

Using SAS[®] to Explain Mediator and Moderator Effect for Social Support of Mothers of Mentally Ill Children

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Background: This study presentation examines the role of perceived stress in the relationship between social support and mood, and tested if moderator or mediator effects influenced the relationship. The role of coping in the relationship between perceived stress and mood was also examined for potential mediator and moderator effects.

Method: The cross-sectional data reported here were collected in an experimental design with repeated measures with mothers of children who had been hospitalized on a child psychiatric unit. A convenience sample of mothers was randomly assigned into three groups: A web-based intervention group, a telephone social support intervention group, and a usual care group. Baron and Kenny (1986) steps were used to examine for mediation effect. The moderator effect was examined by including interaction effect in the regression model.

Result: Results indicated that the relationship between mood and social support was significant ($\beta = -.39$ ($p = .001$)) and that there was significant relationship between mediator and predictor variable ($\beta = -.17$ ($p = .0001$)). Also, previously significant relationship between social support and mood becomes non significant ($\beta = -.009$ ($p = .919$)). Therefore, there is almost complete mediator effect for perceived stress in the relationship between social support and mood. However, the result did not reveal any moderator effect for social support and perceived stress (P -value=0.488). Also, the results did not indicate any mediator and moderator effects for coping in the relationship between perceived stress and mood.

Keywords: Mood, social support, coping, perceived stress, mediator effect, and moderator effect.

Introduction

There is often confusion among why the relationship between predictor variable (X) and criterion variable (Y) become non significant when we introduce the third variable in the model. The reason could be the third variable functions as a mediator. Also, a moderator is a variable (M) whereby predictor variable (X) and criterion variable (Y) have a different relationship between each other at the various levels of M.

Purpose

The purpose of this study presentation is to explain the role of perceived stress in the relationship between social support and mood, and tested if mediator or moderator effects influenced the relationship. Also, we examine the role of coping in the relationship between Perceived stress and Mood for potential mediation and moderator effects.

Background

The cross-sectional data used here were collected in the first of three interviews of a longitudinal study designed to test and compare the effectiveness of web-based social support and telephone social support interventions on stress, coping and mood for mothers of seriously mentally ill children, ages 5 through 12, who had been hospitalized and discharged from a psychiatric. An experimental design with repeated measures was implemented with mothers of children who had been hospitalized on a child psychiatric unit. A convenience sample of mothers was randomly assigned into three groups: the web-based intervention group, a telephone social support intervention group, and a usual care group. The longitudinal data set, referenced in the following sections, was generated in a study which tested social support intervention designed for mothers of children that were hospitalized in psychiatric unit (Scharer, 2008). The study is referred to as the Social support for Mothers of Mentally Ill Children. The experimental study used a repeated measures design with data collection points at baseline, immediately following completion of the 6 months intervention, and at three months following intervention completion. The 132 study participants were recruited from different unit in South Carolina. Forty-four of participants dropped from this study. Study participants were randomly assigned to web-based social support, telephone social support, and usual care. Intervention group participants received a telephone or web –based support over a period of six months, while the control group received the usual care provided by the agency by which they were recruited.

Data Analyses

All data analyses were performed using SAS statistical software, version 9.2 (SAS, 2008). Since all variables were continuous standard Pearson correlation and regression procedures were used to examine the interrelationships among the study variables. *P*-values less than or equal to .05 were considered significant.

Statistical Tests for the Mediator Effect and Moderator Effect

In this presentation mediation effect was determined by procedures described by Baron and Kenny (1986). In order to determine mediation effect three regression equations are tested and four criteria must be met. The first equation tests if the predictor variable significantly predicts the outcome variable. The second equation tests if the predictor variable significantly predicts the mediator. In the third equation, both the predictor variable and the mediator are entered simultaneously and are used to predict the outcome variable. We would consider the mediation is established when the first and the third equations are shown to be significant. In addition, two criteria must to be met in the third equation: (1) the mediator must significantly predict the outcome variable and (2) the direct relationship between the predictor variable and the outcome variable must reduce to zero in the third equation in order to establish full mediation. If, however, the predictor variable is reduced in absolute size but is different from zero when the mediator is controlled, partial mediation can then be concluded. Finally, we can perform Sobel's (1982) test of significance to determine the extent to which a mediator contributed to the total effect on the outcome variable. Also, the moderator effect was tested using regression analysis procedures as described by Baron and Kenny (1986). We included predictor variable, mediator variable, and their interaction effect in the regression model. This interaction term was included in the regression analysis as an additional predictor of outcome. Baron and Kenny considered a moderator effect to exist if the interaction term explains a statistically significant amount of variance of outcome variable.

