



Moderation and mediation in spss

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Download My Free Using SPSS: A Little Syntax Guide Using SPSS: A Little Syntax Guide (.zip file) If you like Introduction to Mediation, Moderation, and Conditional Process, try my regression analysis book: Regression Analysis and Hayes Linear Patterns, A. F., & amp; Montoya, A. K. (in review). Mediation analysis in pretest-posttest design with two conditions: Treatment as moderator of time effects. Guest manuscript under review. [Request a PDF] Coutts, J. J., Hayes, A. F., & amp; Jiang, T. A. (2019). Simple analysis of statistical mediation with distinguishable dyadic data. Communication Journal. [PDF] Hayes, A. F., & amp; Rockwood, N. J. (2020). Conditional Process Analysis: Concepts, calculations and progress in shaping unforeseen situations of mechanisms. American Behavioral Scientist, 64, 19-54. [PDF] Hayes, A. F. (2018). Moderate, partial, conditional and moderate mediation: quantification, inference and interpretation. Communication monographs, 85, 4-40. [PDF] Hayes, A. 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Beyond Baron and Kenny: Analysis of statistical mediation in the new millennium. Communication monographs, 76, 408-420. [PDF] This page contains answers to various frequently asked questions about PROCESS. WARNING: MacOS blocks access to files that make it appear that files are missing and affects the operation of SPSS and the ability to install PROCESS. Here is a video that might be helpful in working around this issue. If you recently installed SPSS27 and receive a string of errors when you try to run PROCESS, see here. Question: Is there documentation or user manual for PROCESS? Answer: The latest version of PROCESS (version 3) is documented in Appendix A and B of the second edition of Introduction to Mediation, Moderation and Analysis of Conditional Processes. Many questions that no doubt will have about using the PROCEDURE and what it is able to do and is not able to do can be found in the documentation as well as throughout the book. Documentation is not available electronically. Question: can I get PROCESS at work? Answer: The documentation answers this question, and many examples can be found in the book. PROCESS for SPSS and SAS can run as a syntax-based macro, and SPSS users have the option to install a drop-down menu by installing the custom dialog file. There is a document in the zip archive that contains the PROCESS files that describes how to install custom dialog files. For instructions on activating syntax-based, see the documentation. Question: download PROCESS? Answer: Choose the download tab from processmacro.org and click the red download button on the page that opens. PROCESS and its associated files are stored as a zip archive. If your browser doesn't automatically download the file as a zip archive, change your browser settings, try a different browser, or check with a local technical support person for support. PROCESS is distributed only through processmacro.org. Files will not be sent by email. Other than the advice I offer here, I can't help troubleshooting the process. Question: Other than by reading your documentation or book, are there any additional places I can go to learn about using PROCESS? Answer: Process workshops are scheduled in different places around the world at different times and the Global School of Empirical Research Methods in Europe. I travel frequently, on an invitation basis, to offer two- and three-day workshops at different universities. During the coronavirus pandemic, these workshops are only available in online format. See Workshops tabs above. If you are interested in a private online workshop for your research organization or group, send an email workshop@processmacro.org. Here are some videos that give me the two most popular courses: Course I Course 2 Question: Do you offer workshops online? Answer: Yes. Online workshops tab above. I can also run an online workshop for a group at your institution. Send an email to workshop@processmacro.org and we can discuss your options, calendar and fees. Here are some videos that give me the two most popular courses: Course I Course 2 Question: What is the difference between version 2 and 3? Answer: There are many differences. For example, you should no longer list the variables in the next vars= model, and the co-variations are specified using the cov= option instead of listing them in the now outdated vars= specification. In version 3, moderators in v3). PROCESS v3 also allows independent multicategorical variables and moderators in all models, and in version 3 you can schedule your own model rather than rely on models that come preprogrammed in the process. Some of the preprogrammed models in version 3, but the new models (for example, moderate serial mediation) have been added to version 3. The template models for version 3 are different. Question: Where are the template models for PROCESS v3? Answer: Templates for the numbered models in PROCESS v3 are available in Appendix A of the 2nd edition, Moderation and Conditional Process Analysis. They are not in electronic form, with the exception of the electronic edition of the book. The templates for version 3 are not the same as for the version version Version 3 allows you to create your own model by bypassing the system of model numbers. For instructions on how to do this, see Appendix B to the second edition of the book. Mediation, Moderation, and Conditional Process Analysis, but not all the templates for the v3 process are there in Appendix A. Where can I find them? Answer: Each preprogrammed model that PROCESS will estimate has a template in Appendix A to the second edition. None of them are missing. Many model numbers

