


# Reliability and Validity of Pharmacy Research Proposal Questionnaire in Saudi Arabia

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## ABSTRACT

**Objectives:** To explore reliability and validity of pharmacy research proposal survey in the Kingdom of Saudi Arabia. **Methods:** It is a cross-section survey developed by the authors and the researcher team. It's based on the updated literature, national and international accreditation standards organizations. The internal consistency reliability through, inter-rater reliability, item-item coloration, item-total coloration, split half reliability (Gutmann's  $\lambda_6$ ), McDonald's  $\omega$  and Cronbach alpha. The validity consisted of face content validity, construct validity through exploratory factorial analysis and confirmatory factor analysis. All analysis had been done through Statistical Package of Social Sciences (SPSS), Statistical Package of Social Sciences-Analysis of Moment Structures (SPSS-Amos) and Jeffrey's Amazing Statistics Program (JASP) **Results:** A total of 209 pharmacists responded. The majority of responders were Saudi 185 (88.52%). The among responders were males 108 (61.77%) and females 101 (48.33%). The three tests had been done of reliability of 17 questions of responders (204). The tests mean $\pm$ SD was 3.788  $\pm$  0.163, McDonald's  $\omega$ , Cronbach alpha and Gutmann's  $\lambda_6$  were 0.975, 0.975 and 0.987, respectively and inter-item coloration was 0.705. The item-total coloration  $>0.7$ , McDonald's  $\omega$ , Cronbach alpha and Gutmann's  $\lambda_6$  value if deleted was  $>0.97$ . By using Exploratory Factor Analysis (EFA), the Kaiser-Meyer-Olkin measure of sampling adequacy was 0.954 and Bartlett's test of sphericity with approximate chi-square was  $<0.001$ . The commonalities extraction for all questions was  $>0.7$ , the related components were two with the rotated component matrix  $>0.7$  of all 17 questions in components 1 and 2 as suggested. They were confirmed by confirmatory with statistically significant ( $p<0.001$ ) of the factor model, by factor analysis, by scree plot, pathway analysis and fit with the original survey. The confirmatory factor index was 0.871, Tucker-Lewis Index (TLI) was 0.853, Goodness of fit index (GFI) was 0.912, Expected cross validation index (ECVI) was 4.299. The collinearity of 17 questions was auto-correlation was 0.058 with not statically significant ( $p=0.403$ ). The majority of 17 questions had Enjuone value had close to number 1, while 7 questions only had condition index less than 30. Most of questions had the Variance inflation factor (VIF) less than 10 except 4 questions, while only 4 questions had tolerance less than 0.1. **Conclusion:** The reliability and validity of a survey about knowledge of pharmacy proposals in the Kingdom of Saudi Arabia were high. The pharmacist in pharmacy research practice can utilize the survey in the future.

**Key words:** Reliability, Validity, Pharmacy, Research, Proposal, Survey, Saudi Arabia.

## INTRODUCTION

In the past years, the pharmacy strategic plan founded and updated one based on Saudi vision 2030. The plan contained of several general goals, initiatives and projects. Besides, crucial general performance indicators to follow-up the plan and validated from the clinical and economic outcomes of the plan. Each project had clinical and economic indicators to validate the results. The majority of pharmacy practice had specific indicators. Besides, there were some tools to validate from outcome results of the indicators. Two concepts were used to assure the reliability and validity of pharmacy projects. Among the pharmacy practice, pharmacy research had validation and reliability tool to promise from procedures and outcomes results of the research or survey repeated at any location in the Kingdom of Saudi Arabia.<sup>1-3</sup> The two concepts of reliability and validity were very critical to assure the pharmacy information with an emphasis on survey or list of questions distributed to the responders will not change if repeated again to target one goal.<sup>4,5</sup> The validity defined as "the degree to which the researcher has measured what he has set out to

measure".<sup>6</sup> The validity entailed of several types the most commonly used in the pharmacy research practice was content and construct validity. The validity is critical to keep touch the same goals, to prevent deviation from the target goals and it's part of quality management processes. However, the validity test needs education and training with an emphasis on statistical software programs. While reliability was defined as "scale or test is reliable to the extent that repeat measurements made by it under constant conditions will give the same result".<sup>6</sup> The reliability is needed to assure the survey will changes if the researcher repeats from time to another or from one population to another.<sup>4,7</sup> The most common types used in practice were test-retest reliability parallel form reliability, inter-rater reliability and the internal consistency. The majority of those tools are easy to implement except internal consistency need biostatistical analysis software program.

