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Analysis of the behavior change mechanism of township hospital health workers in Hubei Province, China
A cross-sectional study

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Abstract

This study aims to analyze the behavior changes of health workers in township hospitals by exploring their individual service, health information utilization, and health information exchange before and after intervention.

A cross-sectional survey was conducted from September, 2016 to December, 2016 in Qianjiang city, Hubei Province, China. A total of 432 township hospital health workers were investigated from 12 township hospitals. t test and chi-square test were adopted in the difference analysis to compare the behavior changes and factors of the control and intervention groups before and after intervention. t test and U test were used to analyze the behaviors and the key impact factors of health workers in township hospitals. The hypothesis test of the behavior changes in the township hospitals were analyzed using the partial least squares (PLS) method.

No significant difference was observed between the control and intervention groups of health workers in township hospitals. Significant differences were observed in the behavior attitude (BA), perceived behavior control (PBC), behavior intention (BI), and behaviors of information utilization and exchange in the intervention group. A significant difference was observed in the indicators of subjective norm (SN), BI, and behaviors with respect to information exchange. A large increment was observed in the intervention group. Based on results of PLS, the individual service, health information utilization, and health information exchange established relationships with BA, SN, PBC, and BI to a certain degree.

A cause and effect relationship can be observed among BA, SN, PBC, BI, and behaviors of health workers in the township hospitals. BI can promote behavior changes among township hospital health workers. Moreover, different behaviors are demonstrated by different people because of BA, SN, PBC, and BI. The results of this study can contribute to improving the feasibility, pertinence, and effects of health service, and can serve as the guide in understanding health workers' behaviors.

Abbreviations: BA = behavior attitude, BI = behavior intention, PBC = perceived behavior control, PLS = partial least squares, SN = subjective norm, TPB = theory of planned behavior.

Keywords: behavior attitude, behavior intention, information exchange, information utilization, perceived behavior control, public health workers

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1. Introduction

The development of public health is influenced directly by health workers. As its most important component, the primary health workers in the township hospitals are also the symbol of development level of public health service.[1] To some extent, the quantity, quality, and capacity of public health service will be decided by Primary health workers who affect the development level of health service.[2] Primary health workers play an irreplaceable role, as key players in primary health service by providing and promoting the development of primary public health service.[3]

The individual health service aims to help residents to realize health risks, and to encourage them to quit unhealthy behaviors. An increasing number of residents, especially the elderly, have begun being concerned with chronic disease intervention.[4] Some intervention models for the elderly include methods of self-efficiency, family, and social support in rural China.[5] In this study, the behaviors of township hospital workers were changed into guiding the health service, which includes providing individual service, information utilization, and information exchange. Recently, several related studies on general behavior changes have conducted.[3,6] However, few studies have focused on the mechanism of behavior changes of health workers in the township hospitals, and our study seeks to fill this gap.

The primary information system includes healthcare records management, health information service, primary public health service, basic medical service, and institutional operations management and monitoring, which are provide according to the requirements of the basic functional specifications of primary health care information system.[7,8] Specifically, township hospital workers played essential roles in providing primary health services, such as providing individual service to residents, seeking clinic skills support from municipal experts, supplying technology skills supports to village doctors, providing referral of patients, through decision support using the information system, reporting patients' diagnostic information to municipal hospitals and providing patients' information to village doctors, and so on.[9,10] At present, the information system of primary health care institutions remains isolated, fragmented, and incomplete. The systems are not interlinked and data are not shared, thereby increasing the workload of health workers. Meanwhile, the incomplete information system and obvious functional fragmentation also increase the workload of the health workers.[7,10] The limitation of the health system operation and maintenance, incomplete information infrastructure construction, and unstable network are some of the issues that township hospital workers will face. The lack of information exchange is another obvious problem in the primary health care.[11,12] As a major management measure, information exchange contains information check, evaluation and summary of patients' visiting to the doctors, village doctor's postoperative visit, and postpartum visit. Information exchange among different health systems, such as the village health system and township hospitals, cannot occur smoothly because most village doctors cannot operate computers well. However, comprehensive, correct, and effective information exchange are vital to the modification of the work plan and to the certain of measures and regularization of standards.[13] Moreover, some township hospital doctors will not provide feedback on the patients' information to city hospitals, such as on the chronic diseases of residents to the city hospitals because the unstable network system.[11,14]

