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A typology of social capital and its mixed blessing for suicidal ideation: A multilevel study of college students

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ABSTRACT

Rationale: Social capital is an important theoretical construct often used to explain positive behavioral outcomes. However, suicide research is often hampered by a limited definition of social capital, at the expense of its multidimensional nature, since suicide may occur when individuals are beset by overwhelming and conflicting relationships. We hypothesize not all dimensions of social capital protect individuals from suicidal ideation, and the beneficial return from some types also gradually diminishes.

Methods: We conducted a hierarchical ordinal regression analysis of combined samples of university students from 22 cities across all regions of China (n = 5025, response rate 97%).

Results: 1) whereas social capital, measured as network connection, embedded-resource, and generalized trust, is negatively associated with self-reported suicidal ideation, controlling for mental stress and other covariates, when measured as social participation, shows a positive association; 2) the moderate curvilinear effects of embedded resource and network connection imply that the return from some dimensions of social capital gradually diminishes.

Conclusions: We leveraged the results to discuss the theoretical relevance of social capital in the suicide literature –particularly its dark side– and the need for more contextualized public health intervention programs for suicide prevention.

1. Introduction

Suicide is a significant public health problem with increasing worldwide prominence. Suicide adversely impacts the economy and represents a profound family, community and public health burden. According to the National Survey on Drug Use and Health, conducted in 2016 in the U.S., 9.8 million Americans are premediating or seriously considering suicide, of which 3.8 million made suicide attempts. A cross-national study estimated that 9.2% of the people from a sample of 17 countries, at varying developmental stages, had suicidal ideation, and one-third had made a suicide attempt (Nock et al., 2018). As an indicator of social misery, the suicide rate trend is particularly concerning in countries experiencing rapid socioeconomic change. China, for example, has registered a rising prevalence of self-reported suicidal ideation and escalating suicide rates among men and the elderly in the two decades following market transformation (Yip et al., 2005).

Understanding suicidal ideation is perhaps the most critical step towards combating the suicide epidemic. Whereas suicidal ideation may have a different etiological mechanism than actualized suicide, it is the most proximate precedent and a necessary condition for a suicide attempt and suicide (Klonsky et al., 2016). Others view suicidal ideation as early progression on the continuum of suicidal behavior, whose culmination in suicide is contingent upon a host of interplaying psychological and social factors (Have et al., 2009). For public health scientists, social workers, and policymakers, the most crucial practical strategy in suicide prevention is to intervene at the stage of ideation.

Current scholarship has addressed two etiologically distinct sets of risk factors for suicidal ideation: psychological and social. A separate line of research focused on the construction of the varying definitions of suicide by dominant social interests (Pescosolido and Mendelsohn, 1986; Wray et al., 2011) and the problematic classification of deaths facing medicolegal authorities (Rockett et al., 2006; Rockett, 2010). While psychological factors, including adverse life events, stress and psychache, show statistically significant associations with suicidal

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ideation across many populations (Nock et al., 2018; O'connor and Nock, 2014; Rockett, 1998), the relative stability of suicides within categories of groups over time demands social and structural explanations for the systemic fluctuations across groups (Bearman, 1991). For this reason, the social understanding of suicidal ideation awaits an overdue update on the classical description of the roles played by social relationships. In this study, we leverage the powerful concept of social capital, disaggregate it into four subtypes, and test the differential effects of social capital types upon suicidal ideation among college students from 22 universities across all regions of China.

1.1. Social capital and suicidal ideation

Many studies have demonstrated the association between social capital and suicide, with most revealing effects of social capital in preventing suicides and suicidal ideation (Abrutyn and Mueller, 2016; Braswell and Kushner, 2012; Fitzpatrick et al., 2007; Kushner and Sterk, 2005). Given the parallel and diverse intellectual origins of social capital, some scholars now refute the notion of social capital as a monolithic concept, and contend there are multiple dimensions, including a social participation/cohesion dimension, an affective dimension, and a resource dimension (Deth, 2008; Lin, 2002; Carpiano, 2006). However, in ignoring or overlooking the subtypes of social capital, few studies have offered a convincing explanation of why and how social capital could initiate or otherwise impact suicidal ideation.

The role played by social capital on suicide behaviors is further complicated by speculation that higher levels may reverse its protective effect. This possibility first stemmed from Durkheim's seminal study *On Suicide*, in which he argued that suicide may occur with both the lack or excess of integration and regulation (Durkheim, 1997(1897)). Pescosolido and Georgianna (1989)—suggesting that integrative communal ties may increase suicides when individuals have little freedom from regulation, particularly during communal crises. Bearman (1991) has elaborated on how an imbalanced array of person-organization connections dampens moral directives and increases anomic suicides.

Social capital, by definition, necessarily involves an individual's active creation and maintenance of some social assets that may generate returns to personal wellbeing (Portes, 1998). Thus, holding social capital also demands reciprocity and investment that may be detrimental to life wellbeing. This potential of social capital is analogous to the dynamic relationship between equity and liability in the financial world. Social ties and network positions, by which social capital is often measured, can transmit negative qualities as well as positive ones, exemplified by the finding that negative affections spread through social connections (Fowler and Christakis, 2008). Emotional energy accumulates when individuals form groups, from which the same emotional energy expands and self-reinforces (Collins, 2014). Overall, while social capital is typically associated with better wellbeing, the potential damage it could inflict regarding suicidal ideation also has theoretical grounds and some empirical support (Abrutyn and Mueller, 2016; Braswell and Kushner, 2012; Davis et al., 2009; Wu et al., 2018).