from PROCESS version 2 have been withdrawn with the release of THE PROCESS 3 version. Because many people refer to process models of their numbers, I didn't want to change any of the model numbers when we released version 3 and the second edition of the book. So these model numbers that PROCESS v2 could estimate that version 3 can no longer be used. That explains skipping the pattern numbers as you look through the pages of Appendix A in the second edition of the book. Question: Is the process available for any program other than SPSS, SAS, and R? Answer: At the moment, PROCESS is only available for SPSS, SAS and R. There are some ambitious people who have written Mplus or state code for some of the preprogrammed models. You can find those online, but they are outdated, as they do not have any of the new features of version 3 of the PROCESS. I do not attest to or approve the guality of these translations or their accuracy. Question: I see that the process changes with time. Where can I find out what changes were made to PROCESS when a new version is released? Answer: PROCESS is always a work in progress. Over time, features are added, bugs are fixed, and improvements are made. Annexes A and B of the second edition of Introduction to Mediation, Moderation and Analysis of Conditional Processes describe what PROCESS can do, and in the zip archive containing PROCES, fill in an addendum to the documentation that documents the new features added from the book printing. Here is a direct link to this addendum. I also document the changes that are made on this page, where you will also find a form you can use to request new changes or features or to report what you think might be a bug in your programming. Question: Can I email you questions I have about using the process? Answer: Questions about PROCES should be directed to afhaves@processmacro.org. I usually won't answer questions about the process sent to my account to osu.edu, and I don't do consulting through or answer all questions sent from PROCESS users through afhaves@processmacro.org. although I do not answer whether the guestion is answered in documentation, introduction to mediation, moderation, and analysis of the conditional process, or on this fag page. Thus, if You don't respond to yourself to or within a week or two, there is a possibility that the answer to your guestion may be available in one of these sources, although sometimes it takes longer. Anyway, please be patient. I get a lot of email about PROCESS and my work. It may also be that the email server is rejecting email from processmacro.org and so i don't get my response. For some reason, German email systems seem to reject my answers more often than systems in other countries. If you are going to email me a guestion and want to increase the likelihood of an answer, please be very specific and tell me which version of the process work for repeated sueficims designs? or Can PROCESS analyze panel date? are impossible to answer without more details about what you are doing, because the terms used (repeated measures or panel data) are too vague to convey useful information about the design, question or intentional analysis. Usually, it's helpful to send me a diagram of the model you're estimating (or mention the model number) of the entire PROCESS output (not just small sections) and the PROCESS command you ran. It's difficult for me to diagnose problems you might have if you use the custom dialog box. For a discussion about the benefits of using syntax rather than a point-and-click interface when analyzing data, see my Using SPSS syntax document. With the exception of data files and the PROCESS syntax, all documents must be sent as PDF files. I will not open Word, PowerPoint, SPSS Output, or documents in any other format to reduce the likelihood of virus transmission. They rarely answer questions about interpreting the results. I have written entire books and journal articles related to the process and the methods it implements. These are good sources to consult. Question: I quote PROCES IN a manuscript or in a publication, Moderation and Conditional Process Analysis. Good academic practice is to quote something only if you have actually read it and are familiarity with its content. I do not recommend using the process without familiarity with what it does, described in the book. He might not do what you think he's doing. We have seen many cases of researchers reporting results from the