

Impact of Different Popular Science Models and Other Factors on Satisfaction of Community Health Popular Science Activities in Shanghai Community Residents

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Research

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Abstract

Objective

To explore and analyze the impact of different popular science models, include traditional and innovative models, and other factors on satisfaction of community health popular science activities in Shanghai community residents.

Method

Four communities were selected in Minhang District, Shanghai, and divided into four groups with simple random sampling method: foreign volunteer medical science talk show group (A), Chinese volunteer medical science talk show group (B), traditional lecture group (C), and control group (D). Using the rules of convenience sampling, 150 residents were randomly selected from each community to participate in 6-month popular science activities, and completed three questionnaires during the 6-month popular science intervention. Data including the sociodemographic data and the satisfaction on community health popular science activities was collected and analyzed.

Results

Compared with those in baseline, the satisfactions of community health popular science activities in three popular science models have all significantly improved with 3 and 6 months popular science intervention (A: $\chi^2 = 47.1$, $p < 0.001$; B: $\chi^2 = 62.0$, $p < 0.001$; C: $\chi^2 = 31.7$, $p < 0.001$) except for in control group (D: $\chi^2 = 0.3$, $p = 0.9$). The factors including gender, education, marital status, popular science model and popular science intervention time all have significant impact on satisfaction. Among these factors, married (Exp (B) = 2.715, 95% CI (1.163-6.336), $p = 0.021$), popular science models (foreign volunteer medical science talk show model: Exp (B) = 8.796, 95% CI (5.907-13.100), $p < 0.001$; Chinese volunteer medical science talk show model: Exp (B) = 5.106, 95% CI (3.564-7.314), $p < 0.001$ and traditional lecture model: Exp (B) = 13.033, 95% CI (8.374-20.283), $p < 0.001$), popular science intervention time (3-month: Exp (B) = 3.988, 95% CI (2.827-5.626), $p < 0.001$; 6-month: Exp (B) = 4.132, 95% CI (2.924-5.840), $p < 0.001$) have positive impact on satisfaction. While female (Exp (B) = 0.598, 95% CI (0.440-0.813), $p = 0.001$), and junior college (Exp (B) = 0.295, 95% CI (0.168-0.519), $p < 0.001$) have negative impact.

Conclusion

Both the innovative and traditional popular science models have positive effect on the satisfaction on Chinese community health popular science activities in Shanghai community residents. In the future, special consideration should be given to the impact of different popular science models and other factors on the popular science effects including the satisfaction, and more tailor-design health popular science activities will be suitable for community residents.

Background

Community health popular science activities are of great significance. Affected by aging, lifestyles, and environment etc., the prevalence and incidence of chronic diseases (hypertension, cardiovascular disease, cerebrovascular disease, tumor, Alzheimer's disease) in community residents have increased significantly in recent decades with accompanying excessive personal, medical, and social burdens. Community health popular science activities effectively help residents master healthy lifestyle, improve their health literacy, and contribute to the prevention, control and recovery from chronic diseases^[1-2]. In addition, traditional health popular science models (manuals, posters, lectures, etc.) can't meet diverse health science needs for public in the Omni-media era^[3].

We created an innovative health popular science model, medical science talk show, to popularize medical knowledge to residents in Shanghai community. It has the advantages of popularity, science, knowledge, artistry, and interest simultaneously, and has good popular science effects. Few studies about innovative popular science models and their effects have been retrieved. In addition, because osteoporosis (OP) became important health problem for people over 50 years old in China, especially for elderly women^[4-6], and the public still knows little about it, OP prevention and control is the issue in this study.

In this study, different health popular science models were used to conduct popular science interventions for the residents of Shanghai community on OP prevention and control, and the satisfactions in different community health popular science models were evaluated, and the factors affecting satisfaction were analyzed. The feasibility and effectiveness of applying medical science talk show to community health science popularization activities were discussed, which provides reference for the promotion of medical science talk show, the innovative popular science model.