Our task is to elucidate the role of social capital types, and empirically demonstrate the return of social capital with respect to suicidal ideation. We synthesize a multidimensional conceptualization of social capital, test the impact of different dimensions or types of social capital on this ideation, and reconcile the dilemma as to why social capital may both protect against and elevate its risk.

1.2. A typology of social capital

Developing a typology of social capital is predicated on the diverse intellectual origins of the concept. Pierre Bourdieu first proposed social capital, together with economic and cultural capital, as the “profits which accrue from membership in a group are the basis of solidarity which makes them possible” (Bourdieu, 1986). In social exchange theory, social capital functions as an infrastructure that promotes the exchange of goods and benefits (Portes, 1998; Coleman, 1988). Here, social capital enables the institutions that facilitate social exchanges, in the sense that a financial system comprises capital, as measured by equity and infrastructure. People may lend money to others in a small and cohesive religious/ethnic community, without collateral liability (a form of economic capital), because the receiver has already made a major investment in social capital. Alternatively, the pervasive acceptance of social capital was made possible by the political science literature traced back to Robert Putnam, whose idea of social capital represents the strength and quality of trust and connections (Putnam, 2001). This latter string of social capital theory, in particular, shares a neoliberal intellectual heritage with rational choice theory in that both prefer the capacity of individuals and voluntary associates to state intervention regarding social projects (Fine, 2010). Naturally, each tradition of social capital theory also emphasized variable operationalization.

To advance multidimensional understanding, scholars generally posit we can classify the generic notion of social capital (Kawachi et al., 2004; Portes, 1998; Deth, 2008; Lin, 2002) by whether it is measured as a property of a *collective* or an *individual* analytic unit, and whether it relates to the *instrumental* or *affective* aspect of the good (content of social capital). For survey studies, where the analytic unit is mostly confined to the individual-level, we will focus on social capital measured at the individual-level and control for aggregate-level capital through mean-centering, as we will later show in the methods section. We now review three types of social capital possessing an instrumental nature—participation, network connections, and resources embedded in networks, and one expressive/affective type of social capital known as trust. Each subtype may affect suicidal ideation through a unique mechanism.

Social capital as participation: Participating in civic and religious activities promotes the health and wellbeing of the participants, meanwhile also facilitating the building of a mutually supportive community (Putnam, 2001). When individuals participate in a diverse set of organizations, moral directives become less demanding and less likely to cause stress and suicide (Bearman, 1991). Social capital, as participation, may affect suicidal ideation by shaping an individual's affinity with others. Social participation increases solidarity among individuals, alleviates the damage of stressors, helps build up self-esteem, and even improves physical fitness (Mirowsky and Ross, 2003; Unger, 1997). However, high participation may adversely affect mental health through draining personal resources and energy (Moore et al., 2009). It is also found that close engagement in some organizations, particularly total institutions, is associated with an elevated suicide risk due to the stringent moral directives imposed on members who do not fit in (Abrutyn and Mueller, 2014; Braswell and Kushner, 2012). Overall, we may use individual frequency of participation in civic and religious activities to measure participatory social capital.

Social capital as social network connections: Occupants with multiple social connections have been found to possess higher socioeconomic status and prestige, leading to the hypothesis that the quantity of social network connections, measured by metrics such as centrality and social integration, may suppress the risk of suicidal ideation. Having more network connections may reduce this risk by enhancing a personal sense of belonging in a community and by buffering stress (Kawachi and Berkman, 2001). Alternatively, the obligation to reciprocate the bonds (material or social), generated from excessive connections, may constitute a chronic stressor and induce suicidal ideation (Mitchell and Lagory, 2002; Kushner and Sterk, 2005). Bearman (1991)argued that person-to-person connections essentially constitute the level of integration in a community, and Durkheim's observation on integration and altruistic suicide can be explained by these connections.

Social capital as network-embedded resources: From this perspective, social capital originates from the resources embedded in social networks as distinct from the connections themselves. Some scholars

(Lin, 2002; Van Der Gaag and Webber, 2008) had argued that network connections *per se* are inconsequential for social capital, as one may possess connections without positive utility, connections that may even invite conflict and turmoil. This possibility prompted Lin to propose "measurements [that] focus on the valued resources (e.g., wealth, power, and status) of others accessed by individuals in their networks and ties" (Lin, 2002). This conceptualization of social capital differs from the network connection perspective by emphasizing the potentiality of the procurement of benefits, an idea proposed earlier by Bourdieu to explicate how class-based tastes translate into economic and social advantages (Bourdieu, 1986). By connecting to others, with varying levels of valuable resources in a network, some will be able to increase their relative material and social support. Accordingly, individuals with access to these resources may lower their risk of stress and suicidal ideation. Such social capital may also inhibit or prevent suicidal ideation by providing new health information and sources of relief.

Social capital as affective connections: Resources do not equate with concrete goods. They can be distinguished as structural or affective. The affective dimension of social capital measures how close and trusting an individual is towards his/her community or immediate social circles. Thoits (2011) explicated that, for mental health, the instrumental resources afforded through personal connections should be clearly differentiated from the emotional connection regarding how individuals value and trust other members in the community. Indeed, Putnam's deployment of trust has become a hallmark of social capital in many fields including public health, criminology, and political science. Possessing greater social capital, in the form of an affective connection, is associated with self-efficacy, collective efficacy of a community, lower level of stress, and better self-rated health (Elgar et al., 2011; Poortinga, 2006; Scheiring et al., 2018). Abrutyn et al. (2019) and Abrutyn and Mueller (2016) proposed that suicides may ensue from the negative affections transmitted through cultural regulations. Although few studies have explored the functions of the affective dimension of social capital on suicidal ideation, it is nonetheless reasonable to hypothesize a negative association between trust and suicidal ideation.

