Association of functional, interactive, and critical health literacy with good self-rated health among Taiwanese community-dwelling older adults

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ARTICLE INFO

ABSTRACT

The functional, interactive, and critical domains of health literacy are associated with health. However, studies examining the relationship between health literacy subdomains and health in the Chinese-speaking context are still limited. Thus, we aimed to examine the association of functional, interactive, and critical health literacy with self-rated health among older Taiwanese adults. A total of 1,072 participants aged 60 or older were included in the analysis. Health literacy was measured by the 11-item short-form Mandarin Health Literacy Scale and validated tools. Self-rated health was categorized into good (good/very good), fair, and poor (poor/very poor) status. Multinomial logistic regression revealed that only interactive health literacy was associated with reporting good health status (OR = 2.30; 95% CI = 1.65 to 3.21). Conversely, all health literacy subdomains were not associated with reporting poor health. This study suggested that interactive health literacy was the key determinant of good self-rated health status for community-dwelling older adults.

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Introduction

Health literacy is a crucial determinant of health promotion in the contemporary era with the rapid change of healthcare technologies. Health literacy has been defined as "the cognitive and social skills which determine the motivation and ability of individuals to gain access to, understand, and use information in ways which promote and maintain good health."[1,2] Health literacy is also widely considered to represent "the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions."[3] Improving health literacy enables people to improve their knowledge and competence to make health care decisions and take control of their health.[4] Low health literacy has been linked to adverse health outcomes, worse self-reported health, cardiovascular health, higher healthcare cost, and greater use of medical care services, including hospitalization and emergency department visits.[5−8] Limited health literacy even accounts for health disparities.[9−11]

In the current era of global aging, every developed country faces the challenge of rapid population aging. Unfortunately, the older adult population has been considered to have lower health literacy than younger adults or the general population.[12−14] For the older adult population specifically, previous studies have shown that limited health literacy is associated with poor self-reported physical functioning, poorer mental health, and higher mortality rates.[15−19] These findings pointed out that the lack of basic health knowledge and skills creates obstacles to engage in healthy behaviors, use preventive health services, and manage chronic diseases.[12] Therefore, Improving health literacy for older adults has been identified as an essential health care strategy to improve their health condition and save health care expenditure.[6,12] Notably, nursing care is in a critical position to developing interventions to reduce inadequate health literacy for older adults in the clinical setting.[20]

In the early stages of developing the concept of health literacy, research has focused predominantly on the functional dimension. Functional health literacy is being able to apply basic reading and writing skills and knowledge related to the health context in daily living conditions.[21] Later, Nutbeam[22] further expanded the concept by adding two other health literacy elements as functional, interactive, and critical dimensions. Interactive health literacy represents more advanced social interaction skills to extract information via communication and apply new knowledge in changing circumstances.[2,22] On the other hand, critical health literacy refers to advanced cognitive skills that can be applied to analyze information critically and exert greater control over life situations.[2,23]

Although the evidence has linked limited health literacy to worse health outcomes in older adults, previous studies mainly focused on

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the functional dimension of health literacy.[12] Studies have indicated the distinct concept between the functional, interactive, and critical domains of health literacy, and each component can impact health uniquely.[24–26] For example, the functional domain of health literacy refers to understanding and using health information. Lower functional health literacy is associated with higher health care utilization and higher mortality.[16,27] In contrast, the interactive and critical domains of health literacy were more closely related to the ability to self-management and interact with healthcare providers.[27,28] However, most literature examining the effect of these three subdomains of health literacy on health in order population is mainly based on the English-speaking context and European countries.[12,29] Literature has indicated that health literacy is context-specific and related to cultural differences.[30,31] Nevertheless, only a few studies measured subdomains of health literacy in Asia, and most of these studies were conducted in Japan.[28,32,33] Studies that examined the association of health literacy subdomains with health in the Chinese-speaking context are still limited.[10,34,35]

In addition, previous works to examine the relationship between health literacy and health outcomes were mainly focused on adverse health outcomes rather than favorable outcomes.[8,12] From the perspective of health promotion,[36] the absence of adverse health problems or disease does not ensure well-being. For nurse research, studies directly focusing on favorable health outcomes are needed to understand the strategy for health promotion intervention.[37] Thus, the objective of this study was to examine the association of functional, interactive, and critical health literacy with good self-rated health status among community-dwelling older adults in Taiwan. A better understanding of which subdomain of health literacy is most salient to good health can improve health promotion interventions. Based on the literature,[16,25–28,33] we hypothesized that interactive and critical health literacy would be more closely associated with good self-rated health status than functional health literacy for community-dwelling older adults.

