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Social capital, migration stress, depression and sexual risk behaviors among rural-to-urban migrants in China: A moderated mediation modeling analysis

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Abstract

Background: Few studies have examined the complex relationship of migration stress and depression with sexual risk behaviors among migrants. The relationship between migration stress and sexual risk behaviors may be mediated by depression, and the mediation process may be modified by social capital. The study aims to investigate this moderated mediation among rural-to-urban migrants.

Methods: Data were collected from rural-to-urban migrants in China. Migration stress, depression, and social capital were measured with validated scales and used as predictor, mediator and moderator, respectively, to predict the likelihood of having sex with risk partners. Mediation and moderated mediation models were used to analyze the data.

Results: Depression significantly mediated the migration stress–sex with risk partner relationship for males (the effect [95% CI] = 0.36 [0.08, 0.66]); the mediation effect was not significant for females (0.31 [−0.82, 0.16]). Among males, social capital significantly moderated the depression–sex with risk partner relation with moderation effect −0.12 [−0.21, −0.04], −0.21 [−0.41, −0.01] and −0.17 [−0.30, −0.05] for total, bonding and bridging capital respectively.

Conclusion: Social capital may weaken the association between migration stress and sexual risk behavior by buffering the depression–sexual risk behaviors association for males. Additional research is needed to examine this issue among females.

Keywords

Social capital; Depression; Risk behaviors; Moderated mediation; Migrants

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Disclosure of Interest

The authors report no conflicts of interest.

Introduction

Migration and sexual risk behaviors

In pursuit of better quality of life, a great number of people leave their homes and migrate to new destinations (Chen, Yu, Zhou, et al., 2015; Yu et al., 2017). Worldwide, there are approximately 250 million people who migrate to other countries, and more than 750 million people who move domestically every year (World Bank, 2017). The process of migration is challenging. Numerous stressors are generated when migrants leave the familiar environment, culture and lifestyles in the place of origin, and settle down in a new environment, assimilate themselves into new neighborhood and culture, adapt to new lifestyles and work environments (Berry, 1997, 2006; Tomás-Sábado, Qureshi, Antonin, & Collazos, 2007; Yu, Chen, & Li, 2014). These stressors may put migrants at increased risk to engage in health risk behaviors, such as using alcohol, tobacco and illicit drugs and taking part in sexual risk behaviors (Borges, Medina-Mora, Breslau, & Aguilar-Gaxiola, 2007; Fitzpatrick, Piko, Wright, & LaGory, 2005; Yu et al., 2017).

Among these health risk behaviors, engaging in sexual risk behaviors is of great significance because of numerous negative consequences (Boyer et al., 2017; Kelly et al., 1993). Sexual risk behaviors, such as having sex with sex workers, having sex without condom, and multiple sexual partners, are not safe. Engagement in any of these behaviors will directly put migrants at risk for HIV infection and other sexually transmitted diseases (STDs) (Giannou et al., 2016; Yu et al., 2017). One study in Ethiopia reported that among migrant workers who had sexual intercourse in the past six months, 74% had sex with sex workers, 49% had unprotected sex, and 69% had multiple sexual partners (Tiruneh, Wasie, & Gonzalez, 2015). Thus, it will be of great significance to investigate factors and mechanisms related to sexual risk behaviors among migrant populations.

Rural-to-urban migrants in China

Along with the rapid economic growth since the 1980s, and more and more rural residents in China migrated to urban areas to seek better opportunities. There are approximately 280 million rural migrants in China (National Bureau of Statistics of the PRC, 2016). As being discussed in the previous section that migration is a challenging process. The challenging events may increase the likelihood for these migrants to engage in sexual risk behaviors. One study conducted among 5,996 rural migrants in Shanghai, China reported that 58% of them did not use condom when having sex, and 15% had sex with casual extramarital partners (Dai et al., 2015). The large number of rural migrants and the high rate of sexual risk behavior among them provide a window of opportunities to investigate the influential factors that are related to sexual risk behaviors and underlying behavioral mechanisms.

Effects of migration stress and depression on sexual risk behaviors

Stress is a general feeling of strain and pressure when individual's internal capacity could not meet the demands of external environment (Lazarus, 2006). Migration stress is one type of stress that are directly related to the strain and pressure experienced by migrants during the process of migration (Chen, Yu, Gong, Zeng, & MacDonell, 2015). Migration stress is a significant threat to migrants' health (Tomás-Sábado et al., 2007). Study findings indicate

that experience of migration stress can increase the likelihood for migrants to engage in sexual risk behaviors (Yu et al., 2017). An immediate negative consequence from stress is reduction in mental health (Tennant, 2002). Studies have documented that poor mental health, including depression, can increase the risk for people to engage in sexual risk behaviors (Williams & Latkin, 2005; H. Yang et al., 2005). Engaging in sexual risk behaviors could be a strategy for migrants to cope with stress and depression (Amirkhanian et al., 2011; Yu et al., 2017).

Poor mental health mediates the migration stress and sexual risk behaviors relationship

The relationship between migration stress and poor mental health has been well established, migration stress is positively associated with multiple poor mental health symptoms, including depression, anxiety, somatization, hostility and obsessive-compulsive disorders (Hovey & Magaña, 2000; Sirin, Ryce, Gupta, & Rogers-Sirin, 2013; Yu et al., 2017). One of our previous studies observed a positive relationship between poor mental health and engagement in sexual intercourse with high risk partners, such as sex workers (Yu et al., 2017). We also found that poor mental health can mediate the association between migration stress and sexual risk behaviors among migrants (Yu et al., 2017). The relationship between migration stress and poor mental health, as well as the relationship between poor mental health and sexual risk behaviors form a mediation relationship, making it hard if not impossible to control sexual risk behaviors among migrant population. Therefore, identification of factors that can moderate this mediation process would be of great significance for devising evidence-based intervention for risk reduction.