Both concepts are highly required in the pharmacy research and practice. Multiple kinds of research had been done locally or internationally

about the reliability or validity of pharmacy services or pharmacy information.<sup>1-3</sup> Most of the various research discussed one type of method for validation or reliability and a very simple or subjective method.<sup>8-14</sup> Few publications released about knowledge of pharmacy research proposal and related reliability and validity.<sup>15</sup> The authors best on their knowledge not aware of any local or Middle East studies about the validity or reliability of knowledge pharmacy research proposal survey. The aim of the current study is to declare the reliability and validity of the survey used in the pharmacy research proposal in the Kingdom of Saudi Arabia.

## METHODS

### Survey Development

It is a cross-section survey developed by the authors and hit the researcher team. It's based on the updated literature, national and international accreditation standards organizations.<sup>16-19</sup> The survey contained of two parts, the first section about demographic data including genders, nationality with dichotomous data and age with ordinal data. The rest of the data as ordinal information including the responder's qualifications, background education, the board of pharmaceutical certificate and the current job and experience. The other section of demographics information was hospital data with ordinal data and included hospital bed capacity based on the ministry of health classification; the university updated hospital accreditation status from national and international accreditation institutions. The second part of the survey about patient satisfaction of pharmacy services. The section divided into several domains and each domain had several questions related to the domain. The answers of the domains were likely with 1 (I do not need this knowledge), 2 (I do not have knowledge), 3 (Weak knowledge), 4 (Incomplete knowledge) and 5 (Complete knowledge). A pilot study had been done through the authors and the team distributes electronically or manually to target responders 20-30 as a pilot. Sometimes they interview patients to assure all the questions clear and understood by the responders. All comments brought for discussion. The correction of the survey was done based on the agreement of most research members.<sup>4</sup> The research team tested the McDonald's  $\omega$  and Cronbach alpha for internal reliability in the pilot responders by using Statistical Package of Social Sciences (SPSS), Statistical Package of Social Sciences-Analysis of Moment Structures (SPSS-Amos) and Jeffrey's Amazing Statistics Program (JASP)<sup>20</sup>

### Internal Consistency Reliability

#### Item-item Correlation

The method was used to measure each question to another one, with high coloration results in more than 0.7, high internal consistency reliability survey.<sup>6,20</sup>

#### Item-total Correlation

The method was used to measure the total questions allocates with each question alone. The results of high results more than 0.7, the high correlate internal consistency reliability of the survey.<sup>6,20</sup>

### Split Half Reliability (Gutmann's $\lambda_6$ )

The method was used through the SPSS and JASP program with the scale option and reliability section with all questions. The test used a split-half option. The SPSS or JASP will split the question into two half and measure the coloration of the two groups. The high results more than 0.9 of coloration means the high reliability with internal consistency.<sup>4, 21,22</sup>

### McDonald's $\omega$ and Cronbach alpha

The research team applied McDonald's  $\omega$  and Cronbach alpha for internal reliability by using SPSS and JASP. All the questions with scale or ordinal data included in the analysis. The scale more than 0.9; it will

be excellent internal consistency, 0.7-0.9 means good reliability, 0.3-0.6 means not acceptable reliability and the score less than 0.3 means weak reliability.<sup>4,7,23</sup>

### Face Content Validity

The principle authors designed the survey and team research revised self-reliantly. Each member revised all the survey content questions based on the updated literature and experience. Any violations had been sent to all research team for further discussion and agreements. The survey had been corrected and agreement from the Research team. One of the team members transferred all surveys to the Arabic language and double-checked by all team members again for content and accurate translation.<sup>4,6</sup>

### Construct Validity

#### Exploratory Factorial Analysis

The method was used for the construct validity of the survey. The factor used univariate description and Kaiser-Myer-Olin measure of sampling adequacy and Bartlett's test sphericity. The extraction used principal components analysis, the Eigen values greater than 1 with the maximum iteration of convergence 25 and display through un-rotated faction solution and scree plot. The rotation used Varimax.<sup>18,22</sup>

#### Confirmatory Factor Analysis

The test was done through SPSS-Amos and JASP software programs with factor variances, R-Sequated, fit measurements, factor loading, without emulation, error calculated with CI 95% and robust method, it was with the auto-estimator and without standardization, it was with pathway analysis.<sup>18,22</sup>