In this study, we focused on the changes in the 3 kinds of behaviors of health workers in township hospitals, as well as the impact factors before and after intervention in the sample areas of Qianjiang city, Hubei Province, China. The theory of planned behavior (TPB) includes the behavior attitude (BA), subjective norm (SN), perceived behavior control (PBC), behavior intention (BI), and behavior. Based on the TPB, the behavior changes of the township hospital health workers were explored by 3 intervention methods: individual service, health information utilization, and health information exchange. Following our research, the health service integration and service of family physician model have been implemented by health workers including clinic workers, public health workers, and nurses in Qianjiang city, Hubei Province.[7] Concurrently, the health information system was established in 2015, around various health and medical institutions. The system integrated primary public health service programs, regional medical and health resources, major public health items, free premarital medical examination, and pregnancy eugenic health examination, as well as forge links with all health services tires.[15] As direct participants, township hospital health workers are the most dynamic and functional elements of the health system.[16,17] A considerable number of studies on behavior change have been conducted. According to other related research, the theory of behavior change has been the precondition of people's behavior change.[18] However, the behavior change of health workers of township hospitals, as the direct providers of

health service, significantly influences the individual service, information utilization, and information exchange.[19,20]

2. Methods

2.1. Sampling

At the base-line 437 health workers are from the township hospitals that include the control group (212) and the intervention group (225). At the end-line of the study, 5 township hospital health workers were excluded for transferring positions, leaving a total number of the 432 township hospital workers, which includes 209 township hospital health workers in the control group and 223 in the intervention group. Self-reporting questionnaires were used to test the health workers in township hospitals. The Cronbach α of the questionnaires was 0.842, and satisfactory reliability was above 0.7 (Fig. 1).

2.2. Statistical analysis

All the data were inputted into SPSS software (v.20.0, SPSS Inc., Chicago, IL) for statistical analysis by all the participants in this study, and all the participants were trained before inputting the data. t test was adopted to analyze the differences between control and intervention groups of the health workers in the township hospitals. Difference test of the behaviors of township hospital health workers and the key influencing factors in the township hospitals also by adopting t test. Statistical analysis of differences about the increment of the 3 kinds of behaviors of health workers in the township hospitals, and the essential influencing factors by adopting to t test and U test. Partial least squares (PLS) was adopted in the structure model estimation of the individual service of township hospital workers, the health information utilization, and information exchange.

3. Results

3.1. Remarkable difference analysis of control and intervention groups of health workers in township hospitals

In Table 1, both t test and chi-square test were adopted to analyze the differences between control and intervention groups of health workers in township hospitals. In Table 1, the 3 terms of "age" "overall work of experience," and "years of working in public health" were analyzed by using t test, and other items were analyzed by chi-square test.

The homogeneity test between the 2 groups was conducted to define the balance among the samples. The control group has 209 township hospital workers and the intervention group has 223 township hospital workers. No significant differences in age, gender, educational degree, professional title, qualification, overall work of experience, and years of working among the samples were observed ($P > .05$).