Social capital and health

Social capital is defined based on a person's network connections. Among a person's network contacts, those who are trustworthy, reciprocal and resource-rich are the social capital possessed by the person (Chen, Stanton, Gong, Fang, & Li, 2009). Personal social capital acts as a function to integrate oneself with others from an inner circle stretching to the broad society. Social capital can facilitate access to informational, instrumental and emotional support from people in the society to improve quality of life (Requena, 2003; Rogers, Halstead, Gardner, & Carlson, 2011). In addition, social capital can strengthen social cohesion and trust in community by growing connections among community members (Smith & Kawachi, 2014). Adequate community social capital is required for collective efficacy—an informal social control of social undesirable behaviors, including sexual risk behaviors (Skrabski, Kopp, & Kawachi, 2004).

Social capital can be divided into bonding and bridging capital (Kawachi, Subramanian, & Kim, 2008; Putnam, 2000). Bonding capital refers to the social capital network contacts who share similar characters, interests and values. Bridging capital, on the other hand, refers to the social capital contacts who may not be similar but connected together through various social groups, organizations and institutions, such as church, sports team and professional associations (Chen et al., 2009; Kawachi et al., 2008). People accumulate bonding capital through free contact with others and accumulate bridging capital by participating in various groups/organizations (Chen, Wang, Wegner, et al., 2015).

The positive impact of social capital has long been reported, and high social capital promotes health protective behaviors, inhibit health risk behaviors, and enhance mental health and wellbeing (Almedom, 2005; Lundborg, 2005; Smith & Kawachi, 2014). People with higher social capital are less likely to suffer from mental health problems (Harpham, Grant, & Rodriguez, 2004). Social capital can also protect people from sexual risk behaviors. For example, studies reported negative associations between social capital and risky sex and positive associations between social capital and safer sex (Crosby, Holtgrave, DiClemente, Wingood, & Gayle, 2003).

Potential moderation effect of social capital

A previous study has demonstrated the effect of poor mental health in mediating the migration stress–sexual risk behavior relation (Yu et al., 2017). The characteristics of social capital suggest that social capital may act as a buffer attenuating the impact of migration stress on the likelihood to engage in risky sex by weakening the stress–depression relation. Despite the fact that the risk of depression is higher for individuals with greater migration stress (Liu et al., 2016); the risk might be lower for individuals with more social capital due to emotional, informational and social support (Kawachi et al., 2008; Whiteford, Cullen, & Baingana, 2005). However, no reported study has examined this moderation effect among any migrant populations.

Adequate social capital may also protect depressed migrants from engaging in sexual risk behaviors as a coping strategy. Different from stress that is volatile, depression usually lasts for days and weeks if not months. With adequate social capital, instead of seeking for sexual risk behaviors, a migrant can cope with depression by interacting with many of his/her trustworthy, resource-rich, and reciprocal friends either individually or through group activities (Chen et al., 2009). This protective effect can also reveal as a negative moderation effect. To our knowledge, no study in the literature has ever investigated the important role of social capital as a moderator on poor mental health and sexual risk behaviors.

Social capital among migrants

Social capital is particularly relevant for studying the risk of mental health and risk behaviors among migrants. Compared to non-migrants, migrants suffer from a big social capital loss when they leave the place origin; migrants have to reconstruct their social capital in the destination (Chen et al., 2011; Flynn, 2004; Tilly, 2007). When leaving the place of origin, migrants lost almost all the social capital they previously accumulated because migration physically break all the ties they have built with people, groups and organizations in the place of origin (Chen et al., 2011). When settling down in the destination, migrants may experience unprecedented difficulties to build social capital in the new environment with few network contacts (Chen et al., 2011, 2009; Ryan, Sales, Tilki, & Siara, 2008).

Another challenge for migrants to rebuild their social capital is that most migrants do not have a permanent residency in the destination; they have to move to find the best (Bhugra, 2004; Li et al., 2007). The relatively low social and economic status and the high mobility will prevent migrants from initiating, maintaining, and growing trustworthy and reciprocal relationships with resource-rich people in a new environment, reducing the opportunity for

them to accumulate social capital (Chen et al., 2011). Therefore, migrants may experience a large reduction with a large variation in social capital. These characteristics are ideal for us to examine levels of social capital and its effects on mental health and risk behaviors among migrants while knowledge gained on social capital will provide data essential for prevention since social capital is a modifiable factor through intervention (Gong, Chen, & Li, 2015; Ottesen, Jeppesen, & Krusturup, 2010).

Purpose of this study

The purpose of this study is to investigate the potential moderation effect of social capital in attenuating the migration stress-depression and depression-risk sexual behavior relationships with data from a random sample of rural-to-urban migrants. The ultimate goal is to enhance our understanding of behavioral mechanisms underlying the complex relationships among migration stress, mental health and sexual risk behaviors, supporting more effective evidence-based prevention intervention programs targeting this population.

Materials and Methods

Participants and sampling

Data were derived from a project to investigate rural-to-urban migration and HIV risk behavior in China. The participants were rural-to-urban migrants with 18–45 years of age, possessing legal rural residence (*Hukou*), and have migrated to the current city for at least one month. These migrants were randomly selected in Wuhan, China. Wuhan, the capital city of Hubei Province, is located in the central China with a total population of more than 10 million and per capita GDP of \$17,000 in 2015 (Statistical Bureau of Wuhan, 2015).