#### Collinearity

The test was done through JASP with linear regression for collinearity diagnostics including Eigen value and condition index, the coefficient used with CI 95% tolerance and variance inflation factor, the model fit through ANOVA and autocorrelation with Durbin-Watson.<sup>24</sup>

#### Statically Analysis

Various biostatistical analysis was done in the current study like the McDonald's  $\omega$ , Cronbach alpha and Gutmann's  $\lambda_6$  for calculation reliability. The Kaiser-Meyer-Olkin measure of sampling adequacy and Bartlett's test of sphericity with approximate chi-square for Exploratory Factor Analysis (EFA). The factor variances, R-Sequated, fit measurements, factor loading, without emulation, error calculated with CI 95% and robust method, it was with the auto-estimator and without standardization, it was with scree plot and pathway analysis. Collinearity had been diagnostician through linear regression the variance inflation factor was calculated, the model fit through ANOVA and auto-correlation with Durbin-Watson. All biostatistical analysis was done by the Statistical Package of Social Sciences (SPSS), SPSS-AMOS and Jeffrey's Amazing Statistics Program (JASP).

## RESULTS

A total of 210 pharmacists responded. The majority of responders were Saudi 185 (88.52%). Among responders were males 108 (61.77%) and females 101 (48.33%). Most of the responders were in age (18-29) years and age (30-44) years were 104 (49.67%) and 78 (37.32%), respectively. The majority of responders had a doctor of pharmacy and a Bachelor's degree in pharmacy was 92 (44.32%) and 81 (38.94%), respectively. Most of the pharmacists had not 16 (8%) certified of pharmaceutical specialties 193 (92%).