3.2. Contrast of the health workers in township hospitals before and after intervention

The difference test of the behaviors of samples and their key influencing factors was tested by adopting t test. The results showed significant differences among BA, PBC, and behaviors of the control group in the individual service. Significant differences were also observed among BA, SN, PBC, BI, and behaviors of the
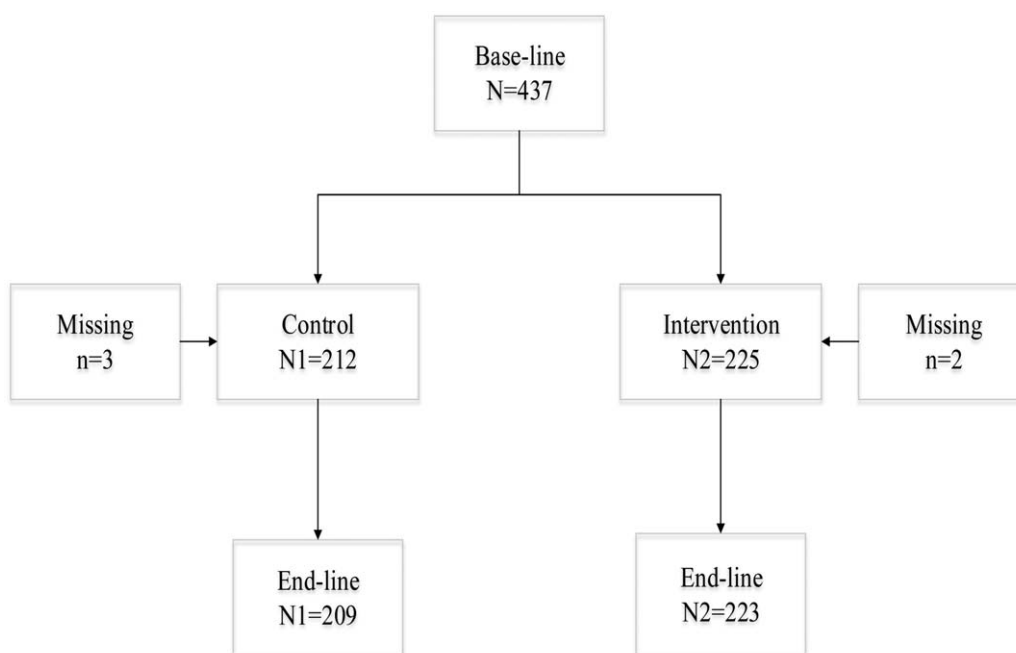
Figure 1. The samples of health workers in the township hospitals.

intervention group. A significant difference was observed in the PBC of health information utilization and information exchange. Significant differences were observed among BA, PBC, BI, behaviors of the health information utilization, and information exchange in the intervention group. Table 2 shows the results.

In terms of individual service, health workers of township hospitals provided individual service at least 24 times for 1 person per month. The eligibility rate of health prescription intervention was up to 82.46% at the third month, and increases to 92.34% at the end-line. Compared with the baseline, the individual service subsidy of health workers in township hospitals increased to 169 RMB per month for the intervention group. The mean score of the health information utilization of the intervention group

increased to 5.41 from the baseline (0.47), but no obvious change was observed in the control group. The mean score of the information exchange increased to 4.68 from the baseline (0.43), but no significant difference was observed in the control group. The results are shown in Table 2.

3.3. Comparison of the groups of the samples before and after intervention

The essential influencing factors of individual service, health information utilization, and information exchange between the intervention and control groups were measured by using t test and U test. The results of individual service presented significant

Table 1

t test and chi-square test for remarkable difference analysis between control and intervention groups.

Indicators	Control group	Intervention group	t/χ	P
Age	38.59 ± 9.13	38.18 ± 8.48	0.286	.775
Gender			0.223	.637
Male	112 (53.52%)	114 (51.16%)		
Female	97 (46.48%)	109 (48.84%)		
Educational degree			3.954	.138
Junior high school	6 (2.82%)	8 (3.49%)		
Senior high school	89 (42.25%)	104 (46.51%)		
College	114 (54.93%)	111 (50.00%)		
Professional title			1.070	.784
None	15 (7.04%)	10 (4.65%)		
Junior	103 (49.30%)	109 (48.84%)		
Secondary	88 (42.25%)	96 (43.02%)		
Senior	3 (1.41%)	8 (3.49%)		
Qualification			3.383	.184
Nursing	9 (4.23%)	10 (4.65%)		
Public health	112 (53.52%)	109 (48.84%)		
Clinic	88 (42.25%)	104 (46.51%)		
Overall work of experience	17.38 ± 9.15	17.18 ± 9.09	0.137	.891
Years of working in public health	6.34 ± 3.43	6.06 ± 3.67	0.482	.633

Table 2

Differences statistics analysis of township hospitals health workers and its essential influencing factors before and after intervention.