Methods

Design

This study was a secondary analysis using data from a cross-sectional survey. Data were obtained from the Survey and Intervention of Health Literacy among Older Adults,[38] available from the Survey Research Data Archive, Academia Sinica.

Sample

The study population of the original study was the older adults aged 60 years or older in Taipei City. The sample size was calculated by a quota sampling method based on the number of male and female population aged 60 years or older in twelve administrative districts of Taipei City.[34] The interviewers recruited participants via convenience sampling at Senior Service Centers in each administrative district of Taipei. Eligibility criteria were: (1) middle-aged and older adults aged 60 or older; (2) clear consciousness and no cognitive impairment; and (3) able to communicate in Mandarin or Taiwanese.

Procedure

Face-to-face interviews were conducted from March to June 2014 at the Taipei City Senior Services Center and were anonymous. The interviewers informed the study purpose and the participants' rights in writing and verbally before the interviewees were willing to participate. Signed informed consent was obtained from the interviewees prior to the interview. All participants can withdraw from the study and withdraw their consent at any time. The questionnaire included sociodemographic characteristics, health literacy scales, self-rated health status, and information on the use of medical care in the preceding year. A total of 1,082 community-dwelling older adults aged 60 years and older were included in the original study. Excluding the 10 participants with missing information on self-rated health status, we analyzed 1,072 samples in this study.

Measures

Functional health literacy

The 11-item short-form Mandarin Health Literacy Scale (s-MHLS) was used to measure the participants' functional health literacy. The s-MHLS is derived from the Mandarin Health Literacy Scale (MHLS), a 50-item Mandarin scale used to assess basic reading and numeracy skills and the use of health information to make health decisions.[39,40] The s-MHLS shorten the 33 health-related text reading tests to 8 items and 17 numerical skill tests to 3 items. The correlation between the MHLS and s-MHLS was 0.97, and the s-MHLS exhibited high reliability of internal consistency with a Cronbach's alpha of 0.94. The s-MHLS scores range from 0 to 11, with higher scores representing higher levels of functional health knowledge.

Community-based health literacy screening tool for older adults

Chung et al.[34] developed a 10-item health literacy assessment tool for community-dwelling older adults based on the health literacy domains derived by Nutbeam.[22] The self-perceived item was based on a 5-point Likert scale and can be completed in 3 to 5 minutes. After a factor analysis of a pilot protocol with 200 older adults, the 10-item health literacy assessment tool was categorized into two domains: communicative/interactive and critical/appraisal health literacy. This 10-item measurement showed satisfactory reliability with a Cronbach's alpha of 0.95, and the split-half reliability was 0.88. The content validity index (panel review by experts) of clarity was 0.82. A recent review indicated that this assessment tool demonstrated good validity and reliability and exhibited adequate psychometric strength.[35] Details of these two health literacy domains are presented below.

The interactive/communicative dimension of health literacy consists of the following four questions: (1) "I am capable of describing my health problems to medical staff members such as physicians", (2) "I am capable of sharing or communicating the health information I have learned to others", (3) "I am capable of completing medical forms in a hospital independently", and (4) "I am capable of directing myself to the medical department to which I should go to a hospital". Each item was rated on a 5-point Likert scale (1 to 5) from strongly disagree to strongly agree. We calculated mean score from these four items. Mean score ranges from 1 to 5; higher scores represented higher self-perceptions of interactive/communicative health literacy. In the present study, the Cronbach's alpha reliability for interactive health literacy was 0.70.

The critical health literacy dimension include: (1) "I am capable of finding the health information that I need", (2) "I am capable of reading health information", (3) "I am capable of explaining the health information that I have learned", (4) "I am capable of becoming aware of inconsistent health information", (5) "I am capable of selecting the health information that I need", (6) "I am capable of judging the accuracy of health information". Response options and mean score ranges were the same as for the interactive health literacy items. Score ranges from 1 to 5, with higher scores representing better self-perception of critical health literacy. The Cronbach's alpha reliability of critical health literacy was 0.90 in this study.