outcome of the process that are incompatible with what the process actually is doing. These mistakes are easy to avoid by reading the documentation. Unfortunately, many people cite a white paper 2012 I wrote that you will find circulating online, which was posted in different places without my permission. I stopped circulating this work in and is now outdated and not a sensitive citation for PROCES because it corresponds to version 2. If you have this paper archived on the internet somewhere where is accessible to the public, you would do the world a service by removing it as its presence is causing confusion in many. I have seen people refer to the process procedure created by Preacher and Hayes (or use similar language), citing our 2004 or 2008 papers published in Behavior Research Methods. PROCES did NOT exist before 2012 as a reference for PROCES would not make sense. Introduction to mediation, moderation, and analysis of conditional processes is guoted only sensitively for PROCES. Question: Is there a way to get SPSS to load the process automatically when SPSS runs, so you don't have to do this manually every time I want to use the syntax version of PROCESS? Answer: You have two decent options. One approach for Windows users is to produce a script. that will automatically load and run every time you open SPSS. Once you've done this, you don't ever have to think about running the macro yourself. A document to guide Windows users can be found in the zip archive that contains the PROCESS files. Thank you to Jon Peck at IBM for this recommendation. See here. However, many users have had trouble getting this in SPSS 24. As using this script is not necessary to run PROCES, we recommend abandoning this option you have problems with getting it to work. The second option is to save PROCESS.sps to a specific location on your hard disk and then call it with an INSERT statement at the top of the SPSS program before using the macro. For example, in Windows, you might have the PROCESS macro saved to your computer in a folder called macros on drive c. In this case, at the top of the SPSS program, add INSERT FILE = 'c:\macros\process.sps'. When you do this, SPSS will first search for PROCESS in this location and run it before running anything else in your program. Note that none of these options install a dialog box in the SPSS menus. Question: I have a copy of the 2012 white paper on PROCES, but the process instructions provided they don't seem to work. What can I do? Answer: This white paper was made available by afhayes.com only very briefly in 2012, when a beta version of PROCESS was made available and before the launch of the first edition, Moderation and Analysis of Conditional Processes. We stopped circulating this work in 2013, but you will still find some versions of it being distributed (unauthorized) by different people around the world. Much of the information in this white paper about PROCESS is outdated and does not apply to process version 3, even though many still quote when using version 3. The syntax in that white paper will not work on version 3. Using PROCESS version 3 is is in the second edition of the book. If you want to use PROCESS, we recommend that you purchase the second edition of the book published in 2018. You can just throw that white paper, and we recommend that you don't circulate it to reduce confusion others will experience trying to apply the outdated syntax in this paper. You certainly shouldn't cite this paper to justify your use of the process. Question: I ran the PROCESS syntax in SPSS, but no dialog box appears anywhere. What did I do wrong? Answer: Running the PROCESS syntax does not produce a dialog box appears anywhere in SPSS. Only the custom dialog generator file, once installed correctly, will produce a dialog box that you can access under Analyze-> Regression. Installing the dialog box does not eliminate the need to run the PROCESS syntax file if you plan to run PROCESS in a different way than by clicking OK in the dialog box. Installing the PROCESS dialog menu item is not required to use PROCESS. Question: Do I install a custom dialog file? Answer: The answer to this question of SPSS you are using. The procedure remained fairly consistent until the launch of SPSS24, at which point the procedure for installing a dialog file changed. For instructions on how to install a custom dialog file in your version, see the instructions that come with the PROCESS files that you downloaded [here is a PDF] or the documentation of the version of SPSS you are using. Most users who follow these instructions can install the dialog box. A common problem Windows users have is not installing as an administrator, which is required to get write permission to change the inner operation of SPSS. You may still receive installation errors, which take many forms. Installing the PROCESS custom dialog file is not required to use PROCESS. You can always run PROCESS through the order syntax, as discussed in the second edition of Introduction to Mediation, Moderation, and Conditional Process Analysis. See the entire book, as well as the