Object And Method

1.1 Object

From June 2018 to January 2019, four communities with similar population size, population structure, and economic level were selected in Minhang District, Shanghai, and randomly assigned into four groups by Simple random sampling method with different popular science intervention models: foreign volunteer medical science talk show group (A), Chinese volunteer medical science talk show group (B), traditional lecture group (C) and control group (D). Using convenience sampling rules, 150 residents were randomly selected with convenience sampling method from each community to participate in community health popular science activities lasting 6 months, and completed three surveys on satisfaction at baseline, and after 3 and 6 months popular science intervention respectively. The survey collected data including sociodemographic information, the awareness of medical knowledge^[7], and the satisfaction on

Chinese community health popular science activities in community residents. There was no statistically significant difference on sociodemographic data in the three groups at baseline, including gender, age, education, working status, and marital status (all $p > 0.05$). Inclusion criteria: clear consciousness and good communication in Mandarin. Exclusion criteria: illiterate, refused to participate in the study.

1.2 Method

1.2.1 Popular science intervention design

Foreign volunteer medical science talk show group (A): The OP-related knowledge (including definition, prevention, main features, serious consequences, etc.) are sequentially compiled into six original medical science talk show scripts, and medical science talk shows are performed to community residents.

Chinese volunteer medical science talk show group (B): Exactly the same as in A group.

Traditional lecture group (C): Put the above-mentioned knowledge points into slides with the same sequence, and conduct science lectures to community residents based on the slides.

Control group (D): no popular science intervention.

1.2.2 Implementation of popular science intervention

Foreign volunteer medical science talk show group (A): A medical science talk show will be performed for community residents once a month by trained foreign volunteers, in accordance with the sequence of the script. Each performance lasts 8-12 minutes, contains 1-2 knowledge points, and a total of 6 performances in 6 months.

Chinese volunteer medical science talk show group (B): Exactly the same as in A group except for performed by trained Chinese volunteers.

Traditional lecture group (C): A traditional science lecture will be given to community residents once a month by trained community doctors in the order of slides. Each lecture lasts 10-20 minutes, contains 1-2 knowledge points, and a total of 6 lectures in 6 months.

Control group (D): No health popular science activities is held within 6 months.

1.2.3 Satisfaction of community health popular science activities

The questionnaire on satisfaction of community health popular science activity in this study was conducted by experts in osteoporosis, health education and community health popular science^[7-9], combined with the earlier study in the innovative popular science models^[7]. The questionnaire includes sociodemographic information, satisfaction with community health popular science activities. The degrees of satisfaction included 2 levels, "1" being satisfied and "0" being dissatisfied. Statistical analysis shows that the structural validity of the questionnaire is 0.83, and the internal reliability Cronbach's coefficient is 0.73, which can be used in the study.

Three surveys were conducted on the satisfaction of community health popular science activities with one questionnaire at baseline, after 3-month and 6-month science intervention respectively. The assessment of questionnaire is issued and collected by specially trained and qualified staff, and filled out by the residents themselves. All data entry has been reviewed by a dedicated person to ensure accuracy.

1.2.4 Indicator

Satisfaction of community health popular science activities = (The number of residents who choose "1" (satisfied) in each group / Total number of residents in each group) × 100 %.

1.2.5 Statistical analysis

All data were analysed with SPSS 21.0 statistical software. The data includes the sociodemographic information and the satisfaction on community health popular science activities in community residents. Counting data is expressed in frequency and percentage. The non-rank data (gender, working status, marital status, popular science model, popular science intervention time, satisfaction) in each group were compared with χ^2 test, while the rank data (age, education) using Kruskal-Wallis H rank sum test. The number of residents choosing "1" being satisfied is expressed by frequency, and the corresponding satisfaction is expressed as percentage. After controlling sociodemographic and popular science variables, binary logistic regression was used to analyze the influencing factors of satisfaction on Chinese community health popular science activities. $p < 0.05$ were considered to indicate statistical significance.