Results

To test for mediation, three regression equations were run for each purpose. First, the outcome (mood) was regressed on the predictor variable (social support). This relationship was significant ($\beta = -.39$ ($p = .001$)). Therefore, we ran second and third equations were analyzed. In the second equation, the mediator (perceived stress) was regressed on the predictor variable (social support). The result indicated that there was significant relationship between mediator and predictor variable ($\beta = -.17$ ($p = .0001$)). The third equation involved regressing the outcome (mood) variable simultaneously on the predictor (social support) and mediator variable (perceived stress). The result indicated that the previously significant relationship between predictor (social support) and the outcome (mood) becomes non significant ($\beta = .009$ ($p = .919$)). Therefore, there is almost complete mediator effect for Perceived stress in the relationship between social support and mood. The result did not reveal that the significant relationship between perceived stress and mood ($\beta = 2.37$ ($p = .0001$)) change after introducing coping as mediator effect.

To test for moderator effect, regression model was included the predictor variables (social support and Perceived stress for first model and perceived stress and coping for second model) plus interaction term of these effect on mood. The result did not reveal any moderator effect for social support and perceived stress ($P\text{-value} = 0.4878$). Also, the result did not indicate any moderator effect for perceived stress and coping ($P\text{-value} = 0.1004$).

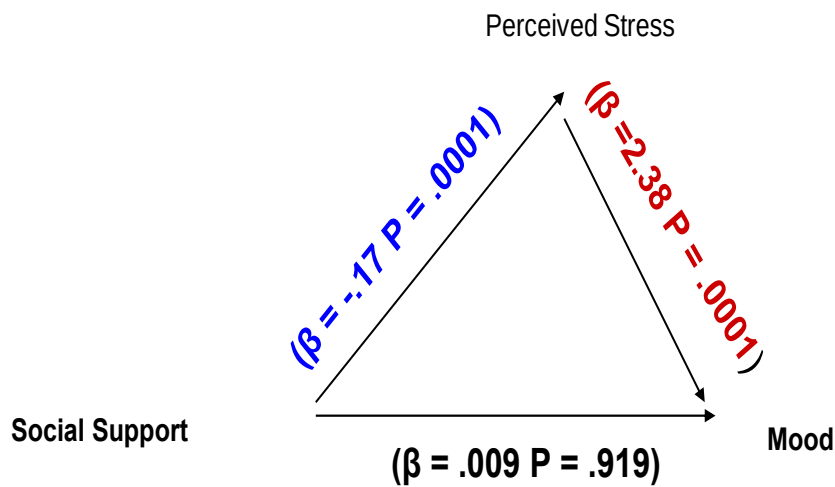
Figure 1 Mediator Model: Perceived stress (TPSS) as mediator of social support (TSS) to mood (POMSMOD)

Step. 1

Social Support $\xrightarrow{\beta = -.39 (p=.001)}$ Mood

Step 2 and 3.

Figure1: Perceived Stress (TPSS) as Mediator of Social Support (TSS) to Mood (POMSMOD).



$$\text{Indirect Effect} = c - c' = -.39 - (.009) = -.399$$

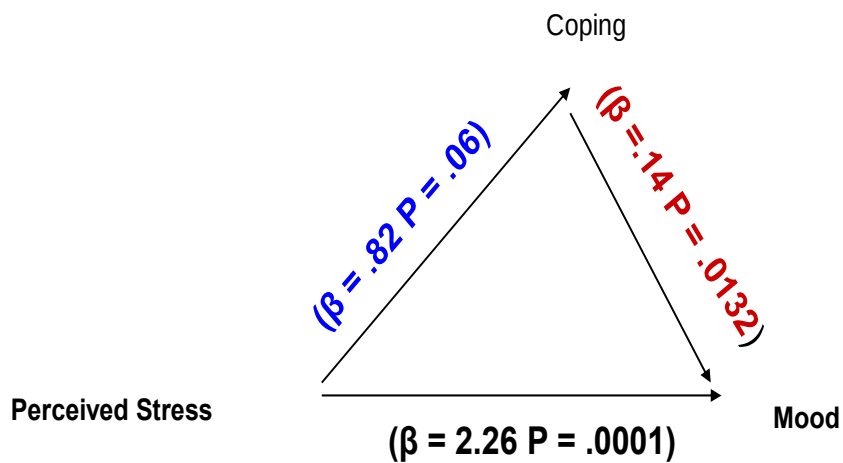
Figure 2 Mediator Model: Coping (TCOPE) as mediator perceived stress (TPSS) to mood (POMSMOD)

Step. 1

$\beta = 2.37$ ($p = .0001$)
Perceived stress -----> Mood

Step 2 and 3.