Participants were sampled using a 4-stage GIS/GPS-assisted sampling methods (Chen et al., 2018). First, the geographic area was divided into 100*100-meter mutually exclusive geographic units (named as geounits) to form the primary sampling frame (PSF). Non-residential areas, including lakes, factories, streets, were excluded. Second, a total of 60 geounits were randomly selected from the PSF. Optimal design for cost-effective was used so that more geounits were allocated in the area with higher density of rural-to-urban migrants (Cochran, 1977; Grove, 2004; Spiegelman & Gray, 1991). From each geounit, 20 participants with one participant per gender per household were randomly sampled. If more than one participant was eligible in one selected household, one was selected using a random digit method. Written informed consents were collected from the participants.

Procedure of data collection

Data collection was completed during 2011–2013. Data were collected using the Migrant Health and Behavior Survey, delivered using an Audio Computer-Assisted Self Interviewing (ACASI) system. The survey was anonymous and confidential. Participants completed the survey in a private room. After completing the survey, participants were provided a \$5 incentive.

Among the total 1,414 eligible participants, 121 (8.6%) refused to participate. At the end of the survey, participants were asked a final question of “How likely you have truly answered

the questions” with answer options of “1=100% true, 2=80% true, 3=50% true, 4=20% true, and 5=not true at all”. Of the 1,293 who completed the survey, 158 (12.2%) were excluded because they reported that 50% or more of their answers were not reliable, yielding a final sample of 1,135 participants. This study was approved by the Institutional Review Board at the Wayne State University, Wuhan Center for Disease Prevention and Control and University of Florida.

Measurements

Predictor variable X -- migration stress—Migration stress was measured using the 16-item Domestic Migration Stress Questionnaire (DMSQ) (Chen, Yu, Gong, et al., 2015). The DMSQ consists of 16 items and four subscales, including separation from the place of origin, lack of self-confidence, rejection in the destination, and maladaptation, with four items per subscale. Individual items were assessed using a five-point Likert scale varying from 1 (never) to 5 (always). The Cronbach’s alpha for DMSQ was 0.92 in this study. Mean score of the total DMSQ scale was computed such that higher scores indicating higher levels of migration stress.

Mediator variable M -- depression—Depression was measured using the five-item Depression Subscale in the Brief Symptom Inventory (BSI) (Derogatis & Melisaratos, 1983). Individual items were measured using a five-point Likert scale ranging from 1 (never) to 5 (always). The reliability for the depression subscale was 0.87 in the study. Mean scores were computed such that higher scores indicating more depressive symptoms.

Moderator variable V -- social capital—Social capital was assessed using the Personal Social Capital Scale (PSCS) (Chen et al., 2009). PSCS is a theory-based instrument with adequate reliability and validity. The instrument has been verified by studies conducted in China and the United States (Archuleta & Miller, 2011; Chen et al., 2009; Chen, Wang, Wegner, et al., 2015; Wang, Chen, Gong, & Jacques-Tiura, 2013). This scale consists of 32 items with two subscales: Bonding Capital (24 items) and Bridging Capital (8 items).

The bonding capital was measured using four attributes: (1) personal network size measured as the perceived number of frequently connected persons (1=very few and 5=many), followed by three questions to assess among these connected persons, how many (1=very few and 5=almost everyone) are: (2) trustful, (3) reciprocal, and (4) resource rich. These four attributes are assessed among six subgroups of people: (1) family members, (2) relatives, (3) neighbors, (4) friends, (5) colleagues, and (6) old classmates to generate the total bonding social capital.

The bridging capital was assessed using four attributes, including (1) the perceived number of groups/organizations by which a person is often connected with (1=a few and 5=a lot), followed by three questions asking among the groups/organizations how many (1=a few and 5=almost all) (2) represent his/her rights and interests, (3) will provide help if needed, and (4) have a lot of resources. Likewise, these four attributes are assessed among two types of groups/organizations: (1) governmental, economic and social groups/organizations, and (2) cultural, recreation and leisure groups/organizations. The Cronbach alpha was 0.91 for the

total PSCS, 0.88 for the Bonding Social Capital Subscale, and 0.93 for the Bridging Social Capital Subscale, respectively.

Social capital scale scores for individual participants were computed such that higher scores indicating higher level of social capital. First, mean scores were computed for the eight attributes (four for bonding social capital and four for bridging social capital) by averaging the item scores over the six network subgroups for bonding and the two groups/organizations for bridging. Bonding capital and bridging capital scores were thus calculated separately by summation of the four attribute mean scores, divided by four; and finally the total social capital scores as summation of the bonding and the bridging capital scores, divided by two.

Outcome variable Y - Having sex with risky partners—Having sex with risky partners was assessed based on participants' response to the question, "Have you ever engaged in sexual intercourse with any of the following persons in the past year?" with a checklist of 6 options: (1) commercial sexual workers, (2) injection drug users, (3) commercial blood donors, (4) people living with HIV/AIDS, (5) people living with other sexually transmitted diseases, and (6) same gender partners. A participant was classified as having had sex with risky partners if he/she responded positively to any of these 6 types of risky partners. This binary variable (1=having sex with risk partners, 0=not having sex with risk partners) was used as outcome in the study.

Condom use behavior—Following the question regarding the sexual behaviors with risk partners, another question about condom use was asked as "When you have had sex with these risk partners, how often did you use condom?" with answer options ranging from "1=never" to "4=always".