Results

2.1 Sociodemographic information

During the study, 600 questionnaires were distributed and a total of 497 were recalled, including 446 valid questionnaires. The final effective response rate was 74.3%. All data of 446 participants with valid questionnaires were divided according to sociodemographic variables (gender, age, education, working status, marital status) and popular science variables (popular science model, popular science intervention time). All were divided by gender as: 163 male (36.5%) and 283 female (63.5%). All were divided by age: 29 (6.5%) in 50 age or below, 50 (11.2%) in 50 - 59 age, 208 (46.6%) in 60-69 age, 128 (28.7%) in 70-79 age, and 31 (7.0%) in 80 age or above. By education: 47 (10.6%) in elementary school or below, 157 (35.2%) in middle school, 144 (32.3%) in high school or secondary technical school, 72 (16.1%) in junior college, and 26 (5.8%) in undergraduate or more than. By working status: 30 (6.7%) worked, 410 (91.9%)

retired, and 6 (1.4%) other. By marital status: 15 (3.3%) unmarried, 355 (79.6%) married, 69 (15.5%) widowed, and 7 (1.6%) divorced. Among all sociodemographic variables, there was no significant difference according to gender, age, education, working status, and marital status in four groups (all $p > 0.05$). The results are shown in Table 1.

Table 1
Demographic Characteristics in Four Group [N (%), N = 446]

Demographic Characteristics	Population	Foreign Volunteer Medical Science Talk Show Group n=111	Chinese Volunteer Medical Science Talk Show Group n=120	Traditional Lecture Group n=105	Control Group n=110	χ^2	p
Gender, n (%)						2.694	0.441
Male	163(36.5)	42(37.8)	40(33.3)	41(39.0)	40(36.4)		
Female	283(63.5)	69(62.2)	80(66.7)	64(61.0)	70(63.6)		
Age, n (%)						17.271	0.14
< 50 age	29(6.5)	8(7.2)	8(6.7)	7(6.7)	6(5.5)		
50-59 age	50(11.2)	14(12.6)	15(12.5)	9(8.6)	12(10.9)		
60-69 age	208(46.6)	54(48.6)	55(45.8)	45(42.9)	54(49.1)		
70-79 age	128(28.7)	29(26.1)	36(30.0)	36(34.3)	27(24.5)		
≥ 80 age	31(7.0)	6(5.4)	6(5.0)	8(7.6)	11(10.0)		
Education, n (%)						9.619	0.649
Elementary School or below	47(10.6)	13(11.7)	10(8.3)	11(10.5)	13(11.8)		
Middle School	157(35.2)	39(35.1)	42(35.0)	38(37.3)	38(34.5)		
High School/ Secondary Technical School	144(32.3)	36(32.4)	40(33.3)	37(36.3)	31(28.2)		
Junior College	72(16.1)	17(15.3)	20(16.7)	15(14.3)	20(18.2)		
Undergraduate or above	26(5.8)	6(5.4)	8(6.7)	4(3.8)	8(7.3)		
Working Status, n (%)						2.201	0.900
Worked	30(6.7)	8(7.2)	8(6.7)	7(6.7)	7(6.4)		
Retired	410(91.9)	101(91.0)	111(92.5)	97(92.4)	101(91.8)		
Other	6(1.4)	2(1.8)	1(0.8)	1(1.0)	2(1.8)		
Marital Status, n (%)						8.980	0.439
Unmarried	15(3.3)	3(2.7)	3(2.5)	4(3.8)	5(4.5)		
Married	355(79.6)	87(78.4)	98(81.7)	86(81.9)	84(76.4)		
Widowed	69(15.5)	19(17.1)	18(15.0)	14(13.3)	18(16.4)		
Divorced	7(1.6)	2(1.8)	1(0.8)	1(1.0)	3(2.7)		
Total	446						
All use Kruskal-Wallis test in χ^2 test							
^a the baseline of each group compared with the baseline of the control group;							
^b the Phase I of each group compared with the Phase I of the control group;							
^c the Phase II of each group compared with the Phase II of the control group							
All use Kruskal-Wallis test in χ^2 test							

The results showed that compared with that at baseline in each group, the satisfaction both at 3 and 6 months of popular science intervention in A, B and C groups were significantly increased (A: $\chi^2 = 47.1, p < 0.001$; B: $\chi^2 = 62.0, p < 0.001$; C: $\chi^2 = 31.7, p < 0.001$), while not in D ($\chi^2 = 0.3, p = 0.9$).

In one of two innovative popular science models, foreign volunteer medical science talk show group (A), the satisfaction at 3 months (95.5%) was higher than that at 6 months (90.1%); while in Chinese volunteer medical science talk show group (B), the satisfaction at 6 months (91.7%) was higher than that at 3 months (83.3%). In traditional lecture model (C), the satisfaction at 3 months (96.2%) was higher than that at 6 months (94.3%).