Self-rated health

Self-rated health was assessed by a question: "Do you consider your current health status is very good, good, fair, poor, or very poor?" The single self-rated health question is widely recognized as a valid and reliable measure of general health status. Evidence has shown that self-reported health strongly predicts one's morbidity and mortality and objective health status.[41,42] In bivariate analyses and multinomial logistic regression models, we categorized participants' responses into good (very good plus good), fair, and poor (poor plus very poor) health status. In the sensitivity analysis, we further dichotomized self-rated health status into good (very good plus good) versus poor (fair, poor, and very poor) for robustness checks.

Covariates

Based on studies on self-rated health of community-dwelling older adults,[43,44] the following covariates were considered in this study. Sociodemographic characteristics included gender, age, marital status, educational attainment, work status, and living arrangement. Educational attainment level included four categories: elementary school and under (compulsory education), junior high school, high school, and college or above. We also considered participants' chronic disease status (yes or no) and healthcare utilization (hospitalization and emergency room visits) in the preceding year.

Data analysis

We used Chi-square test and one-way ANOVA test (with Scheffé post hoc test) to examine the relationships between three self-rated health status (poor, fair, and good) and demographic characteristics, chronic disease status, health care use, and three subdomains of health literacy. We first conducted a multinomial logistic regression analysis to assess the relationship between each health literacy dimension and self-rated health status without considering covariates (univariate model). We then included three health literacy subdomains in a multinomial logistic regression model, controlling for all covariates (adjusted model). To confirm robustness, we dichotomized self-rated health status as good (very good plus good) and poor (fair, poor, and very poor) and performed a logistic regression model. Data analyses were conducted by the IBM SPSS statistical package version 25.0 (SPSS; Chicago, IL, USA). All statistical analyses were two-tailed.

Results

Participant characteristics

A total of 1,072 study participants were included in the analysis, 586 were females (54.7%) and 486 were males (45.3%) (Table 1). The mean age was 71.9 years (SD = 8.1). Most of the participants were married (84.5%), and most had a high school or college degree. Only a small proportion of older adults still worked (5.6%), and nearly one in five lived alone (18.7%). Most participants suffered from chronic diseases, and only 21.8% were chronic disease free. In the preceding year, 10.6% of the study participants had been hospitalized, and 11.4% had visited the emergency department. In self-rated health, 57.4% of study participants reported good health status, whereas 10.4% reported poor health status. The mean scores of functional, interactive, and critical health literacy were 9.52 (SD = 1.99), 4.50 (SD = 0.60), and 4.04 (SD = 0.87), respectively.

Bivariate analysis

The bivariate analysis showed that gender, age, education level, and working status were not associated with self-rated health status (Table 1). Married participants reported a higher percentage of good health and a lower percentage of poor health compared to others (χ^2 = 11.47, p = 0.003). Older adults living alone or with chronic illness were more likely to report poor health status. Also, participants who had health care utilization of hospitalization or emergency department visits in the preceding year reported poorer health status than those who were not. In terms of health literacy, the one-way ANOVA and Scheffé post hoc test revealed that the functional health literacy (s-MHLS) scores were higher among those reporting good and fair health than those reporting poor health (F = 4.67, p = 0.010). In contrast, critical and interactive health literacy scores were significantly higher among older adults reporting good health than those reporting fair and poor health (F = 27.46, p < 0.001 and F = 17.61, p < 0.001).

Association of health literacy with self-rated health

Table 2 shows the results of the multinomial logistic regression models. Participants with good and poor self-rated health were compared with those with fair self-rated health. In the unadjusted univariate model, functional health literacy was associated with lower odds of reporting poor health (odds ratio, OR = 0.60; 95% confidence interval, CI = 0.82 to 0.99) but not associated with reporting good health. In contrast, interactive health literacy and critical health literacy were associated with a higher chance of reporting good health but not associated with reporting poor self-rated health. After adjusting for all covariates, the multinomial logistic regression model showed that only interactive health literacy was significantly associated with a higher chance of reporting good self-rated health status (OR = 2.30; 95% CI = 1.65 to 3.21). On the other hand, all three health literacy subdomains were not associated with reporting poor self-rated health in the adjusted model.