Demographic and migration experiences—Five demographic variables included in this study were age, gender, education, marital status, and income level. Eight variables describing migration experience were: number of cities ever migrated to, duration living at Wuhan, times of visiting hometown annually, if send money home, intention to move to another city, type of residential locations, if living in a rental house, and if living alone.

Statistical analysis

Descriptive statistics were used to describe the study sample. Pearson correlation analysis was used to assess the relationship between social capital, migration stress, depression and having sex with risk partners. Mediation model was used to investigate the role of depression in mediating the relationship between migration stress and having sex with risk partners. Moderated mediation model was applied to investigate if social capital can moderate the mediation model (the upper panel of Figure 1).

We tested the proposed mediation and moderated mediation models (Figure 1) using a specialized method reported by Hayes (Hayes, 2013) with improved efficiency for modeling and validity statistical inferences. As shown in the low panel of Figure 1, the product of the estimated coefficients a_1 and b_1 (a_1*b_1) provided a measure of the variable depression in mediating the relationship between migration stress and having sex with risk partners; a

significant a_3 and b_3 provided a measure of the effects of social capital in moderating the impacts of migration stress on depression and depression on having sex with risk partners. An estimated coefficient was considered statistically significant at $p < .05$ level if the estimated 95% confidence interval did not contain zero. In all the modeling analysis, age, marital status, education and years of migration (continuous) were controlled as covariates. All statistical analyses were conducted using the commercial software SAS, v.9.4 (SAS Institute Inc, Cary, NC).

Results

Characteristics of the study sample

Among the total sample of 1,135 participants, 50.40% were male, with a mean age of 32.46 (SD=7.89) years. One third (32.68%) of the sample had a high school or more education, 78.36% married and 38.15% with monthly income greater than 2,000 YUAN (RMB, approximately \$330). Of the sample, 18.59% migrated to three or more cities, and 52.16% stayed in the current city less than 10 years. Approximately a half reported home visits twice per year or more, and 82.2% reported sending money home. Of the sample, 18.50% reported having intention to move to other cities, 48.19% were residing in the old town, 66.43% lived in rental properties, and 39.21% lived alone. 4.14% have had sex with risk partners (6.29% for males and 1.95% for females).

Correlations among the predictor, mediator, moderator and outcome variables

Results in Table 2 indicate that migration stress was significantly associated with depression. Bonding capital was negatively associated with migration stress and depression only for the total sample. When analyzed by gender, depression was significantly correlated with having sex with risk partners for males, supporting the hypothesized role of depression in bridging the relationship between migration stress and sex with risk partners for males. The correlations between the covariates were also provided in Table 2.

Mediation modeling analysis

Mediation modeling analysis indicated that depression significantly mediated the relationship between migration stress and having sex with risk partners for males with indirect effect [95%CI] = 0.36 [0.08, 0.66] (Figure 2). The mediation effect was not significant for the total sample with indirect effect [95%CI] = 0.21 [-0.06, 0.46]), and the coefficient a (migration stress \rightarrow depression) 0.51 [0.45, 0.57], the coefficient b (depression \rightarrow having sex with risk partners) 0.40 [-0.04, 0.84] and the coefficient c' (migration stress \rightarrow having sex with risk partners when controlling for depression) -0.12 [-0.62, 0.37]. For the subsample of females, the indirect effect was -0.30 [-0.81, 0.15], and $a = 0.58$ [0.50, 0.67], $b = -0.53$ [-1.54, 0.49] and $c' = -0.01$ [-1.09, 1.08].

Moderated mediation analysis

Figure 3 presented results from the moderated mediation analysis. Social capital significantly and negatively moderated the depression-sex with risk partners relationship with $M \times V$ effect = -0.12 [-0.21, -0.04] in Figure 3b. Similar moderation effect was

observed for bonding capital (Figure 3c: $M \times V$ effect = $-0.21 [-0.41, -0.01]$) and bridging capital (Figure 3d: $M \times V$ effect = $-0.17 [-0.30, -0.05]$).

Discussion

In this study, we verified the role of depression in mediating the association between migration stress and engagement in sexual risk behaviors among male rural-to-urban migrants (Yu et al., 2017), and investigated the effect of social capital in moderating the mediation model. Findings of the study provide useful evidence advancing our understanding of the role of social capital in buffering the complex relationship among migration stress, depression and sexual risk behaviors. Findings of this study warrant further research in other cities and outside of China to assess the generalizability of study findings and studies with longitudinal data to verify if the complex relationships we observed in the study are causal.

Mediation effect of depression and gender difference

Findings of this study suggest that male migrants under stressed are at increased risk of suffering from depression, and depressed migrants are at increased risk to engage in sexual risk behaviors. This relationship suggests that migrants suffering from migration stress and depression may use risk sexual behaviors as a coping strategy (Sudhinaraset, Mmari, Go, & Blum, 2012; T. Yang et al., 2009; Yu et al., 2017). Alternative coping strategies may include but not limited to cigarette smoking, binge drinking, using illicit drugs and even suicide. Our study also found that depression did not mediate the association between migration stress and sexual risk behaviors among female rural migrants. It is possible that female migrants may intend to adopt alternative approaches rather than risky sex to cope with migration stress and depression (Yu et al., 2017). One meta-analysis indicated that women are more likely to use verbal expressions to seek for social support and ruminate about problems, and they have more positive self-talk compared to men (Tamres, Janicki, & Helgeson, 2002).