Furthermore, compared with that at baseline, after 3 months and 6 months in the control group (D), the satisfaction in three groups all have significant difference (baseline: $\chi^2 = 25.7, p < 0.001$; 3 months: $\chi^2 = 130.3, p < 0.001$; 6 months: $\chi^2 = 128.6, p < 0.001$ respectively). **The above results are shown in Table 2 and Figure 2.**

2.3 Influencing factors of satisfaction on Chinese community health popular science activities

Binary logistic regression results showed that gender ($p = 0.001$), education ($p < 0.001$), marital status ($p < 0.001$), popular science model ($p < 0.001$), and popular science intervention time ($p < 0.001$) all have significant impacts on the satisfaction of Chinese community popular science activities. Among them, married (Exp (B) = 2.715, 95% CI (1.163-6.336), $p = 0.021$), foreign volunteer medical science talk show (Exp (B) = 8.796, 95% CI (5.907-13.100), $p < 0.001$), Chinese volunteer medical science talk show (Exp (B) = 5.106, 95% CI (3.564-7.314), $p < 0.001$), traditional lecture (Exp (B) = 13.033, 95% CI (8.374-20.283), $p < 0.001$), 3 months popular science intervention time (Exp (B) = 3.988, 95% CI (2.827-5.626), $p < 0.001$), 6 months popular science intervention time (Exp (B) = 4.132, 95% CI (2.924-5.840), $p < 0.001$) have positive effect on the satisfaction; while female (Exp (B) = 0.598, 95% CI (0.440-0.813), $p = 0.001$) and junior college degree (Exp (B) = 0.295, 95% CI (0.168-0.519), $p < 0.001$) have negative effect on the satisfaction. **The above results are shown in Table 3.**

Group Index	Foreign Volunteer Medical Science Talk Show Group n=111					Chinese Volunteer Medical Science Talk Show Group n=120					Traditional Lecture Group n=105					Control Group n=446
	Baseline Phase I Phase II χ^2 p					Baseline Phase I Phase II χ^2 p					Baseline Phase I Phase II χ^2 p					
	70 (63.1)	106 (95.5)	100 (90.1)	47.1	<0.001	60 (50.0)	100 (83.3)	110 (91.7)	62.0	<0.001	77 (73.3)	101 (96.2)	99 (94.3)	31.7	<0.001	
Satisfaction on Community Popular Science Activity																46 (4)

Table 3. The Impact Factors on Satisfaction in Shanghai Community Residents In Different Popular Science Models [N (%)]N = 446]

Factor	Subgroup	B	S.E	Wals	df	Sig.	Exp (B)	95% CI	
								Lower	Upper
Gender	Male								
Age	Female	-0.514	0.157	10.755	1	0.001	0.598	0.440	0.813
Education	Age			8.060	4	0.089			
Work	< 50 age	0			0				
Status	50~59 age	-0.363	0.467	0.603	1	0.438	0.696	0.278	1.739
Marital Status	60~69 age	-0.770	0.478	2.598	1	0.107	0.463	0.182	1.181
Popular	70~79 age	-0.343	0.491	0.489	1	0.485	0.710	0.271	1.857
Science	≥ 80 age	-0.712	0.531	1.797	1	0.180	0.491	0.173	1.389
Model	Education			42.457	4	0.000			
Popular	≤Elementary	0			0				
Science	MiddleSchool	0.199	0.260	0.584	1	0.445	1.220	0.733	2.029
Intervention	High School/ SecondSchool	-0.455	0.263	2.988	1	0.084	0.635	0.379	1.063
Time	JuniorCollege	-1.220	0.288	17.946	1	0.000	0.295	0.168	0.519
	≥ Undergraduate	-0.379	0.390	0.945	1	0.331	0.684	0.319	1.470
	Career			1.799	2	0.407			
	Worked	0			0				
	Retired	0.556	0.432	1.651	1	0.199	1.743	0.747	4.067
	Other	0.083	0.705	0.014	1	0.907	1.086	0.273	4.327
	Marriage			21.577	3	0.000			
	Unmarried	0			0				
	Married	0.999	0.432	5.333	1	0.021	2.715	1.163	6.336
	Widowed	0.163	0.462	0.125	1	0.724	1.177	0.476	2.914
	Divorced	1.267	0.690	3.368	1	0.066	3.550	0.918	13.738
	Group			183.206	3	0.000			
	Foreign	2.174	0.203	114.509	1	0.000	8.796	5.907	13.100
	Chinese	1.630	0.183	79.032	1	0.000	5.106	3.564	7.314
	Lecture	2.567	0.226	129.437	1	0.000	13.033	8.374	20.283
	Control	0			0				
	Time			88.064	2	0.000			
	Baseline	0			0				
	Phase I	1.383	0.176	62.052	1	0.000	3.988	2.827	5.626
	Phase II	1.419	0.177	64.605	1	0.000	4.132	2.924	5.840
	Constant	-1.468	0.582	6.368	1	0.012	0.230		