1.3. Gaps in the literature

Scholars of social capital and suicidality should reflect upon two theoretically distinct problems associated with the positive narrative of social capital. The first problem concerns the heterogeneous functions and values provided by different types of social capital— one that compels us to rethink the possibility that all types of social capital may not exercise a homogeneous impact upon suicidal ideation. The second problem begs the question of magnitude: how beneficial would social capital be at a high level?

For the first question, some exceptional studies considered how the different dimensions of social capital uniquely affect public health, but fewer directly addressed suicidality. Fitzpatrick and associates (2007) found that whereas social capital by connection reduces suicidal ideation, participation social capital exacerbates the adverse impact of mental stress upon suicidal ideation. Most other studies, which leveraged this vein of social capital theory, have focused on the various aspects of mental wellbeing or life satisfaction (De Silva et al., 2005; Mitchell and Lagory, 2002; Poortinga, 2006; Cattell, 2001; Yang and Yang, 2017; Yang, 2017) whose affinity with the etiology of suicide suggests a similar pattern may be discovered for suicidal ideation. To close this gap, this study will test whether the four subtypes of social capital, as we laid out, affect suicidal ideation in the same manner.

The second question, regarding the potential harm inherent in an excess of social capital, had occasionally been labeled by scholars as the dark side of social capital (Beyerlein and Hipp, 2005; Schulman and Anderson, 1999). There exists a famous U-shaped curve of suicide across religious denominations (Pescosolido and Georgianna, 1989). Wu et al. (2018) identified uncertainty stress as the mediator between excess network connections and suicidal ideation among college students. In an alternative vein, scholars found that having too many social ties, particularly strong ones, leads to a capital redundancy that in turn suppresses effective transmission of valuable information and resources (Granovetter, 1973; Yang and Yang, 2018). Following this reasoning, the potential harm from an excess of social capital may gradually override an initial positive effect, and counter-intuitively reduce the benefits of social capital upon suicidal ideation.

Emanating from our literature review, we propose two sets of hypotheses. First, to understand the effects of social capital subtypes upon suicidal ideation, we hypothesize that *all four types of social capital (H1.1-participation, H1.2-network connection, H1.3-embedded resources, and H1.4-trust) are associated with lower suicidal ideation*. Secondly, to test the reduced-benefit hypothesis, we hypothesize *a curvilinear relationship between all types of social capital (H2.1-participation, H2.2-network connection, H2.3-embedded resources, and H2.4-trust) and suicidal ideation, and that the marginal return to suicidal ideation decreases at higher levels of social capital.*

2. Method

2.1. Sample

Potential methodological flaws associated with suicide measurement are severe and rampant, such as misclassification of accidents and drug overdoses, gender and race-related misclassification, and lack of corroborative medicolegal evidence (Klonsky et al., 2016; Rockett et al., 2006, 2010). Fortunately, these issues do not similarly plague surveys of suicidal ideation because self-reported suicidal ideation reflects a susceptibility towards suicide among all populations, and can be readily tapped in surveys. Therefore, studying suicidal ideation among the general population has assumed increasing importance for both research and prevention purposes.

The dataset used in this study was the Chinese extension of the Global Health Professions Student Survey (GHPSS). The survey team employed a multistage sampling design and conducted the sampling in 2013. In Stage 1, 60 potential universities were identified across geographically diverse regions. From the 60 universities in the GHPSS program, students were recruited at 42 participating universities from all main regions of China (the Northeast, Northwest, North, Southeast, Southwest, and South) to complete the survey. Among the 42 participating universities, the survey asked a supplement section on mental health, stress, and suicidal ideation among 22 universities. The remaining 22 universities still represent all six main regions of China and cover all Chinese linguistic areas (i.e. Mandarin, Jin, Wu, Hui, Xiang, Gan, Hakka, Hokkien, and Cantonese), as well as the Tibetan-speaking region (see Fig. 1).

Stage 2 of the sampling strategy involved the selection of classes within each of the 22 universities. All students attending the selected medical/health classes, from the participating universities, received a questionnaire that provided for anonymous response. The research team achieved a high response rate of 97.5% because the questionnaires were administered during regular class sessions by faculty or school officials at each university. The sample size was 5025.

2.2. Measurement

Dependent variable: Three questions with binary Yes/No response options were used to measure suicidal ideation: In the past year, have you "really considered suicide", "thought life was not worth living", and/or "tried to intentionally hurt yourself." A summated score indicated the severity of suicidal ideation, progressing from contemplation to full ideation. It produced a 4-level ordinal variable, with a zero score indicating no suicidal ideation and three representing the highest level.