Additionally, depression acted not only as a mediator, but it fully mediated the migration stress–risky sex relationship. The finding suggests that migration stress alone may not be sufficient for migrants to seek risk sexual behaviors as coping strategy. However, when strong and long-lasting stress has resulted in depression, a migrant may seek exciting and stimulating behaviors for coping (Fitzpatrick et al., 2005), risk sexual behavior thus would be an option for rural migrants in urban settings. Therefore, interventions on reducing migration stress and depression, as well as decreasing the effects of migration stress on depression and/or depression on risk sex, are strongly needed.

Moderation effect of social capital

One unique finding of this study is the demonstration of the role of social capital in moderating the mediation relationship of migration stress–depression–risky sex. First, social capital showed significant effect in modifying the association between depression and having sex with risk partners. No published studies have examined the role of social capital in moderating the mediation effect of depression that links migration stress to risk sexual behaviors. From our understanding, it's reasonable that relative to a rural migrants with less

social capital, a migrant with more social capital can receive informational, emotional and instrumental support if depressed (Kawachi & Berkman, 2000; Ryan et al., 2008), reducing the likelihood to engaging in risk sexual behaviors.

Second, we also observed that both bonding and bridging capital moderated the mediation model. Bonding capital links individuals together, such as friends and colleagues (Chen, Yu, Gong, Wang, & Elliott, 2017; Whitley & McKenzie, 2005). These people may provide emotional support when migrants suffer from depression, reducing the likelihood of progressing to risk sexual behaviors. Bridging capital links individuals with groups/ organizations, such as community health center and local non-profit organizations (NGOs). These groups may occupy rich resources, and provide informational and instrumental support for individuals with depression, such as providing information about psychological counseling, and offering available healthcare for migrants' families. Thus these migrants may be less likely to use risk sexual behaviors to cope with depression.

Third, from theoretical perspective, social capital may also buffer the impact of stress on depression. However, we did not observe this effect in this study. The lack of moderation effect could be due to the difference between migration stress and depression and the research design we used for this study. Relative to depression that can be long-lasting, migration stress is a more volatile process that comes and goes more rapidly. Therefore, the moderation effect of social capital on migration stress-depression relationship could not be effectively detected using cross-sectional data.

Finally, like the mediation effect, the moderation effect of social capital was observed for male migrants only. Reported studies indicated that relative to males, female migrants are more likely to be stressed and depressed (Yu et al., 2017), and this difference was also revealed in this study. It is unclear why there is a lack of moderation effect of social capital on the mediation mechanisms. One possible reason could be due to the small number of female migrants in our sample who reported having had sex with risk partners in the past year. Different from most reported studies on sexual risk behavior, participants in the study is a probability sample representing all female migrants in a city, not those female migrants who were engaging HIV risk behaviors, such as commercial sex workers. Therefore, only 20 female participants reported having had sex with risk partners.

Findings of the study is of great significance for developing more effective interventions against risk sexual behaviors. From the perspective of bonding capital, interventions on family and peer are needed by delivering the message through various approaches, such as social media and health education programs. While interventions for bridging capital, organized groups, such as NGOs, community center, and country fellow organizations, are preferred in the target area with high density of migrants. It will be more effective to conduct interventions through these groups by organized activities. One social capital based community intervention has been proven effective in promoting physical exercise and preventing stroke and heart attack in China (Gong et al., 2015), providing clues for future interventions on risk sexual behaviors through social capital based programs.

Limitations and conclusions

The study has limitations. First, this study is cross-sectional, no causal relationship is warranted. However, data from cross-sectional study are snapshots of a longitudinal process, and providing information regarding the dynamic changes in the variables used in the study (Yu, Chen, & Wang, 2018). Thus, findings from the study still provided useful information regarding the potential mechanism of mental health and sexual risk behaviors. Second, this study targeted rural migrants in one city, cautions are needed when generalizing study findings to other cities within and outside of China. Third, the outcome variable was based on self-report. Given the sensitive nature of sex-related questions, underreport could not be ruled out due to social desirability bias. Despite the limitations, this study is the first to apply a moderated mediation model in investigating the complex underlying mechanisms regarding sexual risk behaviors among rural migrants in China by considering social capital. Findings of this study provide timely and important data informing HIV prevention in China considering the role of social capital.