documentation in Appendix A for guidance. If anything provided to you here or in the files you have downloaded seems to solve your problem, contact your local technical support staff or IBM technical support, as your problems that users have with their software and various bugs in their programs and may have a solution for you. But make sure you try to install the latest version of PROCESS. Use the download tab above to download the latest If you can't install the dialog box, think of it as a nuisance. I offer the dialog box as a courtesy to those who are not familiar with the SPSS syntax. You do not need to use PROCESS. Many of the important and valuable features of are not available in the dialog box, but are available through the command syntax. Use this as an opportunity to update and expand your skills. There are many reasons why you should learn to communicate with SPSS through syntax, rather than relying on the graphical user interface. I offer eleven such reasons in my free-available Using SPSS: A Little Syntax Guide. The syntax is extensively documented in the 2nd edition of Introduction to Mediation, Moderation and Conditional Process Analysis and many examples are provided. With a copy of the book and documentation you will better understand what the process is to make and make it work for you. Researchers who take one of my workshops become comfortable using the process through the command syntax in about 5 minutes and feel better a result of being learned about talking to the PROCESS using the syntax system rather than the graphical user interface. Question: Do I know what model number to use? Answer: Preprogrammed numbered models in version 3 can be found in Appendix A for introduction into mediation, moderation and analysis of conditional processes, 2nd edition. Choose the model number that corresponds to the model you want to estimate. If you don't know which model you want to estimate. recommend that you consider the reasons why you conducted the study, the questions you tried to answer with the data, and/or the model that best corresponds to the theory or prediction you are testing. If you don't see a model that exactly matches what you want to estimate, try creating your own model. See Appendix B to the second edition of the guidance book. Question: Can you give me some examples of works published based on analyses done with PROCEDURE. Probably the best way to find examples is to look at works that include a citation to Introduction to Mediation, Moderation, and conditional process analysis. Click here for a list generated by Google Academic. Question: do I write about the results I find when using PROCESS? Answer: Do we recommend that you read the section of Chapter 14 of the second edition of Introduction to Mediation, Moderation, and the analysis of the conditional process titled I write about this? But don't expect much best practice advice. Good writing can't be distilled down to a dos list and don'ts (though there are certainly some), and I don't believe in homogenizing science communication. Question: Can the PROCEDURE use sampling weights? Answer: No, unless you consider equal weighting a use of sampling weights. Each case is weighted equally in all the analyses that PROCESS Perform. There is no alternative available in PROCESS Perform. process analysis)? Answer: Typical analysis, one or more effects in a model (such as an interception or a slope/weight for a variable) is estimated to vary randomly between higher-level units of measurement. PROCESS cannot mediate, moderate, or analyze multi-level analysis processes. But MLMED macro for SPSS can. To get a copy of MLMED, go to Nick Rockwood's MLMED page. MLMED and multi-level conditional process analysis is discussed in Hayes and Rockwood (2020, American Behavioral Scientist). Question: Can PROCESS estimate a pattern that includes the mutual causal link? Answer: I address some pretty unsophisticated, but easy to implement means of entertaining questions of causal order in the book. PROCESS cannot officially estimate a model that includes a latent variable with multiple indicators? Answer: For latent variable models, I recommend Mplus, because it has the ability to estimate latent variable patterns and parameters that are functions of model coefficients while producing bootstrap confidence intervals for these parameters, without having to jump. through all the circles many other covariance structure modeling programs require. If your latent variable is an average of indicators and available in your data as such, then technically it is not a latent variable; is observed. In this case, the process could be used. They describe the differences between PROCESS and SEM and a few reasons to use a SEM program, such as Mplus in Hayes, Montoya and Rockwood (2017), as well as Hayes and Rockwood (2020). Question: Can I use PROCESS to do a mediation analysis (or conditional process analysis) with cross-cutting data? Answer: There is a vocal minority that takes the position that you shouldn't or, even worse, can't do mediation analysis with cross-cutting data, and no doubt you'll meet