Social capital variables: We enlisted three types of instrumental

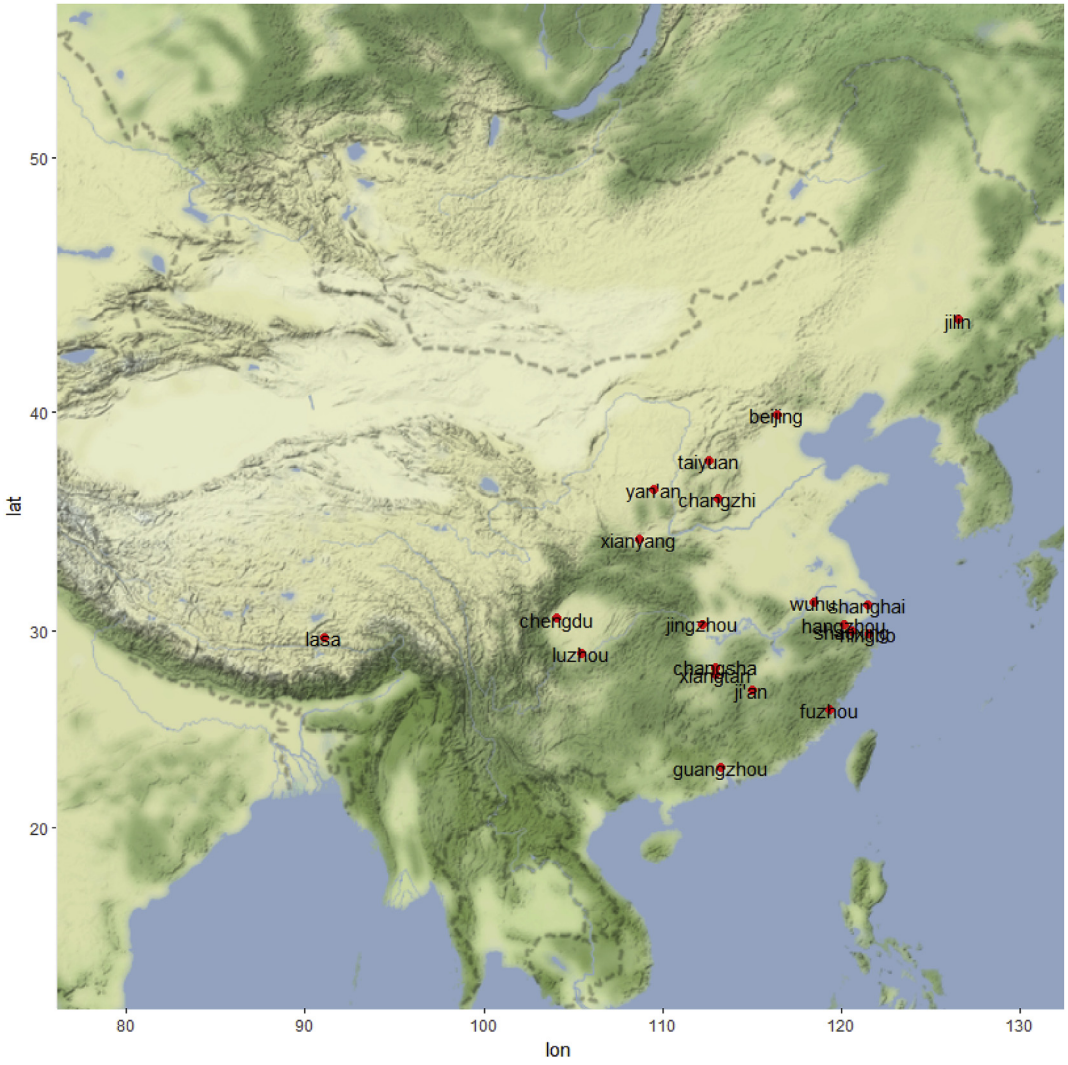

Fig. 1. Mapping the cities hosting the 22 universities participating in the full survey.

social capital and one type of affective capital as predictors of suicidal ideation: social capital as participation, network connections, network-embedded resources, respectively, and generalized trust. The GHPSS has an extended section designated for social capital measurement, comprising four scales and 20 items.

For *participation*, respondents answered how often they had participated in voluntary/charitable activities, student organization events, extracurricular activities outside the campus, activities in a bar and karaoke, public meetings, and religious activities. For *network connections*, they indicated the number of contacts of the following nature: romantic partners, friends, colleagues, and the frequency of contact with family members. For *resources in social networks*, the quality and resource-richness of the connections were assessed by asking the respondents how many people they could "confide in and talk with during a life crisis", "collaborate with for business purposes," and "borrow 100 Yuan from during an emergency." These questions emphasized the concrete resources available in the set of connections they possessed, rather than the connections *per se*. For the *trust*, the questionnaire asked whether respondents "would you like to trust most people," "feel an affinity with your primary social circle," "feel that people are constantly taking advantage of you," and "feel most people would be helpful if I needed them."

The literature also addressed the typology of social capital in lieu of its ecological unit, distinguishing social capital aggregated at the collective level from that measured as an individual property. Although the survey asked only for information on social capital at the individual level, its multilevel identification of the higher-level analytic units (i.e., school and city) allowed us to methodologically model and control for the influence of collective-level social capital.

For each sampling site, when social capital at the collective level represented an aggregate feature of all people living at the site, we could use group-mean centering for accommodation. For example, if the average trust among all k respondents from site j is $\bar{x}_j = \sum_{i=1}^{k} x_{ij}$, this average is a compositional characteristic of the population and bears no correlation with any individual's value on that characteristic. Thus, scholars often use such compositional characteristics to represent collective-level features (Macintyre et al., 2002). The OLS model of suicidal ideation for the *i*th person at the *j*th site expressed as $y_{ij} = \alpha + x_{ij} + \bar{x}_j + \sigma$, with an individual-level social capital variable x_{ij} and an aggregate capital variable $\bar{x}_j$. When the group-mean-centered variable is $C_{ij} = x_{ij} - \bar{x}_j$, then replacing the two variables in the right-hand side of the first equation by C_{ij} would result in no functional changes. In other words, using group-mean-centered variables is equivalent to the inclusion of both individual- and collective-level variables. Therefore, we created group-mean-centered social capital variables to measure the pure effect of the individual-level social capital net of the influence of collective social capital.

