisons, middle-aged group—perceived stress

Dependent variable: pain severity					
Perceived stress	(I) Gender	(J) Gender	Mean difference	SE	Significance
10–22	1	2	0.30	0.48	0.53
23–37	1	2	0.07	0.54	0.91
38–50	1	2	3.00	2.75	0.28

Based on estimated marginal means.
Note: simple effect analysis of gender and perceived stress of middle-aged group.

and scholars. In this study, social health referred to social ties and social support. The findings presented here indicated that enlarging social networks and improving social support could be an effective social approach to decreasing pain severity in adults.

There are significant interactions between age, gender and employment status, depression symptoms, physical health and perceived stress. The simple test effects indicated that unemployed male participants experienced more intense pain across all age groups, compared with women. Men are encouraged by culture and society to take economic responsibility to feed their families and to participate in social competition to gain success, which may result in more intense psychological pain for men when they are unemployed. Thus, having stable employment is important for decreasing men's pain severity. Providing multiple job skills training to enhance men's employability across all age groups and offering more employment information and opportunities for them may be a useful social approach to mitigate the severity of their mental pain and psychoache from unemployment. Average-level stress increased young men's pain severity more dramatically than women's. High-level stress could increase middle-aged men's pain severity significantly compared with women's. Reducing perceived stress may be helpful for the pain management and treatment of men, which could be achieved by reducing-stress therapy.[90]

It has been reported that depression symptoms influenced pain experienced.[86 91–93] Our study revealed that female adults' pain severity was much more entangled with depression symptoms in real-life situation. The absence of depression significantly decreased the pain severity in the young women, and severe depression symptoms significantly increased the pain severity in the middle-aged women. Treatment for depression symptoms may be effective for decreasing female's pain severity, which could be achieved using medication or psychotherapy (such as cognitive– behavioural therapy[94]), or complementary therapy such as exercises or meditation. Good physical health condition could significantly decrease young women's pain severity. For young women, improving their physical functioning could be a viable method for decreasing pain severity. This could be achieved by way of sports and exercise.

The factors related to pain severity differed across ages and genders, and therefore the treatment of pain across the general population should be designed with consideration for different ages and genders. Whether clinical pain treatments and analgesics should be customised for different genders and ages needs to be further explored.

Strengths and limitations

This study reported a 4-week prevalence of pain in rural China and the risk factors of experiencing pain of a rural Chinese sample. To our knowledge, this is the first study to explore the psychosocial and health condition predictors on pain severity and the interactions of gender and age with those variables in real-life situations. However, the study has a few limitations. First, our measurements of pain were not precise: we did not detail the site of pain, nor did we distinguish chronic pain from acute pain or physical pain from psychological pain. And the frequency of the pain experienced was not included in the study design, so how often the study subjects had experienced pain over the 4 weeks preceding the survey was not determined. Subjects could have experienced pain as frequently as every day or as rarely as just once in the span of 4 weeks. In future research, more detailed information (eg, pain duration, the frequency of pain and the pain sites) would be useful to refine the understanding of the various dimensions of pain. Another limitation is the cross-sectional design of the study, which precludes the induction of cause and effect and a potential causal relationship between independent variables and pain severity is inferred. In addition, the sample size only reflected the rural population of Liuyang, Hunan province and the findings of this study cannot be generalised to other rural counties in China. Future multicentres research is required to reflect the pain conditions of the rural population in China.

CONCLUSIONS

In conclusion, our study revealed that about two-thirds of adults in a rural Chinese sample experience pain over the course of 4 weeks and the predictors of pain severity differ significantly across ages and genders. Improving physical and social health could be effective in reducing the severity of pain, and the treatment of pain should be designed specifically for different ages and genders.

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