<b>Table 1: Scale Reliability Statistics.</b>																							
scale	mean	sd	McDonald's $\omega$	Cronbach's $\alpha$	Guttman's $\lambda_6$	Greatest lower bound	Average inter-item correlation	95.0% Confidence Interval		item-rest correlation	sd	mean	Guttman's $\lambda_6$	Cronbach's $\alpha$	McDonald's $\omega$	Guttman's $\lambda_6$	Cronbach's $\alpha$	Guttman's $\lambda_6$					
								Lower	Upper														
3.788	0.163	0.975	0.987	0.975	0.987	0.993	0.699	0.970	0.980														
Note. Of the observations, 204 were used, 6 were excluded pairwise and 210 were provided..																							
3.732	0.169	0.976	0.998	0.976	0.998	0.998	0.705	0.961	0.987														
Note. Of the observations, 29 were used, 1 were excluded pairwise and 30 were provided																							
<b>Item Reliability Statistics</b>																							
	204 responders									29 responders									If item dropped				
	mean	sd	item-rest correlation	McDonald's $\omega$	Cronbach's $\alpha$	Guttman's $\lambda_6$	item-rest correlation	sd	mean	Guttman's $\lambda_6$	item-rest correlation	sd	mean	McDonald's $\omega$	Cronbach's $\alpha$	Guttman's $\lambda_6$	item-rest correlation	sd	mean	McDonald's $\omega$	Cronbach's $\alpha$	Guttman's $\lambda_6$	
Q1	Title of research	3.914	1.150	0.860	0.973	0.986	0.856	1.262	3.833	0.974	0.856	1.262	3.833	0.974	0.974	0.986	0.856	1.262	3.833	0.974	0.974	0.986	0.856
Q2	Abstract	3.962	1.153	0.870	0.973	0.986	0.899	1.242	3.900	0.974	0.899	1.242	3.900	0.974	0.974	0.986	0.899	1.242	3.900	0.974	0.974	0.986	0.899
Q3	Introduction	4.010	1.137	0.895	0.973	0.985	0.884	1.217	3.967	0.973	0.884	1.217	3.967	0.974	0.974	0.985	0.884	1.217	3.967	0.974	0.974	0.985	0.884
Q4	Background	3.971	1.156	0.864	0.973	0.985	0.869	1.217	3.967	0.973	0.869	1.217	3.967	0.974	0.974	0.985	0.869	1.217	3.967	0.974	0.974	0.985	0.869
Q5	Description of Proposed Research	3.852	1.140	0.858	0.974	0.986	0.809	1.179	3.700	0.973	0.809	1.179	3.700	0.975	0.975	0.986	0.809	1.179	3.700	0.975	0.975	0.986	0.809
Q6	Description of Relevant Institutional Resources	3.610	1.202	0.746	0.975	0.986	0.744	1.248	3.600	0.975	0.744	1.248	3.600	0.976	0.976	0.986	0.744	1.248	3.600	0.976	0.976	0.986	0.744
Q7	List of References	3.981	1.164	0.850	0.974	0.986	0.875	1.217	3.967	0.974	0.875	1.217	3.967	0.974	0.974	0.986	0.875	1.217	3.967	0.974	0.974	0.986	0.875
Q8	Personnel	3.652	1.157	0.770	0.975	0.986	0.797	1.165	3.567	0.974	0.797	1.165	3.567	0.975	0.975	0.986	0.797	1.165	3.567	0.975	0.975	0.986	0.797
Q9	Budget	3.442	1.157	0.731	0.975	0.987	0.746	1.181	3.414	0.975	0.746	1.181	3.414	0.976	0.976	0.987	0.746	1.181	3.414	0.976	0.976	0.987	0.746
Q10	Conclusion	3.967	1.145	0.872	0.973	0.986	0.889	1.112	3.933	0.973	0.889	1.112	3.933	0.974	0.974	0.986	0.889	1.112	3.933	0.974	0.974	0.986	0.889
Q11	Meta-analysis	3.690	1.078	0.778	0.975	0.986	0.825	1.070	3.600	0.974	0.825	1.070	3.600	0.975	0.975	0.986	0.825	1.070	3.600	0.975	0.975	0.986	0.825
Q12	Systematic Review	3.697	1.090	0.828	0.974	0.985	0.836	1.184	3.667	0.974	0.836	1.184	3.667	0.975	0.975	0.985	0.836	1.184	3.667	0.975	0.975	0.985	0.836
Q13	Cohort	3.651	1.086	0.798	0.974	0.986	0.817	1.163	3.600	0.974	0.817	1.163	3.600	0.975	0.975	0.986	0.817	1.163	3.600	0.975	0.975	0.986	0.817
Q14	Case series	3.679	1.121	0.807	0.974	0.986	0.812	1.163	3.600	0.974	0.812	1.163	3.600	0.975	0.975	0.986	0.812	1.163	3.600	0.975	0.975	0.986	0.812
Q15	Case control	3.722	1.131	0.821	0.974	0.985	0.814	1.189	3.633	0.974	0.814	1.189	3.633	0.975	0.975	0.985	0.814	1.189	3.633	0.975	0.975	0.985	0.814
Q16	Case report	3.788	1.173	0.836	0.974	0.985	0.779	1.172	3.733	0.974	0.779	1.172	3.733	0.975	0.975	0.985	0.779	1.172	3.733	0.975	0.975	0.985	0.779
Q17	Observational	3.809	1.144	0.841	0.974	0.986	0.843	1.194	3.767	0.973	0.843	1.194	3.767	0.974	0.974	0.986	0.843	1.194	3.767	0.974	0.974	0.986	0.843

**Reliability**

The three tests had been done with reliability of 17 questions for the initial 29 responders. The mean±SD was 3.732±0.169, McDonald’s ω, Cronbach alpha and Gutmann’s λ6 were 0.976, 0.976 and 0.998, respectively, while inter-item coloration was 0.699. After the completed number of responders (204). The tests the mean±SD was 3.788±0.163, McDonald’s ω, Cronbach alpha and Gutmann’s λ6 were 0.975, 0.975 and 0.987, respectively and inter-item coloration was 0.705 among the 30 responders. All question item-total coloration >0.7 and McDonald’s ω, Cronbach alpha and Gutmann’s λ6 value if deleted was >0.97. While with responders’ number (204), the item-total coloration >0.7, McDonald’s ω, Cronbach alpha and Gutmann’s λ6 value if deleted was >0.97 (Table 1). The split-half reliability of 204 valid cases and 17 items; the Cornbrash’s Alpha of part 1 was 0.968, while part 2 was 0.964, the correlation between forms was 0.802. The Spearman-Brown Coefficient of Unequal Length was 0.891 and Guttman Split-Half Coefficient was 0.885 (Table 2).