Indicators	Control group						Intervention group					
	T0		T1		t	P	T0		T1		T	P
Individual service (mean±SD)												
BA	3.640	0.620	3.730	0.660	−3.789	.000	3.720	0.780	4.940	0.680	−10.747	.000
SN	2.630	0.560	2.650	0.550	−1.425	.159	2.640	0.550	2.890	0.530	−2.982	.003
PBC	4.650	0.470	4.680	0.450	−3.197	.002	4.660	0.710	5.050	0.670	−3.639	.000
Intention of individual service	3.930	1.190	3.960	1.160	−1.425	.159	4.190	1.150	5.640	0.800	−14.412	.000
Numbers of individual service	35.720	11.790	43.300	13.270	−3.494	.006	37.160	10.670	61.190	12.240	−13.479	.000
Information utilization (mean±SD)												
BA	4.900	0.820	4.930	0.790	−1.758	.083	4.460	1.010	5.540	1.040	−6.806	.000
SN	5.520	0.760	5.550	0.720	−1.654	.103	5.490	0.610	5.550	0.600	−1.758	.083
PBC	5.350	0.510	5.380	0.490	−3.003	.004	5.370	0.590	5.620	0.560	−3.285	.002
Intention of information utilization	5.540	1.180	5.570	1.170	−1.425	.159	5.320	0.960	5.570	0.900	−5.260	.000
Scores of information utilization	0.460	0.090	0.480	0.110	−1.152	.252	0.470	0.080	5.410	1.210	−14.542	.000
Information exchange (mean±SD)												
BA	3.960	0.800	4.040	0.810	−2.179	.033	3.990	0.680	4.100	0.650	−2.259	.026
SN	3.970	0.780	3.980	0.790	−0.256	.798	3.980	0.660	4.420	0.750	−7.554	.000
PBC	4.060	0.520	4.080	0.540	−0.652	.517	4.050	0.540	4.090	0.830	−1.741	.085
Intention of information exchange	3.820	0.810	3.850	0.820	−1.425	.159	3.570	0.990	4.110	1.090	−7.573	.000
Scores of information exchange	0.410	0.100	0.420	0.130	−0.498	.619	0.430	0.110	4.680	1.110	−15.020	.000

BA = behavior attitudes, PBC = perceived behavior control, SD = standard deviation, SN = subjective norm.

differences were existing among BA, SN, PBC, BI, intention of individual service, and numbers of individual service per month. In terms of information utilization, the significant difference was observed in BA, PBC, BI, intention of individual service, and scores of information utilization between the control and intervention groups. A higher increment was observed in the intervention group. A significant difference was also observed among indicators of SN, BI, intention of information exchange, and scores of information exchange with respect of the information exchange, and a higher increment was observed in the intervention group. The results are shown in Table 3.

3.4. Structural model estimation of individual service of samples in township hospitals
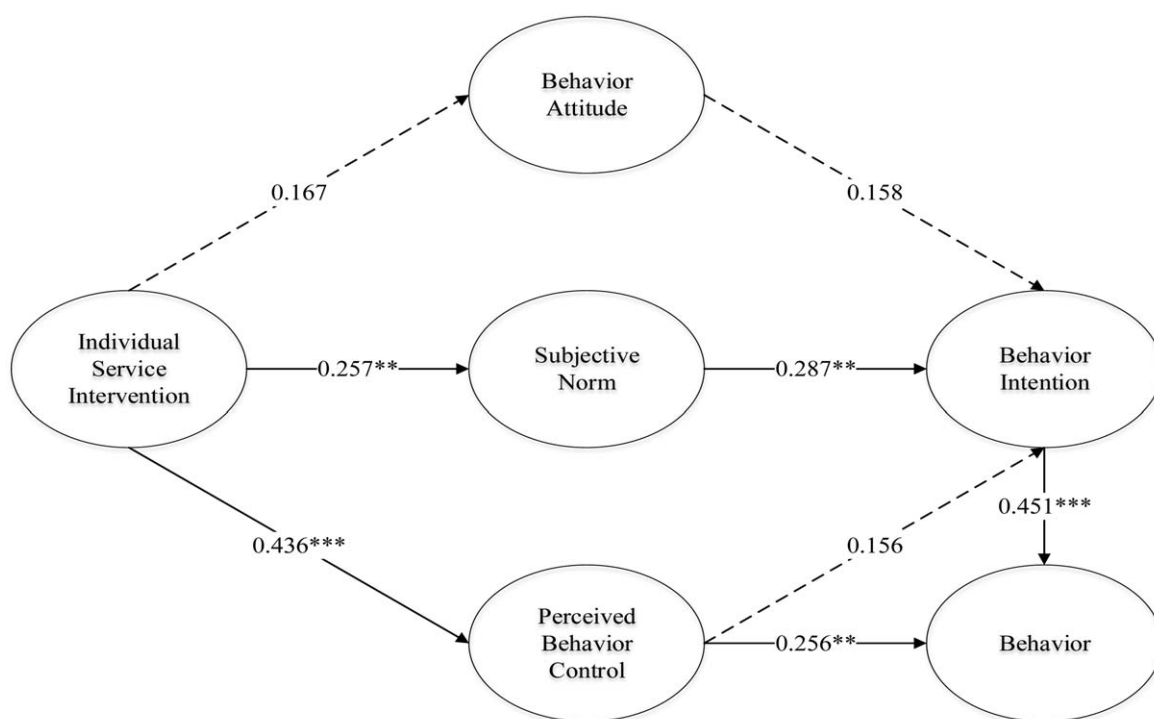
Based on the results of PLS and individual service intervention of the samples in township hospitals, relevance was found between the individual service and SN, and the path coefficient is 0.257. Relevance was also found between SN and BI, between BI and behavior, with path coefficients being 0.287 and 0.451, respectively. Relevance was observed between individual service intervention and PBC, between PBC and behavior, with the path coefficients being 0.436 and 0.256, severally (Fig. 2).