Figure1: Coping (TCOPE) as Mediator of Perceived Stress (TPSS) to Mood (POMSMOD).



$$\text{Indirect Effect} = c - c' = 2.37 - 2.26 = .11$$

Conclusion

The present presentation examined the influence of Perceived stress in the relationship between social support and mood, whether the relationship was influenced by a mediator or moderator effect. The result revealed that there is complete mediator effect for perceived stress in the relationship between social support and mood. However, the result did not indicate any moderator effect for social support and perceived stress on mood. However, the study did not reveal any mediator and moderator effects for coping and perceived stress on mood.

SAS Syntax for Mediator Effect:

```
ods rtf;
ods listing close;
proc reg data=two;
    model pomsmod = tss / stb pcorr2 scorr2;
    title ' Regression model / step1 y=x' ;
run;

proc reg data=two;
    model tpss = tss / stb pcorr2 scorr2;
    title ' Regression model / step2 m=x' ;
run;

proc reg data=two;
    model pomsmod = tpss tss / stb pcorr2 scorr2;
    title ' Regression model / step3 y=m x' ;
run;

proc reg data=two;
    model pomsmod = tpss / stb pcorr2 scorr2;
    title ' Regression model / step1 y=x' ;
run;

proc reg data=two;
    model tcope = tpss / stb pcorr2 scorr2;
    title ' Regression model / step2 m=x' ;
run;

proc reg data=two;
    model pomsmod = tcope tpss / stb pcorr2 scorr2;
    title ' Regression model / step3 y=m x' ;
run;

ods rtf close;
ods listing;
quit;
run;
```

SAS Syntax for Moderator Effect:

```
ods rtf;
ods listing close;

proc reg data=two;
    model pomsmod = tpss tss tpssss / stb pcorr2 scorr2;
    title ' Regression model / testing moderator effect' ;

proc reg data=two;
    model pomsmod = tcope tpss tpsscop / stb pcorr2 scorr2;
    title ' Regression model / testing moderator effect' ;

run;
ods rtf close;
ods listing;
quit; run;
```

Examining Mediation effect: Social support on mood: step1 y=x

Number of Observations Read	88
Number of Observations Used	88

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	5489.07679	5489.07679	11.57	0.0010
Error	86	40807	474.49699		
Corrected Total	87	46296			

Root MSE	21.78295	R-Square	0.1186
Dependent Mean	43.04545	Adj R-Sq	0.1083
Coeff Var	50.60453		

Parameter Estimates									
Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > t	Standardized Estimate	Squared Semi-partial Corr Type II	Squared Partial Corr Type II
Intercept	Intercept	1	68.22684	7.75927	8.79	<.0001	0	.	.
tss	total / social support	1	-0.38612	0.11353	-3.40	0.0010	-0.34433	0.11857	0.11857

Social support on stress: step2 m=x

Number of Observations Read	88
Number of Observations Used	88

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	1015.07264	1015.07264	23.66	<.0001
Error	86	3689.42736	42.90032		
Corrected Total	87	4704.50000			

Root MSE	6.54983	R-Square	0.2158
Dependent Mean	20.75000	Adj R-Sq	0.2066
Coeff Var	31.56546		

Parameter Estimates									
Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > t	Standardized Estimate	Squared Semi-partial Corr Type II	Squared Partial Corr Type II
Intercept	Intercept	1	31.57875	2.33311	13.54	<.0001	0	.	.
tss	total / social support	1	-0.16604	0.03414	-4.86	<.0001	-0.46451	0.21577	0.21577

Social support and stress on mood: step3 y = m x

Number of Observations Read	88
Number of Observations Used	88

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	26391	13195	56.35	<.0001
Error	85	19905	234.17699		
Corrected Total	87	46296			

Root MSE	15.30284	R-Square	0.5700
Dependent Mean	43.04545	Adj R-Sq	0.5599
Coeff Var	35.55043		