Covariates: Covariates entered into the models, to control for confounding influences, included a series of demographic background characteristics and health status measures. Demographic information

included the logarithm of monthly spending (in Yuan), age, gender, and ethnicity (Han vs. minorities). This study also controlled for several physical and mental health characteristics, including chronic illness, sleep disorders, mental stress, and mental illness, that are closely associated with suicidal ideation (Klonsky et al., 2016; Rockett, 1998). To control for these confounders, GHPSS asked the respondents to assess chronic illness ("have you been diagnosed with a chronic illness?"), frequency of visiting a clinic ("how many times have you been to a hospital in the past year?"), and hours of sleep ("on average how long do you sleep on weekdays?"). To compute a summated mental stress score, respondents were assessed using eight five-point Likert scales (Cronbach $\alpha = .895$): "I feel unease about something that happened out of the blue; I feel unable to control important things in my life; I feel stressed out; I can successfully manage troubles in my life; I feel things are going the way I expected; I found myself unable to finish necessary things; I found myself occupied with something I cannot finish; I feel my problems are mounting".

2.3. Statistical analysis

We adopted the most basic form of hierarchical regression modeling to fit the proposed relationships between suicidal ideation and the independent variables. Since the sample originated from 22 universities, with possible non-uniform variances across different sampling sites, hierarchical regression modeling adjusted the varying errors due to sampling design by allowing a unique intercept at each sampling site. Without further freeing coefficient parameters at the second-level, this random intercept produces a partial-pooling regression that helps minimize design-induced errors (Gelman, 2006). Scholars prefer ordinal regression with logit link function over linear regression when a dependent variable has several ranked categories with ambiguous metric distance between each two categories. We applied such hierarchical ordinal regression to our data:

$$\ln \frac{\Pr(y \geq l)}{\Pr(y < l)} = \beta_{0j} + \boldsymbol{\beta}_{11}\boldsymbol{C}_{ij} + \boldsymbol{\beta}_{12}\boldsymbol{C}_{\boldsymbol{ij}}^{2} + \boldsymbol{\beta}_{13}\boldsymbol{Z}_{\boldsymbol{ij}} + \eta_j + \sigma_{ij},\ l \in (0,\ 1,\ 2,\ 3)$$

$$C_{ij} = x_{ij} - \bar{x}_j$$

The left-hand side of the equation is the likelihood that one reports lth level of suicidal ideation than any level lower than l. The division is the probability increment in having an additional higher-level of suicidal ideation. Coefficients and modeled random errors occupied the right-hand side of the equation. Significant coefficients (or their converted odds ratios) should be interpreted as: each additional score in an independent variable pushes the suicidal ideation to pass a threshold to gain one higher level.

Vector $\boldsymbol{C}_{ij}$ are the mean-centered social capital variables for the ith person, their corresponding coefficient $\boldsymbol{\beta}_{12}$ test hypotheses H1.1, H1.2, H1.3, and H1.4. Vector $\boldsymbol{C}_{\boldsymbol{ij}}^{2}$ is the multiplicative of social capital, its coefficients $\boldsymbol{\beta}_{13}$ will be cited to test hypotheses H2.1, H2.2, H2.3, and H2.4. Vector $\boldsymbol{Z}_{\boldsymbol{ij}}$ contains all other covariates, η_j is the site-level variance at the jth university, and σ_{ij} represents the individual-level error. We conducted all analyses within the environment of Stata 14.

3. Results

Table 1 summarizes the key descriptive statistics for all variables: means for interval and ordinal variables, proportions for the categories of nominal variables, standard deviations, and minimum and maximum values. On the incremental ordinal level from zero to four, the mean score of self-reported suicidal ideation was only 0.41, barely above the floor of zero. However, the larger standard deviation of 0.69 shows considerable variation in suicidal ideation, and some individuals reported very strong suicidal ideation. Among social capital variables, the mean level of participation social capital was 7.25, the mean for network connection was 12.34, the mean level for network-embedded resources was 10.46, and affective social capital averaged 3.07. Females represented 67.8% of the respondents, approximating the gender composition of university students in contemporary China. The Han majority constitute 91.3% of the respondents, 22.3% had a chronic illness, 27.5% were smokers, and 47.1% were drinkers.

Table 1
Descriptive statistics for all variables. Means and standard deviations reported for interval and ordinal variables, proportions and standard deviations for nominal or binary variables.

Variable	Mean	Standard deviation	Range
Suicidal ideation	.41	.69	0, 3
Participation	7.26	1.72	4, 17
Connection	12.34	2.5	3, 18
Embedded resource	10.46	2.49	2, 14
Trust	3.07	1.05	0, 4
Mental stress	1.68	.68	0, 4
Gender (female)	67.8%	.7%	0, 1
Age	20.87	1.72	14,28
Ethnicity (Han)	91.3%	.4%	0, 1
Log monthly spending	6.67	.44	4.61, 9.21
Chronic illness	22.3%	.6%	0, 1
Visiting clinic	1.59	.71	1, 4
Sleeping time	2.89	.81	1, 5
Tobacco smoking	27.5%	.6%	0, 1
Alcohol drinking	47.1%	.7%	0, 1

Note. The year was 2013. $N = 5025$.