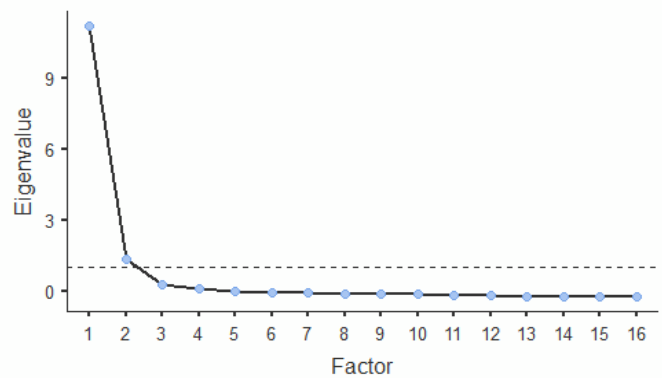
**Validity**

By using Exploratory Factor Analysis (EFA) the Kaiser-Meyer-Olkin measure of sampling adequacy was 0.954 and Bartlett’s test of sphericity with approximate chi-square was <0.001 (Table 3). The commonalities extraction for all questions was >0.7, the related components were two with the rotated component matrix >0.7 of all 17 questions in components 1 and 2 as suggested as declared with scree plot (Figure 1). They were confirmed by confirmatory with statistically significant (p<0.001) of the factor model, by factor analysis, by pathway analysis and fit with the original survey. The confirmatory factor index was 0.871, Tucker-Lewis Index (TLI) was 0.853, Goodness of fit index (GFI) was 0.912 and Expected cross validation index (ECVI) 4.299. Other results Bentler-Bonett Non-normed Fit Index (NNFI) was 0.853, Bentler-Bonett Normed Fit Index (NFI) was 0.851, Parsimony Normed Fit Index (PNFI) was 0.745, Bollen’s Relative Fit Index (RFI) was 0.830, Bollen’s Incremental Fit Index (IFI) 0.871, Relative Noncentrality Index (RNI) was 0.871, Root mean

square error of approximation (RMSEA) was 0.164 and Standardized root mean square residual (SRMR) was 0.400 (Table 3 and 4). The square, multiple correlations of the questions R2 were from 0.487 to 0.908, while factor loading was all the questions >0.8 and it was a range 0.80-1.09 with p <0.001. In the pathway analysis, each latent factor and observed coloration with >0.7 with p <0.001 as explored in pathway analysis (Figure 2).

**Collinearity**

The correlation coefficients of 17 questions was R2 was 0.891 and RMSE was 0.4 with statistically significant (p<0.001), while the auto-correlation was 0.058 with not statically significant (p=0.403). The majority of 17 questions had Enjuone value close to number 1, while 7 questions only had condition index less than 30. Most of questions had the Variance inflation factor (VIF) less than 10 except 4 questions, while only 4 questions had tolerance less than 0.1 (Table 5).



**Figure 1:** Exploratory Factor Analysis Scree Plot.

<b>Table 2: Split-Half reliability.</b>			
<b>Case Processing Summary</b>			
		N	%
Cases	Valid	204	97.1
	Excluded <sup>a</sup>	6	2.9
	Total	210	100.0
a. Listwise deletion based on all variables in the procedure.			
<b>Reliability Statistics</b>			
Cronbach's Alpha	Part 1	Value	.968
		N of Items	9 <sup>a</sup>
	Part 2	Value	.964
		N of Items	8 <sup>b</sup>
Total N of Items		17	
Correlation Between Forms			.802
Spearman-Brown Coefficient	Equal Length		.890
	Unequal Length		.891
Guttman Split-Half Coefficient			.885
a. The items are: Title of research, Abstract, Introduction, Background, Description of Proposed Research, Description of Relevant Institutional Resources, List of References, Personnel and Budget.			
b. The items are: Conclusion, Meta-analysis, Systematic Review, Cohort, Case series, Case control, Case report, Observational.			