Table 3

Essential influencing factors of the 3 kinds of behaviors between the control and intervention groups.

Indicators	Control group δ		Intervention group δ		t test/U test of independent samples	
	Mean	SD	Mean	SD	t/Z	P
Individual service						
BA	0.088	0.052	1.220	0.678	−13.625	.000
SN	0.019	0.012	0.252	0.138	−15.311	.000
PBC	0.029	0.017	0.387	0.217	−13.462	.000
Intention of individual service	0.028	0.021	1.452	0.824	−15.737	.000
Numbers of individual service per month	7.580	2.744	24.028	7.868	−17.755	.000
Information utilization						
BA	0.028	0.013	1.083	0.520	−18.477	.000
SN	0.029	0.018	0.035	0.029	−1.551	.121
PBC	0.032	0.021	0.251	0.155	−12.728	.000
Intention of individual service	0.033	0.019	0.249	0.136	−14.297	.000
Scores of information utilization	0.022	0.015	4.941	1.718	−26.084	.000
Information exchange						
BA	0.083	0.059	0.107	0.108	−1.729	.084
SN	0.010	0.006	0.440	0.376	−10.141	.000
PBC	0.019	0.014	0.024	0.019	−1.854	.064
Intention of information exchange	0.029	0.017	0.536	0.348	−13.254	.000
Scores of information exchange	0.011	0.009	4.248	1.617	−23.871	.000

BA = behavior attitudes, PBC = perceived behavior control, SD = standard deviation, SN = subjective norm.

Figure 2. Structural model of individual service intervention of the samples in township hospitals.