The correlation matrix in Table 2 depicts a pairwise correlation test for the dependent variables and the four social capital variables. As anticipated, each type of social capital was significantly correlated with all other types of social capital. The consistent and significant correlations between all social capital variables suggested strong internal reliability of the concept of social capital. The dependent variable, suicidal ideation, was significantly correlated with all but one type of social capital, namely, participation. However, this non-relationship may be due to confounding by other types.

To examine possible confounding, we moved to hierarchical ordinal regressions. The first model in Table 3 is an intercept-only baseline model that serves as a comparison for the full model. The thresholds were cut-off points beyond which the likelihood of reporting the higher level of suicidal ideation was reached. Model 2 included only social capital variables. We found diverging effects between different types of social capital: whereas network connections, embedded resources, and trust were negatively associated with suicidal ideation in a statistically significant manner, and participation social capital was positively associated with suicidal ideation, after controlling for the confounding effects of the other types of social capital. Participation increases the odd ratio of having more suicide ideation by 1.09 times. When the original scale of participation ranges from 4 to 17, an odds ratio of 1.09 means that a person with the maximum participation score at 17 has three times higher odds of reporting ($1.09^{13} = 3.06$) suicidal ideation than a person with participation social capital of 4. Other types of social capital—network connections, network-embedded resources, and general trust—all reduce self-reported suicidal ideation.

We further tested if the association between suicidal ideation and

Table 2
Correlation matrix of different sub-types of social capital and suicidal ideation.

Social capital	Suicidal ideation	Participation	Connection	Embedded resource
Participation	.01			
Connection	-.18***	.19***		
Embedded resource	-.25***	.20***	.54***	
Trust	-.19***	.04**	.21***	.33***

*$p < .05$, **$p < .01$, ***$p < .001$.

Table 3
Hierarchical ordinal regression on suicidal ideation, random intercept at school-level and social capital variables centered around the group mean.

$N = 5025$, $m = 22$	Model 1-baseline	Model 2		Model 3	
		OR	95% *CI*	*OR*	95% *CI*
Participation		1.09***	1.05, 1.13	1.07***	1.03, 1.11
Connection		0.92***	0.89, 0.95	0.92***	0.89, 0.95
Resource		0.85***	0.83, 0.88	0.85***	0.83, 0.88
Trust		0.80***	0.75, 0.85	0.83***	0.79, 0.89
Stress				1.62***	1.42, 1.83
Gender				1.06	0.90, 1.24
Ethnicity				0.78*	0.60, 0.99
Spending				0.98	0.84, 1.15
Chronic illness				0.51***	0.35, 0.72
Medical visit				0.95	0.81, 1.10
Chronic illness × medical visit				1.22*	1.01, 1.47
Sleeping				0.86***	0.79, 0.93
Age				0.93**	0.89, 0.98
Smoking				1.37***	0.18, 1.60
Drinking				0.73***	0.64, 0.84
Threshold 1	2.21	0.83		−0.96	
Threshold 2	2.54	2.69		0.95	
Threshold 3	3.97	4.16		2.44	
Variance of group means	0.07	0.06		0.05	

$*p < .05$, $**p < .01$, $***p < .001$, *OR* = odds ratio, *CI* = confidence interval.

social capital remains robust when individual demographic background and health status are considered. Model 3 shows that participation is still associated with higher odds of suicidal ideation, while network connections, embedded resources, and trust are associated with lower odds. At this point of the analysis, hypothesis H1 is only partially supported: not all types of social capital are protective against suicidal ideation because greater social participation showed a positive association.

Among demographic variables, we found a negative association between age and suicidal ideation ($OR = 0.93$, $p < .05$). Many health status and health behavior variables showed significant associations with suicidal ideation. High mental stress is a strong and significant risk factor for suicidal ideation ($OR = 1.62$, $p < .001$): a person with the highest level of mental stress is seven times ($1.62^4 = 6.89$) more likely to report suicidal ideation than a person without stress. More sleep reduces suicidal ideation ($OR = 0.86$, $p < .001$). Alcohol-drinkers have lower odds ratio of suicidal ideation ($OR = 0.73$, $p < .001$), but smokers show higher odds ($OR = 1.37$, $p < .001$). There also is a significant interaction between chronic illness and the frequency of hospital visitation ($OR = 1.22$, $p < .05$). People with chronic illness and those with hospital visits report excess suicidal ideation, indicating that the severity of chronic illness has inhibited their wellbeing.

To test hypothesis group 2, we incorporated the multiplicative terms of social capital variables into the full model. With the main coefficients present, the multiplicative terms inform the curvilinear relationship between the main effects and the dependent variable. One may also consider the multiplicative term as the "acceleration" of the main effect because the multiplication represents the exponential increase of the main effect in the manner that, if the multiplicative term is positive, the marginal return of the main effect will increase exponentially at higher levels. In contrast, a negative multiplicative term retards or reverses the marginal return of the main effect. Table 4 shows significant and positive multiplicative effects for network connections ($OR = 1.01$, $p < .01$) and embedded resources ($OR = 1.01$, $p < .05$). Such effects indicate that, at incrementally higher levels, more network connections and network-embedded resources will elevate the odds of reporting suicidal ideation. This finding supports hypothesis H2, namely, that the marginal return of social capital on suicidal ideation diminishes at higher levels. While more network connections and greater embedded resources diminish suicidal ideation, these two types of social capital may begin increasing the risk of suicidal ideation as they reach a higher level.

Table 4
Multiplicative effects of social capital variables on suicidal ideation.