Discussion

In the era of omi-media, innovative models of popular science in community health science continue to appear: medical science film and television dramas such as "Grey Intern", "White Tower", medical reality shows "Emergency Room Stories" etc. They satisfy the increasing public demand for popular science and the pursuit of innovative models of popular science^[10-11], provide new methods and perspectives for exploring innovative popular science models, increase the public health knowledge, and health literacy^[12-13].

The results show that with the same knowledge in osteoporosis, compared with that in baseline in each group, the satisfactions in two innovative and one traditional model have been significantly improved after 3 and 6 months of popular science intervention, which shows that both innovative and traditional

models in this study have achieved better satisfaction in community health science activities. In the comparison of different models with the popular science intervention for 3 months or 6 months, the satisfaction in C is always the highest than in A, B, which showed the traditional lecture mode has wider adaptability and better science popularization effect for the dissemination of popular science knowledge.

Lectures are an on-site community popular science on method, which has always been familiar and welcomed by community residents. It is also a type in health popular science research (about 31.34 ~ 47.77% in the research), with a high degree of awareness and satisfaction^[14-16]. In this study, the satisfaction in A with 3 months intervention (95.5%) was basically equal to or slightly lower than that in C (96.2%), and that in B (91.7%) with 6 months intervention was slightly lower than that in C (94.3%). Prompt the health popular science model, the medical science talk show maximizes the scientific and professional content as well as the artistry and fun of form, which blends solemnity and harmony, and has excellent popular science effects in Shanghai community health popular science activities^[7].

Next, the satisfaction in different models varies with the popular science intervention time. Although after 3 months, the satisfactions in A, B, C were significantly improved compared with that in baseline, the satisfaction in A and C both reached the highest after 3 months intervention, while that in B reached the highest after 6 months. The reason may be that because the main features and the serious consequences of OP are relatively abstract and complex concepts, in the next three months of popular science intervention, one of innovative model, Chinese volunteer medical science talk show has made knowledge continue to be effectively repeated and intensified, continued to advance residents' understanding on knowledge. So at the end of 6 months, the satisfaction in B continued to increase. However, due to some unknown mechanism, in A and C, the popular science intervention in the next three months did not effectively continue repeat and strengthen the understanding of same knowledge, the satisfaction reached the highest at the end of the three months. with a slight decrease in satisfaction at the end of six months. The results also indicated that when applying different popular science models, we should distinguish between the nature of knowledge, choose appropriate popular science models and reasonable intervention time for different knowledge, so as to improve popular science satisfaction.

Female (0.598, 95% CI (0.440-0.813), $p = 0.001$) and junior college (0.295, 95% CI (0.168-0.519), $p < 0.001$) have negative effects on the satisfaction, which is consistent with many studies^[19-20]. It is speculated that because female generally have better various types of knowledge than male have, and are meticulous and sensitive to knowledge, they have higher requirements for popular science activities leading to lower satisfaction. Education has also become a major factor affecting satisfaction. Residents with better education, for example with college education have higher requirements for popular science activities, which results in lower satisfaction^[17]. Based on the different satisfaction in different groups, and our findings about many residents have gradually realized the importance of popular science activities in community, therefore there is a large demand for science popularization and they are willing to participate in popular science activities. In the future, more individual innovative popular science models in Shanghai community will enhance the effectiveness of popular science activities.