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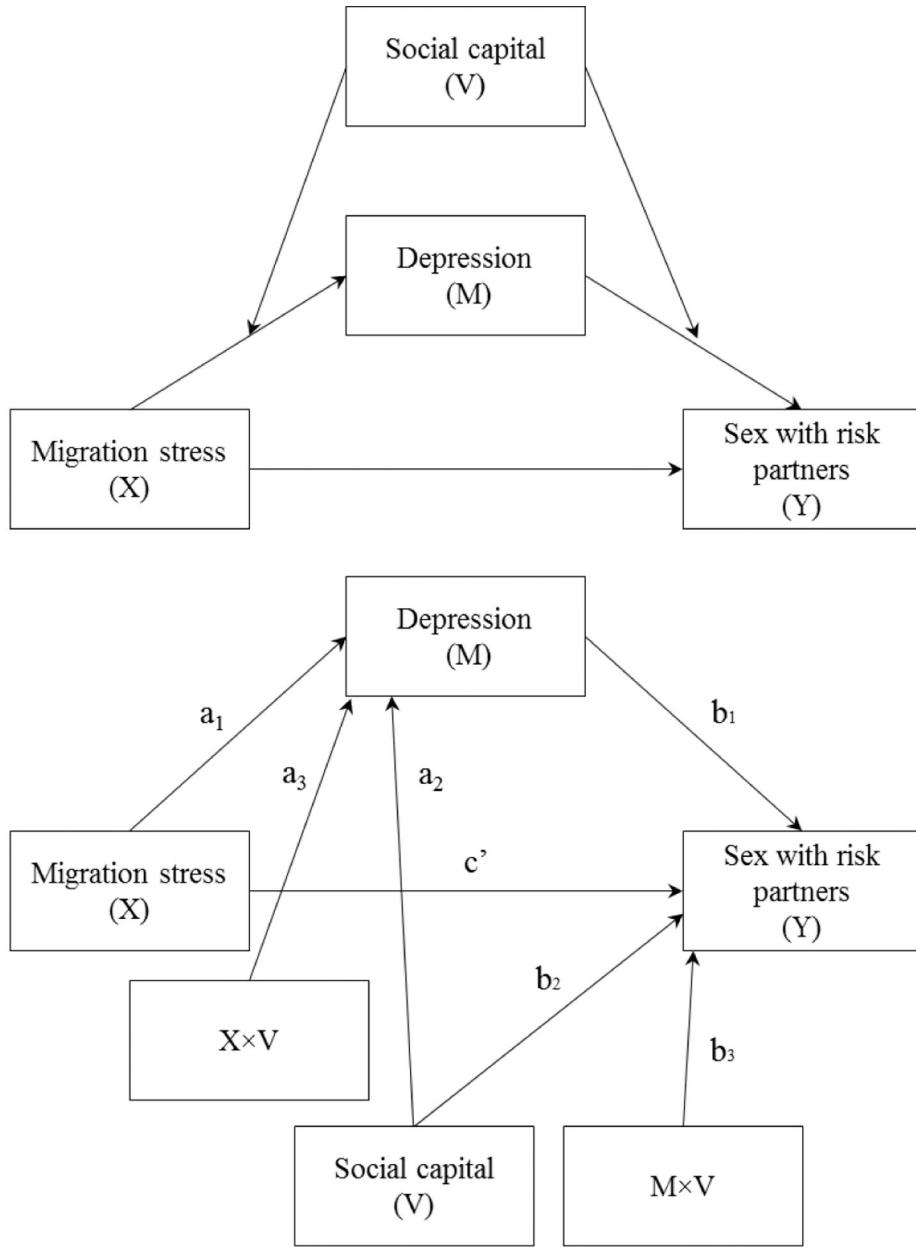


Figure 1. Conceptual (upper panel) and statistical diagram (lower panel) for the proposed moderated mediation model

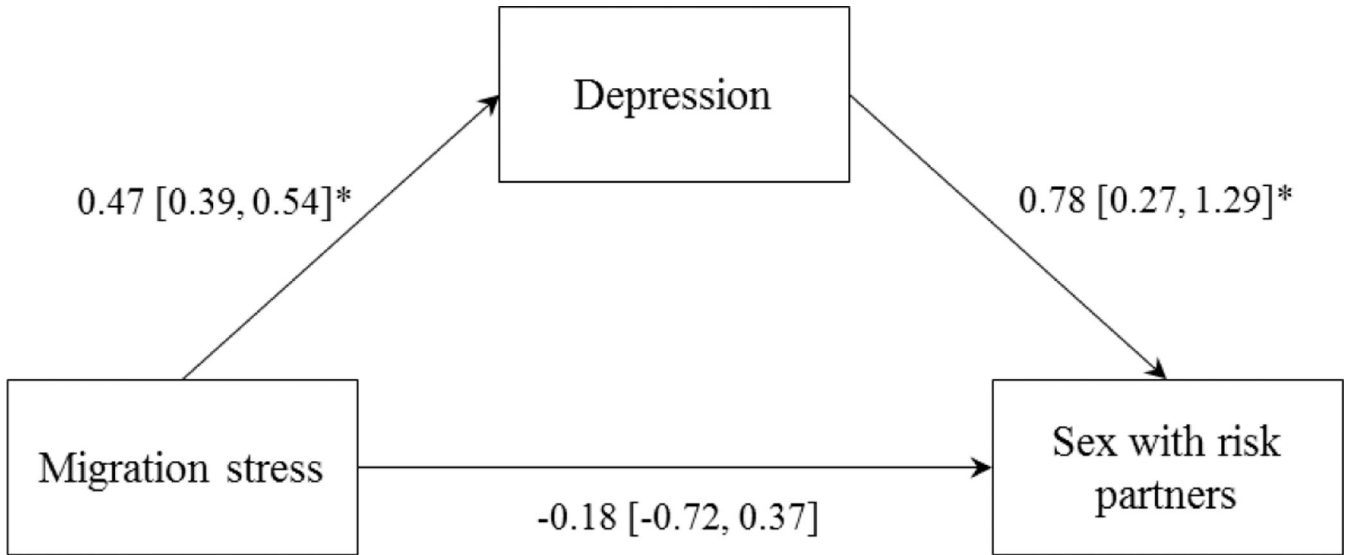


Figure 2. Mediation modeling analysis of the relationship among migration stress, depression and having sex with risk partners (male migrant subsample only, n=572)

Note: (1) Covariates controlled in the modeling analysis were: age, marital status, education and years of migration. (2) The same analysis revealed that depression was not a significant mediator for the total sample and for female subsample (results not shown). (3) *p<0.05, **p<0.01