Factors and thresholds	Odds ratio	95% *CI*
β (participation) acceleration	1.01	0.99, 1.02
β (connection) acceleration	1.01**	1.00, 1.02
β (resource) acceleration	1.01*	1.00, 1.02
β (trust) acceleration	0.98	0.94, 1.03
Threshold 1	−5.77	
Threshold 2	−3.85	
Threshold 3	−2.34	
Variance	.09	

Note. All main effects are specified identically as in Table 3. $*p < .05$, $**p < .01$, $***p < .001$. *CI* = confidence interval.

Recent scholarship on methodology urges the use of predicted marginal effects along with significance tests to affirm the existence of any significant multiplicative term in a generalized linear regression (Hainmueller et al., 2018; Long and Mustillo, 2018). Figs. 2 and 3 show the predicted margins of suicidal ideation by the values of social capital. Both network connections and network-embedded resources are associated with lower self-reported suicidal ideation. When network connections and embedded resources increase, there is an incremental trend for reporting no suicidal ideation, and a suppressive trend for reporting suicidal ideation at any non-zero level. However, the curve in the connected probabilities also shows that as social capital accumulates, it starts to generate an increasingly weaker marginal return as protection against suicidal ideation. For example, persons scoring 16 in network connections report slightly more suicidal ideation than persons scoring 11.

4. Discussion

Suicidal ideation is a critical antecedent of suicide attempts and suicides. Although not all people with suicidal ideation actualize it, suicidal ideation is a necessary condition of attempted suicide (Klonsky et al., 2016). Given suicide's increasingly recognized public health burden globally—particularly in developing countries related to massive structural changes in people's capacity to work and its nature (Rockett, 2010)—understanding the risk factors associated with the formation of suicidal ideation provides a foundation for preventing and managing this serious health and social issue at the population level.

Social capital, as a widely applied concept in the studies of well-being, has received sparse attention in the suicide literature, and its mechanism affecting suicidal ideation is poorly understood. However, social capital has been measured in several conceptually distinct ways since its inception. Social capital may refer to a very unique type of capacity and power conferred by social relationships, and thus may differentially impact suicidal ideation. This study investigated four social capital subtypes commonly seen and delineated in the literature (Lin, 2002; Lochner et al., 1999; Portes, 1998). Three of these are social capital as structured social relationships and one as an affective resource. The first is the level of participation in voluntary activities of various kinds—be it religious, civic, or leisure. Social capital as an instrumental good is also frequently measured by the size of connections in a network, namely network connections. The third type of social capital—embedded resources—emerged as a critique of the network connections subtype: the richness of resources embedded in a network should override the significance of connections alone. The last type of social capital–affective social capital–is measured by the level of trust that one expresses towards the generic others around him/her.

Pairwise correlation has shown that all four types of social capital

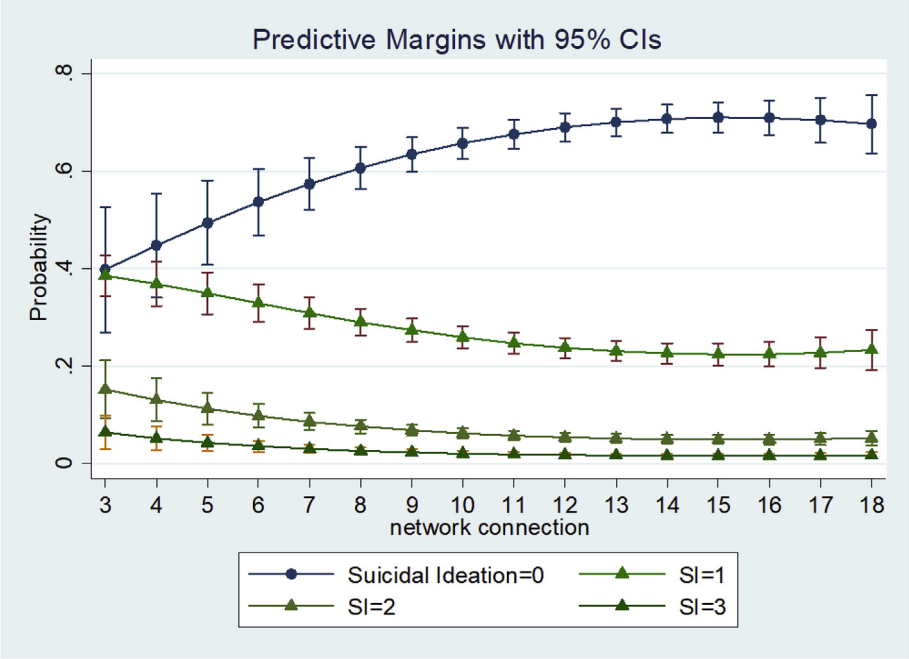

Fig. 2. Predicted probabilities of achieving different levels of suicidal ideation (SI) as network connections increase, presented with 95% confidence intervals.

are inter-related, affirming the internal consistency of social capital as a concept with multiple dimensions. However, not all social capital types are directly associated with suicide ideation. Participation is an example. Through multilevel regressions with random intercepts, we affirmed hypotheses H1.2, H1.3, and H1.4, but found no empirical support for H1.1 regarding social capital as participation. Social capital as network connections, embedded resources, and trust, is inversely associated with suicidal ideation. We found that participation is positively correlated with suicidal ideation. This finding suggests that, even holding constant the level of other social capital variables, a person who more actively participates in social activities is more susceptible to suicidal ideation.