Sensitivity analysis

The sensitivity analysis used binary logistic regression and showed similar patterns (Table 3). The interactive and critical health literacy were positively related to reporting good self-rated health in the univariate model, but only interactive health literacy showed a positive association with good self-rated health in the adjusted model (OR = 2.07; 95% CI = 1.51 to 2.82). There was no multicollinearity problem between predictors in the multiple logistic regression models; the variance inflation factors (VIF) of all predictors were under 2.1.

Discussion

Main findings

The present study showed that communicative/interactive health literacy was the key determinant of good self-rated health status among community-dwelling older adults. The higher the interactive health literacy, the higher the chance of reporting good health status. This positive association was more profound than critical health literacy. Conversely, lower functional literacy tended to be associated with lower odds of reporting poor health, but the association became insignificant in the adjusted model. To our knowledge, this is the first community-based study to assess the association of three health literacy subdomains with good self-rated health for the older adults in the Chinese-speaking context.

Comparison with previous findings

The findings of this study were in coherence with prior research. A concept analysis indicated that one of the consequences of health literacy is improved self-reported health status.[45] Wagner et al.[46] used

Table 1
Participant characteristics and bivariate analysis (n = 1,072).

Self-rated health	Total		Poor		Fair		Good			
Variable	n	%	n	%	n	%	n	%	χ^2/F	*p*-value
Total	1072	100.0	111	10.4	346	32.3	615	57.4		
Sex										
Female	586	54.7	62	10.6	201	34.3	323	55.1	2.85	0.241
Male	486	45.3	49	10.1	145	29.8	292	60.1		
Age (Mean, SD)	71.9	8.1	72.4	9.0	71.0	7.7	72.2	8.1	2.59	0.076
Marital status										
Others	166	15.5	29	17.5	54	32.5	83	50.0	11.47	0.003
Married	906	84.5	82	9.1	292	32.2	532	58.7		
Education										
Elementary school	190	17.7	30	15.8	62	32.6	98	51.6	11.35	0.078
Junior high	154	14.4	18	11.7	55	35.7	81	52.6		
High school	268	25.0	21	7.8	87	32.5	160	59.7		
College	454	42.4	42	9.3	139	30.6	273	60.1		
Still Working										
No	1012	94.4	105	10.4	326	32.2	581	57.4	0.04	0.983
Yes	60	5.6	6	10.0	20	33.3	34	56.7		
Living alone										
No	872	81.3	78	8.9	284	32.6	510	58.5	10.11	0.006
Yes	200	18.7	33	16.5	62	31.0	105	52.5		
Chronic disease										
No	235	22.0	7	3.0	46	19.6	182	77.4	52.40	<0.001
Yes	835	78.0	104	12.5	300	35.9	431	51.6		
Hospitalization										
No	959	89.5	83	8.7	308	32.1	568	59.2	30.93	<0.001
Yes	113	10.5	28	24.8	38	33.6	47	41.6		
Emergency room visit										
No	950	88.6	90	9.5	300	31.6	560	58.9	11.13	0.004
Yes	122	11.4	21	17.2	46	37.7	55	45.1		

Self-rated health	Total		Poor (1)		Fair (2)		Good (3)			
Health literacy	Mean	SD	Mean	SD	Mean	SD	Mean	SD	F	*p*-value
Functional[a]	9.52	1.99	8.99	2.39	9.51	2.08	9.62	1.86	4.67	0.010
Interactive[b]	4.50	0.60	4.33	0.67	4.35	0.62	4.62	0.56	27.46	<0.001
Critical[c]	4.04	0.87	3.73	1.02	3.93	0.83	4.17	0.83	17.61	<0.001

Note. Scheffé test:
[a] (1) < (2) = (3).
[b] (1) = (2) < (3).
[c] (1) = (2) < (3).

Table 2
Associations of health literacy with self-rated health in multinomial logistic regression.