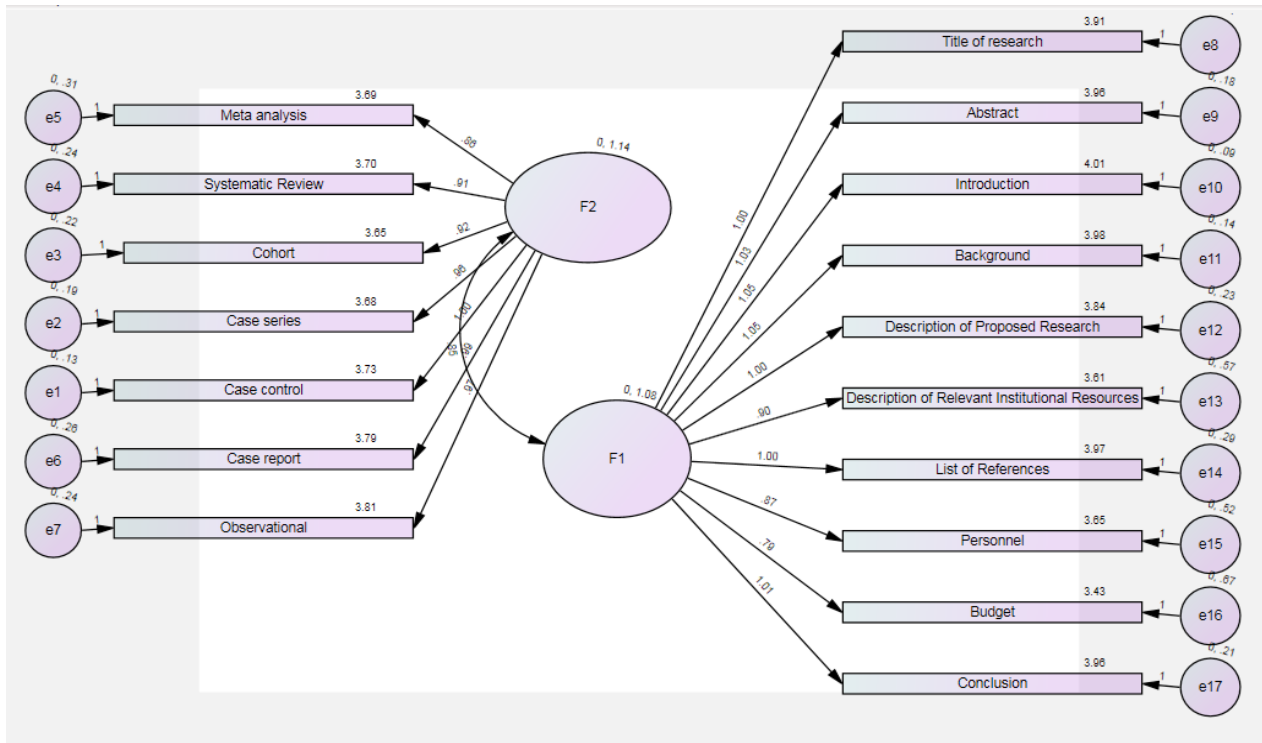


Figure 2: Confirmatory analysis pathway diagram.

Table 3: Scale of Validity.

Exploratory Factor Analysis (EFA)			Confirmatory Factor Analysis (CFA)					
KMO and Bartlett's Test								
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.945	CFI		0.871			
Bartlett's Test of Sphericity	Approx. Chi-Square	5020.238		Chi-square test				
	df	136		Baseline model	5186.302	136	P	
	Sig.	.000		Factor model	770.743	119	< .001	
	<b>Communalities</b>	<b>Factor loading</b>		<b>Squared Multiple Correlations</b>	<b>Factor loading (F)</b>	<b>95% Confidence Interval</b>		
<b>Items</b>	<b>Extraction</b>	<b>Component</b>		<b>R<sup>2</sup></b>		<b>Lower</b>	<b>Upper</b>	<b>p</b>
		<b>1</b>	<b>2</b>					
Title of research	.826	.796	.439	0.821	<b>F1 1.029</b>	0.928	1.131	< .001
Abstract	.872	.822	.443	0.893	<b>1.067</b>	0.967	1.167	< .001
Introduction	.894	.846	.423	0.944	<b>1.099</b>	1.005	1.194	< .001
Background	.898	.860	.398	0.940	<b>1.089</b>	0.995	1.183	< .001
Description of Proposed Research	.849	.847	.362	0.811	<b>1.028</b>	0.929	1.128	< .001
Description of Relevant Institutional Resources	.735	.823	.240	0.622	<b>0.947</b>	0.838	1.055	< .001
List of References	.821	.819	.389	0.785	<b>1.031</b>	0.924	1.138	< .001
Personnel	.750	.819	.281	0.629	<b>0.917</b>	0.811	1.023	< .001
Budget	.601	.668	.393	0.487	<b>0.808</b>	0.695	0.920	< .001
Conclusion	.863	.844	.389	0.846	<b>1.052</b>	0.959	1.146	< .001
Meta-analysis	.798	.344	.824	0.734	<b>F2 0.924</b>	0.836	1.012	< .001