This main finding of participation social capital may respond to prior studies on religious participation and suicide, which propose that excessive participation binds people to their moral community with harmful consequences for suicide and mental health (Pescosolido and Georgianna, 1989). Too much participation may detract from the limited energy and time an individual possesses, elevate personal stress, and impose emotional and financial costs. Studies on the social production of emotions in suicides further suggest that people participating closely in their community may face the greater pressure of moral directives (Abrutyn and Mueller, 2014, 2016).

From a network perspective, some scholars contend that having too many connections may constitute a chronic stressor (Mitchell and

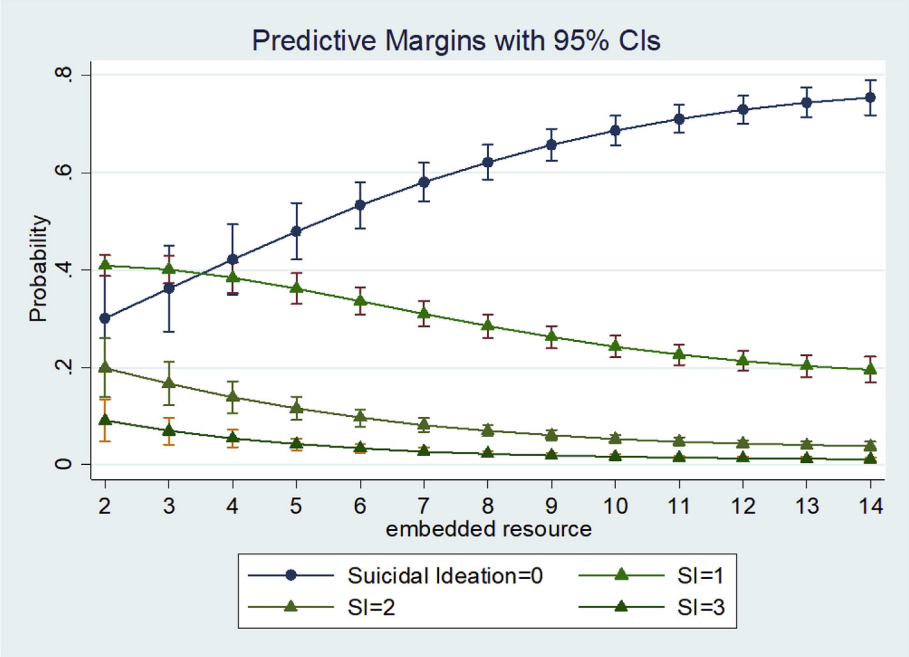

Fig. 3. Predicted probabilities of achieving different levels of suicidal ideation (SI) as network-embedded resource increases, presented with 95% confidence intervals.

Lagory, 2002; Kushner and Sterk, 2005) and most connections are too redundant to be utilized for psychological and social benefits (Granovetter, 1973). Overall, we generated evidence that not all dimensions of social capital protect against suicidal ideation. We recommend other scholars not restrict social capital to a single construct. Instead, social capital is multi-dimensional, with subtypes that differentially impact suicidal ideation.

To further elucidate the complexity of social capital, we also hypothesized that the beneficial effect of social capital may gradually diminish as it increases. First, in light of the strength-of-ties thesis, one may no longer benefit from a social capital asset when it becomes redundant, and any further increase in social capital, beyond a certain threshold, may cease providing its former marginal utility (Granovetter, 1973). Secondly, in a Durkheimian framework, suicide may occur in an over-regulated and over-integrated society (Durkheim, 1997(1897)) just as it may in a loosely connected society. Pescosolido and Georgianna (1989) argued there exists a U-shaped curve between religious affiliation and suicide. The very notion of social capital, at least that rooted in the mainstream conceptualization of social capital as material or immaterial goods and positions that come with associations (Portes, 1998), requires deliberate investment and management that exact a cost as well as confer a benefit. Too much of social capital may incur greater liability, starting to burden the holders with emotional and material costs. The capital holders may also face too many obligations to their community in crises, causing ideation akin to Durkheim's "altruistic suicide". This line of literature is aligned well with our finding that social capital at an excess level may increase suicidal ideation. We found that the protective functions of social network connections and network-embedded resources gradually diminish at higher levels. In fact, people with the highest level of connections and resources showed slightly elevated self-reported suicidal ideation relative to people with mid-high levels.

4.1. Limitations

We note several limitations of this study that are partly a product of the nature of the research design and data properties. Self-reporting suicidal ideation is not characterized by the same problems that affect reporting of suicide, such as medicolegal inference of decedent intent post-mortem. Yet, self-reports tend to suffer from recall bias and measurement unreliability. Second, since the survey containing the rotating suicide and stress components was distributed at only 22 out of 42 universities, a selection effect favoring the inclusion of richer and larger institutions may exist. Finally, the cross-sectional research design prohibits us from drawing causal inferences between social capital and suicide ideation.

5. Conclusions

Suicidal ideation may originate from the lack of sanitary social relationships, but also from overloaded relationships or an imbalance of different types of relationships. This study conceptually distinguishes four different types of social capital and tested the unique effect of each social capital type on suicidal ideation with a large sample of college students from 22 Chinese cities. We found that all four types of social capital are internally and significantly correlated, but not all are associated with suicidal ideation. In the series of ordinal hierarchical models we employed, participation social capital is actually associated with a greater level of suicidal ideation. Furthermore, very strong network connections and network-embedded resources are both associated with higher odds of suicidal ideation. We suggest policymakers and interventionists reconsider the utility of mobilizing social capital for suicide prevention and researchers heed the complexity of social capital.

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