Chinese residents generally have insufficient awareness of osteoporosis, and the detection rate of bone mineral density needs to be improved urgently. Popularization of science is particularly important. Previous studies have shown that the awareness rate of osteoporosis-related knowledge among people over 20 years old in China is only 11.7%, of which 10.5% of men, 13.0% of women, 17.8% in urban areas, and 8.1% in rural areas. Therefore, on the one hand, innovative forms of popular science can improve community residents' comprehensive knowledge of various chronic diseases including OP, help residents to achieve early prevention and early improvement of bone density, and the prevalence of OP will be greatly reduced^[19-21]. On the other hand, innovative forms of science popularization with better science popularization effects can meet the increasing needs of community residents for popular science.

The limitations of this study are that the surveyed residents are relatively high in age (only 17.7% of residents are under 60) and low education level (only 54.2% of residents are high school/technical school and above). Although the scope of the survey cannot represent the whole, it is representative in the sample of this age group (60 years old and above). We have reason to believe that because of the easy-to-understand characteristics of medical science cross talk, it is speculated that good science popularization effects will also be achieved in other age groups (younger) and other educational backgrounds (higher education). In addition, the overall sample size is not high, and the sample size difference between some groups is slightly larger. Although this study cannot be representative of Chinese community residents, it is representative in the sample of Shanghai community residents. In the future, we can consider designing a large sample study to further control the influence of factors such as gender, age, education, occupation, marriage, and economic income on the effect of popular science. In the future, it is necessary to continue to expand the scope of popular science in the form of innovative science. In addition to osteoporosis, it should also be extended to other common physical and mental diseases of community residents, such as Alzheimer's disease, cardiovascular and cerebrovascular diseases.

In 2020, the proportion of Chinese citizens with scientific literacy will reach 10.56%, and the improvement of Chinese citizens' scientific literacy has entered a stage of rapid growth^[22]. Community residents are the main force receiving health science training, and they also assume the responsibility of publicizing and disseminating health science knowledge and skills, and driving the public to comprehensively improve the national scientific literacy level. Both the innovative forms of popular science and the traditional forms of popular science in this study can effectively improve the knowledge level of community residents, and both have a high degree of satisfaction. Not only will it meet the needs of community residents for popular science, but it will also promote the demonstration effect of community health popular science activities.

Conclusion

Both the innovative and traditional popular science models have positive effect on the satisfaction on Chinese community health popular science activities in Shanghai community residents. In the future, special consideration should be given to the impact of different popular science models and other factors on the popular science effects including the satisfaction, and more tailor-design health popular science activities will be suitable for community residents.

Abbreviations

confidence intervals (C.I.)

interquartile range (IQR)

osteoporosis (OP)

probability value (p)

standard deviation (SD)

Statistical Package for the Social Sciences (SPSS)

Declarations

Ethical Approval and Consent to participant: This study was approved by the Ethics Committee of Shanghai Mental Health Center. The Institutional Ethics Committee also approved the consent procedure. Informed consent was obtained from all participating subjects before the study.

Consent for publication: All authors agreed to the publication of this study

Availability of supporting data: No additional data are available.

Competing interests: None declared

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Authors' contributors: JP participated in the conception and design of the study. JP drafted the manuscript and revised the manuscript critically for important intellectual content. The author is responsible for the paper's data.

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Figures

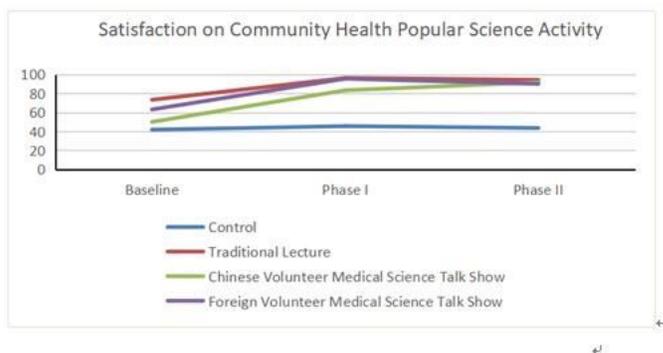


Figure 1. The Satisfaction in Shanghai Community Residents In Different Popular Science Models

Figure 1

See image above for figure legend.