Systematic Review	.851	.388	<b>.837</b>	0.794	<b>0.971</b>	0.888	1.055	< .001
Cohort	.858	.326	<b>.867</b>	0.816	<b>0.983</b>	0.901	1.065	< .001
Case series	.848	.351	<b>.851</b>	0.851	<b>1.031</b>	0.953	1.110	< .001
Case control	.903	.340	<b>.887</b>	0.908	<b>1.073</b>	1.001	1.146	< .001
Case report	.821	.435	<b>.794</b>	0.803	<b>1.046</b>	0.965	1.127	< .001
Observational	.833	.434	<b>.803</b>	0.802	<b>1.026</b>	0.936	1.116	< .001
	Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.							
	a. Rotation converged in 3 iterations.							

<b>Table 4: The validity analysis test.</b>		
<b>Index</b>	<b>Value</b>	<b>normal value</b>
Comparative Fit Index (CFI)	0.871	>0.9
Tucker-Lewis Index (TLI)	0.853	>0.9
Bentler-Bonett Non-normed Fit Index (NNFI)	0.853	>0.9
Bentler-Bonett Normed Fit Index (NFI)	0.851	>0.9
Parsimony Normed Fit Index (PNFI)	0.745	>0.9
Bollen's Relative Fit Index (RFI)	0.830	>0.9
Bollen's Incremental Fit Index (IFI)	0.871	>0.9
Relative Noncentrality Index (RNI)	0.871	>0.9
Root mean square error of approximation (RMSEA)	0.164 CI 90% (0.153-0.175) P<0.001	< 0.08
Standardized root mean square residual (SRMR)	0.400	
Hoelter's critical N ( $\alpha = .05$ )	39.312	
Hoelter's critical N ( $\alpha = .01$ )	42.562	
Goodness of fit index (GFI)	0.912	>0.9
McDonald fit index (MFI)	0.201	
Expected cross validation index (ECVI)	4.299	<5

## DISCUSSION

Pharmacy research contained of various steps. It started with the formulation of the research problem to publish the results of the research. Among the steps of the pharmacy research was sometimes the writing proposal of the research. The goal of the proposal is to identify the general of particular research to expert people for review or evaluation including submission proposals for getting the research funds from governmental or non-governmental institutions. Sometimes to get approval from institutions review board (IRB) to start conducting the pharmacy research if it not essentially. Information is highly demanded by the pharmacist to improve his knowledge. Assessment of proposal knowledge of pharmacy research is critical to set up a pharmacy plan transition improving the knowledge level of pharmacists. As a result, the authors conducted a cross-sectional study about proposal knowledge of pharmacy research.<sup>15</sup> The author used a survey consisted of demographic data and specific information related to knowledge of the proposal. The survey was validated during the study. The authors did not mention more details about the reliability and validity of the survey of the study.<sup>15</sup> In the current study, need to declare such details about the reliability or validity of the survey and related questions. Three bio-statistical tests were used for internal re-

liability of the survey at bringing of the study and after ending the investigations. All tests showed excellent value with high indicated reliability of the survey similar to previous studies<sup>8,11</sup> better to other study<sup>12</sup> might related sample size. Besides, there are excellent correlations between the item to into and intend to total items with the very internal consistency of the survey. The author used multiple methods for the validity of the study including exploratory factor analysis, confirmatory factor analysts and collinearity. The findings showed an excellent sample for testing the survey and suggested two components with statically significant and confirmed the results through confirmatory factor analysis by two-factor loading with a large scale and correlation coefficients validity as the original survey similar analysis to previous study.<sup>11</sup> In the majority of the questions, findings showed few collinearities existed and might be removed once the sample size of the study increased. The study was first done in the Kingdom of Saudi Arabia or Gulf and Middle East countries about the reliability or validity of the survey of proposal knowledge of pharmacy research. The survey had reliable and valid to conduct a study in the future with an increased sample size.