	Good self-rated health		Poor self-rated health	
Variable (reference group)	OR	95% CI	OR	95% CI
Univariate model				
Functional health literacy	1.03	(0.96 - 1.10)	0.90	(0.82 - 0.99)
Interactive health literacy	1.41	(1.20 - 1.65)	0.81	(0.65 - 1.01)
Critical health literacy	2.14	(1.70 - 2.69)	0.96	(0.70 - 1.30)
Adjusted model				
Functional health literacy	0.97	(0.89 - 1.06)	0.92	(0.82 - 1.05)
Interactive health literacy	2.30	(1.65 - 3.21)	1.57	(0.98 - 2.51)
Critical health literacy	1.04	(0.82 - 1.33)	0.73	(0.52 - 1.03)
Male	1.19	(0.88 - 1.61)	1.00	(0.62 - 1.62)
Age	1.04	(1.02 - 1.07)	1.00	(0.97 - 1.03)
Married	1.14	(0.74 - 1.74)	0.66	(0.37 - 1.18)
Education (Elementary school)				
Junior high	1.00	(0.63 - 1.57)	1.08	(0.55 - 2.15)
High school	0.76	(0.48 - 1.18)	0.80	(0.40 - 1.60)
College and above	1.00	(0.70 - 1.43)	0.76	(0.41 - 1.41)
Still Working	1.24	(0.66 - 2.34)	1.13	(0.42 - 3.07)
Living alone	1.07	(0.72 - 1.59)	1.55	(0.89 - 2.70)
Chronic disease	0.35	(0.24 - 0.51)	1.94	(0.83 - 4.54)
Hospitalization	0.78	(0.48 - 1.28)	2.46	(1.35 - 4.48)
Emergency room visit	0.71	(0.45 - 1.12)	1.10	(0.59 - 2.05)

Note: fair self-rated health status is the reference category.

a national sample in British of 759 adults and found that higher functional health literacy score is related to good self-rated health. Bennett et al.[9] used a nationally representative sample of 2,668 US older adults from the 2003 National Assessment of Adult Literacy (NAAL). They found that health literacy is associated with better self-rated health status and mediated the racial/ethnic and educational disparities in self-rated health. Lee et al.[17] used a national survey of 1493 adults in Taiwan and found health literacy, which was measured by 50-items MHLS, was related to worse self-reported mental health but not physical health after controlling for covariates.

Our results were also comparable to few studies that further distinguished the multiple dimensions of health literacy in Japan. Ishikawa et al.[33] have developed a 14-item scale to measure functional (5 items), communicative (5 items), and critical (4 items) health literacy in a sample of 138 hospital-based type-2 diabetes outpatients in Tokyo, Japan. They found communicative and critical health literacy were positively associated with diabetes knowledge but not functional health literacy in the bivariate correlation analysis. Based on this measuring scale, Ishikawa et al.[28] further concise the communicative and critical health literacy into five items and found the higher communicative/critical health literacy group has regular diet and exercise patterns. In addition, Furuya et al.[32] conducted a national cross-sectional survey of community-dwelling Japanese between the

Table 3
Associations of health literacy with good self-rated health in binary logistic regression.

Variable (reference group)	Good self-rated health	
	OR	95% CI
Univariate model		
Functional health literacy	1.06	(1.00 - 1.12)
Interactive health literacy	2.16	(1.74 - 2.68)
Critical health literacy	1.49	(1.29 - 1.72)
Adjusted model		
Functional health literacy	0.99	(0.91 - 1.07)
Interactive health literacy	2.07	(1.51 - 2.82)
Critical health literacy	1.13	(0.91 - 1.40)
Male	1.19	(0.89 - 1.57)
Age	1.04	(1.03 - 1.06)
Married	1.28	(0.87 - 1.89)
Education (Elementary school)		
Junior high	0.83	(0.52 - 1.32)
High school	1.10	(0.72 - 1.69)
College and above	1.03	(0.68 - 1.57)
Still Working	1.20	(0.66 - 2.18)
Living alone	0.95	(0.66 - 1.36)
Chronic disease	0.31	(0.22 - 0.45)
Hospitalization	0.58	(0.38 - 0.91)
Emergency room visit	0.69	(0.46 - 1.05)

Note: poor and fair self-rated health status is the reference category.

ages of 20 and 74 years. They measured communicative/critical health literacy by three questions derived from the scale developed by Ishikawa and colleagues. They found the higher communicative/critical health literacy was associated with good self-rated health. Unfortunately, they did not distinguish the communicative and critical domains of health literacy.