3.5. Structural model estimation of information utilization training of the samples

The results of the information utilization training of health workers in township hospitals showed that, based on PLS, the relevance could be observed between information utilization training and BA, and the path coefficient is 0.392. Relevance was also observed between BA and BI, between BA and behavior. The path coefficients were 0.412 and 0.347, severally. Simultaneously, the relevance was observed between information utilization training and PBC, between PBC and behavior, the path coefficients were 0.259 and 0.263, respectively (Fig. 3).
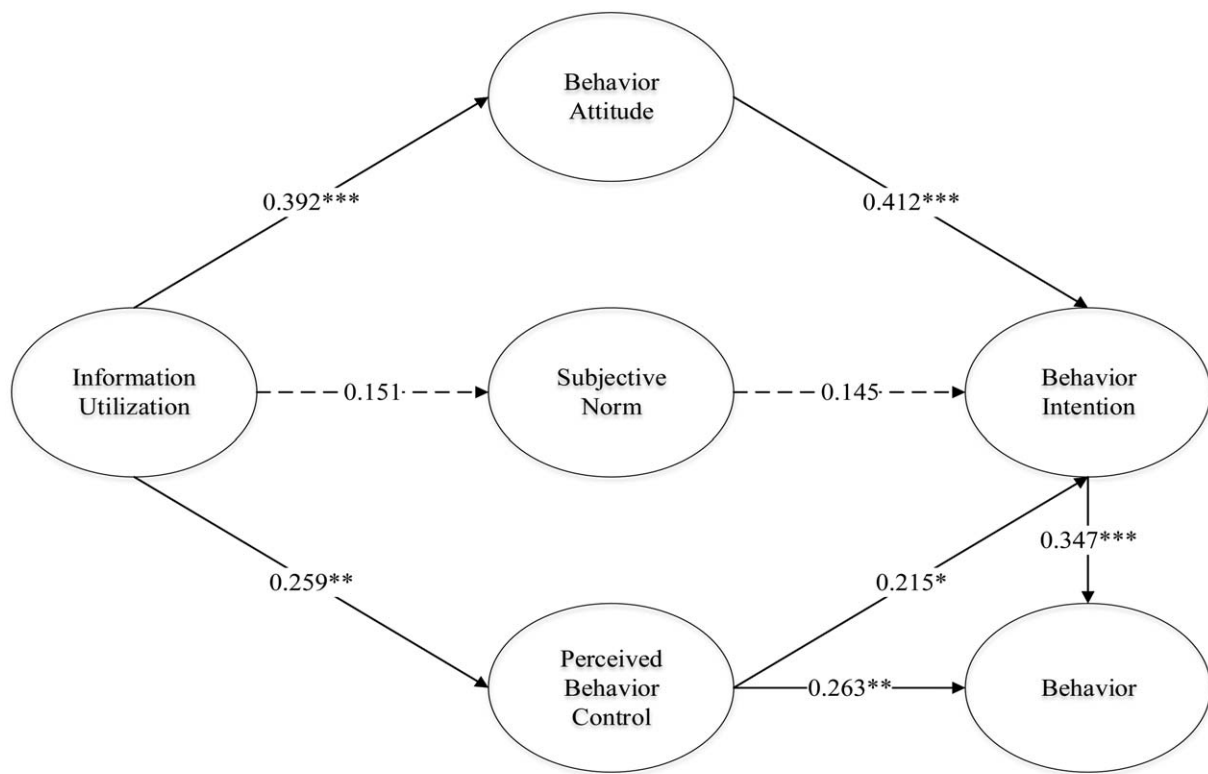
3.6. Structural model estimation of information exchange of the samples in township hospitals

The results showed that, based on PLS, information exchange and SN were related, and the path coefficient is 0.398. SN and BI, BI and behavior, information exchange and PBC, and PBC and behavior were all related and had path coefficients of 0.427, 0.463, 0.186, and 0.179, respectively (Fig. 4).

4. Discussion

The results indicated the absence of significant differences in the age, gender, educational degree, professional title, qualification, overall work experience, and years working in health service providing among all the samples ($P > .05$). We selected male and female health workers in township hospitals, based on the needs of our research investigation and intervention goals. The homogeneity of the 2 groups is a precondition of the intervention study. Related studies have also found insignificant differences

among social-geographic characteristics of the 2 groups, which is the basis and precondition in conducting the intervention research.[21] The results indicated that in individual service, the health workers of township hospitals provided individual service at least 24 times for each person per month. Compared with the baseline, the individual service subsidy of health workers in township hospitals increased to 169 RMB 1 person per month of the intervention group. Individual service can be considered as major and important task of the health workers in township hospitals. To some extent, the effect of individual service can be considered as evidence and serves as the evaluation standard of the relationship between township hospital health workers and residents.[21,22] A previous study showed that health managers should focus on promoting community health by ensuring the provision of food, water, exercises, and mental health during the individual service.[23] Health education and health examination, especially personalized health examination during individual service, personalized health prescription,[24] heath tracking, and follow-up visits all played vital roles in establishing a more stable relationship between public health workers and residents.[25] The results showed the existence of a significant difference among indicators of SN, BI, and behavior with respect to the information exchange, with higher increments for the intervention group. Based on previous study on information exchange, information exchange has been shown to be related closely to the quality of information system, health service level and quality of township hospital health workers, and support of the government.[8] Related literature indicated that under the pure TPB model, BA, SN, and PBC all had significant indirect effects on behavior whereas both SN and PBC contribute to the explanation of BI.[26] SN, BI, and behavior have also been included in the studies on the TPB.[27] Similarly, significant difference has also been observed