**Table 5: The Collinearity analysis test.**

	Collinearity										95% Confidence Interval			
	Eigenvalue	Condition Index	Unstandardized	Standard Error	Standardized	t	p	lower	upper	Tolerance	VIF			
Q1	16.604	1	-0.037	0.064	-0.129	-0.573	0.567	-0.163	0.089	0.150	6.681			
Q2	0.143	10.768	0.046	0.080	0.160	0.574	0.566	-0.111	0.203	0.098	10.225			
Q3	0.058	16.859	-0.102	0.112	-0.359	-0.912	0.363	-0.324	0.119	0.049	20.431			
Q4	0.035	21.829	0.163	0.108	0.568	1.512	0.132	-0.050	0.377	0.053	18.728			
Q5	0.032	22.925	0.071	0.060	0.252	1.186	0.237	-0.047	0.190	0.167	5.972			
Q6	0.02	28.616	0.057	0.046	0.213	1.247	0.214	-0.033	0.148	0.260	3.852			
Q7	0.018	29.973	-0.033	0.057	-0.119	-0.574	0.567	-0.146	0.080	0.177	5.651			
Q8	0.016	32.452	-0.046	0.052	-0.163	-0.868	0.387	-0.149	0.058	0.214	4.673			
Q9	0.014	35.001	0.042	0.044	0.151	0.949	0.344	-0.045	0.129	0.300	3.333			
Q10	0.013	36.257	0.036	0.064	0.128	0.560	0.576	-0.091	0.163	0.145	6.903			
Q11	0.012	37.974	0.056	0.058	0.188	0.965	0.336	-0.059	0.172	0.195	5.123			
Q12	0.009	43.303	0.019	0.070	0.064	0.272	0.786	-0.120	0.158	0.134	7.436			
Q13	0.008	46.082	0.035	0.065	0.119	0.541	0.589	-0.094	0.165	0.155	6.461			
Q14	0.007	47.77	-0.072	0.071	-0.251	-1.027	0.306	-0.212	0.067	0.127	7.892			
Q15	0.005	56.253	-0.039	0.085	-0.135	-0.453	0.651	-0.207	0.130	0.085	11.700			
Q16	0.005	59.884	-0.016	0.066	-0.060	-0.250	0.803	-0.147	0.114	0.133	7.523			
Q17	0.002	89.818	0.097	0.063	0.345	1.539	0.125	-0.027	0.222	0.151	6.625			
R	R <sup>2</sup>	Adjusted R <sup>2</sup>	RMSE	R <sup>2</sup> Change	F Change	df1	df2	p						
0.944	0.891	0.882	0.4	0.891	89.829	17	186	< .001						
ANOVA														
Model	Sum of Squares	df	Mean Square	F	p			Variance inflation factor (VIF)		Collinearity Threshold				
Regression	246.033	17	14.473	90.312	< .001			Tolerance	> 10	> 0.1				
Residual	29.967	187	0.16					Condition index (CI)	> 30					
Total	276	204						The eigenvalue (coloration matrix); if it is close to 0 collinearity is high, if it is close to 1 there is no collinearity in the data						
	Durbin-Watson													
	Autocorrelation	Statistic												
	0.058	1.882	0.403											

## CONCLUSION

The knowledge about pharmacy research proposal survey distributed in the Kingdom of Saudi Arabia had high reliability and validation scale level. The various test was used for reliability or validity with an emphasis on exploratory factor analysis and confirmatory factor analysis. The survey might be used in the future in Saudi Arabia.

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## CONFLICT OF INTEREST

The authors declare no conflict of interest.

## ABBREVIATIONS

**KSA:** Kingdom of Saudi Arabia; **CFI:** Comparative Fit Index; **TLI:** Tucker-Lewis Index; **NNFI:** Bentler-Bonett Non-normed Fit Index; **NFI:** Bentler-Bonett Normed Fit Index; **PNFI:** Parsimony Normed Fit Index; **RFI:** Bollen's Relative Fit Index; **IFI:** Bollen's Incremental Fit Index; **RNI:** Relative Noncentrality Index; **RMSEA:** Root Mean Square Error of Approximation; **SRMR:** Standardized Root Mean Square Residual; **GFI:** Goodness of Fit Index; **MFI:** McDonald Fit Index; **ECVI:** Expected Cross Validation Index; **SPSS:** Statistical Package of Social Sciences; **JASP:** Jeffrey's Amazing Statistics Program; **ANOVA:** Analysis of Variance; **SPSS-Amos:** Statistical Package of Social Sciences-Analysis of Moment Structures.

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