Furthermore, van der Heide et al.[27] investigated 2508 adults in the Netherlands and assessed health literacy by the Dutch-translation version of the functional (5-item), interactive/communicative (5-item), and critical (4-item) scales based on Ishikawa's work.[33] The results showed that interactive health literacy was associated with patients' perceived ability to perform self-care, organize care, and interact with healthcare providers, whereas lower functional health literacy was related to more frequent visits to the general practitioner. Critical health literacy was not associated with these outcomes when simultaneously including the three health literacy dimensions in the analysis. The authors concluded that the functional, interactive, and critical health literacy seen as complementary and addressing interactive health literacy might benefit patient activation. Using the measurement of health literacy, Heijmans et al.[25] analyzed a nationwide sample in the Netherlands of 1341 chronic disease patients to examine the relationship between health literacy and various aspects of self-management. They found communicative health literacy was a stronger predictor of all aspects of successful self-management of chronic disease. In contrast, functional and critical health literacy were associated with some aspects of self-management but not to all. The present study further adds to the literature by showing that interactive health literacy was the most salient dimension in promoting wellness for community-dwelling older adults.

A possible mechanism linking better interactive/communicative health literacy to good health status is the concept of self-management. A poor patient-provider interaction might reflect a worse patient activation, passive attitude, and miscommunication that directly determined self-care and self-management.[47] Interactive competence relies on a partnership with others for individual improvement and enhancement through self-management, including decisions and actions to maintain and improve health.[48] A systematic review of health literacy programs for older adults noted that "interactive health literacy is grounded in health promotion theory, as personal skill development enables individuals to gain control over their existing health issues while developing skills for preventative

health."[49] Research also supported that interactive health literacy is related to patient activation.[27] Interactive/communicative health literacy plays a crucial role in the successful self-management of chronic diseases.[25] Developing interactive health literacy programs is needed for future health promotion research and practice.[49]

Limitation

This study has some limitations. First, the causal relationship between health literacy and good self-rated health cannot be confirmed because of the cross-sectional design. However, health literacy development takes a long time to cultivate, and it is linked to a lifelong learning process.[50] In contrast, self-rated health status reflects the current state of health, which might change substantially in the short term. Thus, we believe that health literacy is more likely to affect self-rated health status rather than the other way around. Second, this study's participants were community-dwelling older adults in a metropolitan area. The results' generalizability may be limited to order people in an urban context. Nevertheless, since large hospitals are concentrated in urban areas, the results of this study were still instructive for health promotion actions in hospital settings. Finally, this study's measurement tool of health literacy differed from other scales used in previous studies.[25,27,28,32,33] It may be difficult to compare the study results because of the different survey questions. However, previous studies have indicated that older people refuse to respond to the standard health literacy questionnaire because they feel embarrassed or frustrated if they cannot understand the questions.[34,51] Therefore, the culture-based screening instrument in the present study is appropriate to reflect the self-perception of health literacy among older adults in Chinese-speaking settings, and it can be completed within 5 minutes. A recent review of health literacy measurement instruments for Chinese-speaking populations also supports that the instrument in this study exhibited satisfactory reliability and validity.[35]

Conclusion

This study found that interactive health literacy was a stronger predictor of good self-rated health than functional and critical health literacy for community-dwelling older adults. Health promotion actions focused on enhancing interactive health literacy can improve the well-being of older adults, not merely the absence of adverse health outcomes. Nurses can involve in designing interventions to enhance better patient-provider interaction. For example, nurse practitioners can help patients develop interactive skills in sharing or communicating health information and ensure a supportive context in the hospital or community setting. Future research is needed to evaluate the effectiveness of health promotion interventions that aim to enhance interactive health literacy to improve older adults' health status and quality of life.

Funding

Ethical considerations

This study used de-identified data publicly available from the Survey Research Data Archive, Academia Sinica, Taiwan. Ethical approval was not required. The original study was certificated from Taipei Medical University-Joint Institutional Review Board (TMU-JIRB) approval (JIRB No.201308017). The interviewer informs the purpose of the study and the participant's rights in written and orally. Participants can withdraw from the study and withdraw their consent at any time. The interviewer obtained written informed consent before the interview.

Acknowledgments

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