*P<0.05; **P<0.01; ***P<0.001

Figure 3. Structural model of information utilization training of the samples.
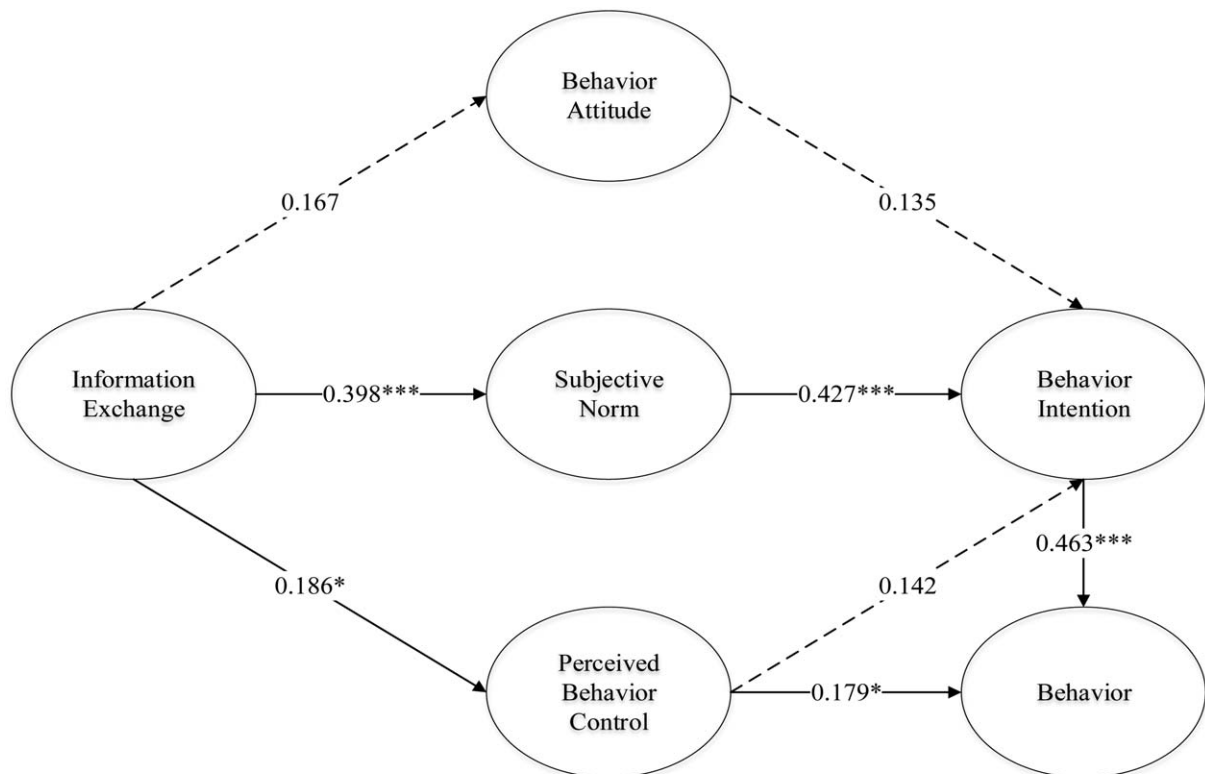
*P<0.05; **P<0.01; ***P<0.001

Figure 4. Structural model of information exchange of the samples.

the 3 indicators, namely, SN, BI, and behavior, which could reflect the effect of the information exchange to a certain extend.

In township hospitals, relations between the individual service and SN, BA and BI, BA and behavior, and individual service intervention and PBC could be observed. These results indicated the closer relation among individual service, SN, BA, BI, and behavior, which also means that any isolated independence does not exist in TPB. Hence, all the 5 factors are indispensable determinants of TPB. However, the relationship between BA, SN, and PBC has not been particularly well understood.[28] Mathieson found that TPB indicated that BA, SN, meanwhile PBC are the direct determinants of the BI, which in turn affects behavior.[29] In a decomposed TPB model, drawn upon constructs from innovations characteristics literature, the dimensions of SN, such as social influence, are explored more completely. The PBC is obtained by decomposing them into specific belief dimensions. Ajzen found that PBC was an essential determinant of behavior, and provided a more complete understanding of usage. Hartwick and Barki's conducted a study in organizational settings and found that SN was an important determinant of BI.[30,31] In such setting, actual behavior is a determinant of intention and usage.