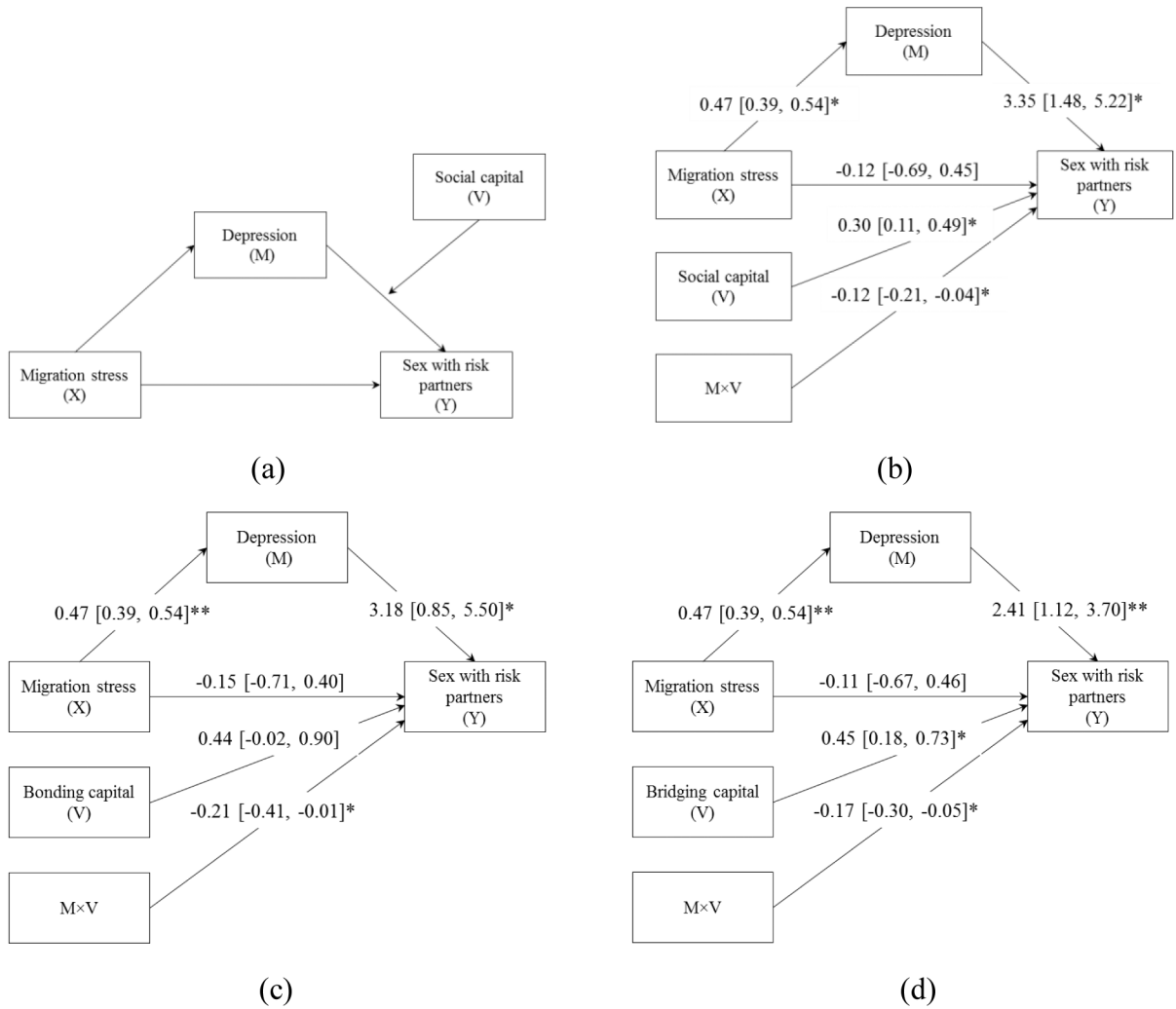


Figure 3. Moderated mediation modeling analysis of the complex relationship among social capital migration stress, depression and having sex with risk partners, male migrant subsample (n=572): (a) conceptual diagram, (b) total social capital as moderator, (c) bonding capital as moderator and (d) bridging capital as moderator

Note: (1) Covariates controlled in the modeling analysis were age, marital status, education and years of migration. (2) The same analysis revealed that depression was not a significant mediator for the total sample and for female subsample (results in text). (3) The moderation effect of social capital on the path from migration stress to depression was not significant, thus according to the guidance of moderated mediation model by Hayes, the moderation effect was removed from the final model. (4) *p<0.05, **p<0.01.

Table 1.

Characteristics of the study sample

Variables	Male	Female	Total
Total, n (%)	572 (50.40)	563 (49.60)	1135 (100.00)
Age (in years)			
Range	18–45	18–45	18–45
Mean (SD)	32.14 (8.16)	32.79 (7.59)	32.46 (7.89)
Education, n (%)			
Primary or less	57 (10.00)	95 (16.90)	152 (13.43)
Middle school	304 (53.33)	306 (54.45)	610 (53.89)
High school	169 (29.65)	125 (22.24)	294 (25.97)
College or more	40 (7.02)	36 (6.41)	76 (6.71)
Marital status, n (%)			
Not married	159 (27.89)	86 (15.30)	245 (21.64)
Married	411 (72.11)	476 (84.70)	887 (78.36)
Income (RMB), n (%)			
1000 or less	61 (10.66)	165 (29.31)	226 (19.91)
1001–2000	220 (38.46)	256 (45.47)	476 (41.94)
2001–4000	230 (40.21)	123 (21.85)	353 (31.10)
More than 4000	61 (10.66)	19 (3.37)	80 (7.05)
No. of cities migrated, n (%)			
2 cities	413 (72.20)	511 (90.76)	924 (81.41)
> 2 cities	159 (27.80)	52 (9.24)	211 (18.59)
Year of migration, n (%)			
< 5 years	185 (32.34)	175 (31.08)	360 (31.72)
5–10 years	101 (17.66)	127 (22.56)	228 (20.09)
10–15 years	119 (20.80)	128 (22.74)	247 (21.76)
15 years	167 (29.20)	133 (23.62)	300 (26.43)
Mean (SD)	10.44 (7.56)	9.89 (7.03)	10.17 (7.30)
Times of visiting home per year, n (%)			
2 times	294 (51.40)	325 (27.73)	619 (54.54)
> 2 times	278 (48.60)	238 (42.27)	516 (45.46)
If send money home, n (%)			
Yes	479 (83.74)	454 (80.64)	933 (82.20)
Intention of moving to other cities, n (%)			
Likely	144 (25.17)	66 (11.72)	210 (18.50)
Unsure	103 (18.01)	91 (16.16)	194 (17.09)
Unlikely	325 (56.82)	406 (72.11)	731 (64.41)
Residential locations, n (%)			
Old town	274 (47.90)	273 (48.49)	547 (48.19)
New town	112 (19.58)	107 (19.01)	219 (19.30)
Urban-rural fringe zone	105 (18.36)	95 (47.50)	200 (17.62)