Parameter Estimates									
Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > t	Standardized Estimate	Squared Semi-partial Corr Type II	Squared Partial Corr Type II
Intercept	Intercept	1	-6.93654	9.64413	-0.72	0.4740	0	.	.
tpss	perceived stress scale	1	2.38019	0.25194	9.45	<.0001	0.75875	0.45148	0.51221
tss	total / social support	1	0.00909	0.09006	0.10	0.9198	0.00811	0.00005158	0.00011995

Examining Moderator effect: Social support and stress on mood: $y=x_m x^*m$

Number of Observations Read	88
Number of Observations Used	88

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	26505	8835.06942	37.50	<.0001
Error	84	19791	235.60250		
Corrected Total	87	46296			

Root MSE	15.34935	R-Square	0.5725
Dependent Mean	43.04545	Adj R-Sq	0.5573
Coeff Var	35.65847		

Parameter Estimates									
Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > t	Standardized Estimate	Squared Semi-partial Corr Type II	Squared Partial Corr Type II
Intercept	Intercept	1	6.88448	22.06487	0.31	0.7558	0	.	.
tpss	perceived stress scale	1	1.75228	0.93573	1.87	0.0646	0.55859	0.01785	0.04007
tss	total / social support	1	-0.17983	0.28574	-0.63	0.5308	-0.16037	0.00202	0.00469
tpssss		1	0.00898	0.01289	0.70	0.4878	0.19898	0.00247	0.00575

Examining Mediation effect: Stress on mood: step1 y=x

Number of Observations Read	88
Number of Observations Used	88

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	26388	26388	114.00	<.0001
Error	86	19907	231.48176		
Corrected Total	87	46296			

Root MSE	15.21452	R-Square	0.5700
Dependent Mean	43.04545	Adj R-Sq	0.5650
Coeff Var	35.34525		

Parameter Estimates									
Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > t	Standardized Estimate	Squared Semi-partial Corr Type II	Squared Partial Corr Type II
Intercept	Intercept	1	-6.09824	4.88017	-1.25	0.2148	0	.	.
tpss	perceived stress scale	1	2.36837	0.22182	10.68	<.0001	0.75498	0.57000	0.57000

Stress on coping: step2 m=x

Number of Observations Read	88
Number of Observations Used	88

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	3180.64790	3180.64790	3.65	0.0594
Error	86	74967	871.71221		
Corrected Total	87	78148			

Root MSE	29.52477	R-Square	0.0407
Dependent Mean	89.46591	Adj R-Sq	0.0295
Coeff Var	33.00114		

Parameter Estimates									
Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > t	Standardized Estimate	Squared Semi-partial Corr Type II	Squared Partial Corr Type II
Intercept	Intercept	1	72.40433	9.47028	7.65	<.0001	0	.	.
tpss	perceived stress scale	1	0.82224	0.43046	1.91	0.0594	0.20174	0.04070	0.04070

Stress and coping on mood: step3 $y = m x$

Number of Observations Read	88
Number of Observations Used	88

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	27784	13892	63.79	<.0001
Error	85	18512	217.78919		
Corrected Total	87	46296			

Root MSE	14.75768	R-Square	0.6001
Dependent Mean	43.04545	Adj R-Sq	0.5907
Coeff Var	34.28395		

Parameter Estimates									
Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > t	Standardized Estimate	Squared Semi-partial Corr Type II	Squared Partial Corr Type II
Intercept	Intercept	1	-15.97627	6.13490	-2.60	0.0109	0	.	.
tpss	perceived stress scale	1	2.25619	0.21968	10.27	<.0001	0.71922	0.49622	0.55377
tcope	total score / cope	1	0.13643	0.05390	2.53	0.0132	0.17725	0.03014	0.07009

Examining Moderator effect: Stress and coping on mood: $y = x m x^*m$

Number of Observations Read	88
Number of Observations Used	88

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	28373	9457.57170	44.32	<.0001
Error	84	17923	213.37027		
Corrected Total	87	46296			

Root MSE	14.60720	R-Square	0.6129
Dependent Mean	43.04545	Adj R-Sq	0.5990
Coeff Var	33.93436		

Parameter Estimates									
Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > t	Standardized Estimate	Squared Semi-partial Corr Type II	Squared Partial Corr Type II
Intercept	Intercept	1	3.93971	13.43753	0.29	0.7701	0	.	.
tpss	perceived stress scale	1	1.20663	0.66810	1.81	0.0745	0.38464	0.01503	0.03738
tcope	total score / cope	1	-0.10534	0.15499	-0.68	0.4986	-0.13686	0.00213	0.00547
tpsscop		1	0.01236	0.00744	1.66	0.1004	0.51550	0.01272	0.03182

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