The relevance of the path coefficient was significant between the information utilization training and BA. Relevance was also observed between BA and behavior, information utilization training and PBC, PBC and behavior by adopting the PLS method. These results indicated the obvious relation between information utilization training and TPB. As the reform and development of primary health service continues, information utilization will become increasingly needed and implemented. Information utilization has also been referenced in the field of public health and medical care. Using information in public health and medical care is vital, because it can contribute to the improvement of the correct rate of public health and medical data. Most township hospitals have poor information utilization and despite some primary health workers having information utilization skills, meanwhile, most village doctors have limited computer skills. The results showed that in township hospital, the promotion and development of information utilization has always been implemented by health workers. Hence, more township hospital health workers will be needed and should undergo regular information utilization training.[32,33] To some extent, BA is the most basic of health workers' behaviors, and attitude is always the previous condition and direct reflection of behaviors.[34,35] The relationship between PBC and behavior indicated that in addition to BA, PBC is also the key factor of behavior. PBC is an indirect factor that has an important effect on BA, BI, and behaviors. Other related literature review also showed the PBC is to be a key factor in TPB.[36] The present finding provided some support to clarify the intention and to show that self-predictions were superior predictors of behavior than desires. The attitudes, SN, and PBC were the best predictors of desire. Thus, in our research, the residents must first translate their attitudes into desires, however, desires were direct predictors of behaviors, which may also be mediated by intentions or self-predictions.[34,37]

The results of PLS show that not only information exchange and SN are related but also BI and SN. These results indicated that SN affected with impacted the information exchange, and information exchange was the performance of SN. BI has always been a cornerstone of SN, to a certain degree, BI is the consciousness of people's performance, will always influence SN regardless of positive or negative primary health workers. Conversely, SN is the result of

one's intention.[37] In our study, we focused on township hospital health workers, whose BI, to a large extend, can decide SN, especially in the information exchange, between the township hospital workers and village doctors. A review of related literature showed that information exchange was widespread between 2 different levels in the field of primary public health.[24] A close relation exists between information exchange and behaviors, and PBC was mediating variable. As the mediating variable, PBC connects the information exchange and behaviors. The relationship is not merely between information exchange and PBC, but rather between the PBC and behaviors in the TPB. However, other similar studies have indicated that all factors of TPB can affect each other. The performance improvement of the primary health service system depends on health workers who possess professional skills. Concurrently, for township hospitals workers, in addition to professional and technology skills, and motivation and encouragement play a key role in their job satisfaction.[38] Motivation and encouragement are essential to the behavior change of health workers, in addition to the number of primary health workers, which serves as the direct health provider in health service supply, deciding on the quantity, quality, health service pattern, and health cost.[39,40]

5. Conclusions

The 4-month intervention work of the health workers in township hospitals led to significant improvement in providing health service through the individual service, the information utilization, and information exchange activities. The results showed that cause and effect existed among BA, SN, PBC, BI, and behavior of township hospitals workers. BI can promote changes in behaviors. Moreover, different people have different behaviors, because of the differences in BA, SN, PBC, and BI. This study has significance in fully considering the rules of behavior changes to establish the intervention strategies and safeguards. Monitoring the behaviors of health workers, understanding the thoughts of health workers, and adjusting the strategies to evaluate and extend the health policy are all important.

6. Limitation

However, in this study, the township hospital is the smallest intervention unit, and township hospital health workers are the object of this study. We also did not use random sampling of the group, but rather quasi-experimental research methods, because of investigation time limitations and the cost of labor. More data will be collected subsequently, which will verify the validity of the behavior change mechanism of health workers in township hospitals.

Author contributions

Zhifei He contributed to the design of the research. Zhifei He, Zhanchun Feng, Tailai Wu, Ghose Bishwajit, and Zhaohui

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