Variables	Male	Female	Total
Suburban	81 (14.16)	88 (15.63)	169 (14.89)
If rent house, n (%)			
Yes	370 (64.69)	384 (68.21)	754 (66.43)
If living alone, n (%)			
Yes	250 (43.71)	195 (34.64)	445 (39.21)
If sex with risk partners, n (%)			
Yes	36 (6.29)	11 (1.95)	47 (4.14)
Condom use if sex with risk partners, n (%)			
Never	18 (50.00)	6 (54.55)	24 (51.06)
Occasional	4 (11.11)	3 (27.27)	7 (14.89)
Often	4 (11.11)	0 (0)	4 (8.51)
Always	10 (27.78)	2 (18.18)	12 (25.53)

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Table 2.

Variables	Mean (SD)	2	3	4	5	6	7	8	9	10
Total										
1. Social capital	20.68 (4.54)	0.77 ^{***}	0.90 ^{***}	-0.05	-0.04	0.04	0.03	0.15 ^{**}	-0.02	0.07 [*]
2. Bonding capital	11.59 (2.21)	0.41 ^{***}	0.41 ^{***}	-0.08 [*]	-0.06 [*]	0.02	0.01	0.18 ^{**}	-0.06 [*]	0.07 [*]
3. Bridging capital	9.10 (3.15)			-0.01	-0.02	0.04	0.32	0.09 [*]	0.01	0.05
4. Migration stress	2.61 (0.66)			0.45 ^{**}	0.01	0.15 ^{**}	0.15 ^{**}	-0.07 [*]	0.15 ^{**}	0.13 ^{**}
5. Depression	1.99 (0.71)			0.05	-0.02	0.01	-0.02	0.01	-0.03	0.01
6. Sex with risk partners	0.04 (0.20)			0.01	-0.05	0.01	-0.05	0.01	0.01	0.04
7. Age				-0.27 ^{**}	0.58 ^{**}	0.63 ^{**}				
8. Education				-0.30 ^{**}	-0.20 ^{**}					
9. Marital status										0.37 ^{**}
10. Years of migration										
Male										
1. Social capital	20.94 (4.66)	0.79 ^{***}	0.91 ^{***}	-0.05	-0.07	0.01	0.02	0.11 [*]	-0.01	0.03
2. Bonding capital	11.72 (2.20)	0.46 ^{**}	0.46 ^{**}	-0.07	-0.04	-0.04	-0.03	0.13 [*]	-0.05	0.02
3. Bridging capital	9.22 (3.23)			-0.02	-0.07	0.05	0.05	0.08	0.02	0.03
4. Migration stress	2.62 (0.70)			0.43 ^{**}	0.03	0.18 ^{**}	0.18 ^{**}	-0.04	0.19 ^{**}	0.17 ^{**}
5. Depression	1.95 (0.70)			0.13 [*]	-0.07	0.00	-0.07	0.00	-0.06	0.01
6. Sex with risk partners	0.06 (0.24)			0.02	-0.09 [*]	0.03	0.02	-0.09 [*]	0.03	0.03
7. Age				-0.22 ^{**}	0.67 ^{**}	0.68 ^{**}				
8. Education				-0.26 ^{**}	-0.18 ^{**}					
9. Marital status										0.46 ^{**}
10. Years of migration										
Female										
1. Social capital	20.43 (4.40)	0.76 ^{***}	0.88 ^{**}	-0.05	-0.004	0.07	0.03	0.19 ^{**}	-0.02	0.11 [*]
2. Bonding capital	11.45 (2.21)	0.37 ^{**}	0.37 ^{**}	-0.10	-0.07	0.11 [*]	0.05	0.22 ^{**}	-0.06	0.11 [*]

Variables	Mean (SD)	2	3	4	5	6	7	8	9	10
3. Bridging capital	8.97 (3.07)			-0.001	0.05	0.01	0.01	0.11 *	0.01	0.08
4. Migration stress	2.60 (0.62)				0.49 **	-0.03	0.12 *	-0.10 *	0.11 *	0.07
5. Depression	2.04 (0.72)					-0.05	0.02	0.03	-0.01	0.02
6. Sex with risk partners	0.02 (0.14)						-0.01	-0.02	0.02	0.05
7. Age								-0.33 **	0.46 **	0.57 **
8. Education									-0.34 **	-0.22 **
9. Marital status										0.28 **
10. Years of migration										

Note:

** p<0.001,

* p<0.05