a critic now and then who takes the roles of data analysis, research design, and theory in causal inference. My position on the role of data analysis in causal inference is discussed in books and journal articles I have written, and is more relaxed, empowering, and trusting the scientist's intelligence than the extreme manipulative position. See Introduction to Mediation, Moderation and Conditional Process Analysis (second edition, Chapters 1, 3 and 4) or Regression Analysis and Linear Models (Chapter 6). Other places to discuss this include Hayes and Rockwood (2017). The position I take - that inference is a product of our minds and not our math (or software --it has nothing to do with PROCESS. It's the position I would take, even if I didn't design or create the process as a data analytics tool. All that said, it's up to you. Your, to keep your brain adapted to the inferential load at hand and not to be lulled in complacency when interpreted output (from PROCES or elsewhere). A statistically significant indirect effect is by no means evidence of causation. Make your argument, if an argument is the best you can do given the nature of the research design, but do not exaggerate or convey overtrust in what your analysis tells you about the cause-effect. Question: My independent variable (X) or moderator (W, Z) is dichotomic. Can the PROCEDURE handle this? Answer: PROCESS has always allowed independent dichotomic variables and moderators. Because the math is the same for dichotomous X, W, and/or Z so it is for continuous variable(s) in the process command or menu for X, W, and/or Z. You do not have to use the multicategorical option with an independent dichotomic variable or moderators. A multicategorical variable has three or more categories. In earlier version 3, using the multi-catheter option with a dihotomic or moderator independent variable could, in some circumstances, produce incorrect output (see version history). Starting with version 3.3, PROCESS will not allow you to specify X, W, or Z as multicategorical when it is dichotomy. Note that you should not put a multicategorical variable in like X, W, or Z, without telling PROCESS that the variable is multicategorical by using the multicategorical option. This will generally produce nonsense output. Question: My M mediator is dichotomous/count/ordinal. Can the PROCEDURE handle this? Answer: PROCESS uses regression with the smallest ordinary squares (OLS) to estimate the variables on the left sides of the model equations, with the exception of the Y-result variable model, which can be estimated with logistic regression if it is dichotomic. If you wouldn't be comfortable using OLS regression to model one or more of your variables, you don't need to use PROCESS for your problem. PROCES WILL accept the ordinal number or mediator (but not a dichotomous one), but will use OLS regression to estimate the model coefficients. If this doesn't concern you, go ahead and use PROCES, but anticipate some criticism from some of our research consumers if you do so. Question: Result my Y dichotomous/ count/ordinal. Can the PROCEDURE handle this? Answer: PROCESS uses regression with the smallest ordinary squares (OLS) to estimate variables on the left sides of the model equations, unless the Y result variable is dichotomic, in which case the Y model is estimated by Logistics. Note that in version 3.1. See addendum to the documentation here. If you would not be comfortable using OLS regression to model and ordinal or count the variable Y result, you should not use PROCESS for your problem. The PROCESS will or ordinal results, but will use OLS regression to estimate the coefficients of the model. If this doesn't concern you, go ahead and use PROCES, but anticipate some criticism from some of our research consumers if you do so. Question: I want to estimate a mediation model with more than one X, but I can't find such a model? Answer: In all models that PROCESS can estimate, only one X is allowed. However, if the model does not include a component that allows the effect of X to be moderated (e.g. models 4, 6, 14, 80, 81), then you can use the trick discussed in section 4.5 of Introduction to Mediation, Moderation and Analysis of Conditional Processes to obtain PROCESS to estimate a mediation model with more than one X Question. : I want to estimate a moderation model with more than one X, but I can't find such a model in the PROCESS templates. can I use PROCESS for such a model? Answer: You can't. Although you may be tempted to try to process trick using other Xs, moderators, and their products as covariated in Model 1, not to do so. Although the model will be properly estimated (e.g. regression coefficients and regression constant), most of the production for conditional effects, the JN technique and data generation swill be incorrect. Algorithms that generate these output sections are not programmed to deal with such a problem. The closest thing you can do with PROCESS is to estimate and probe an interaction that involves a single X and up to two moderators of the effect of that single X (using models 2 and 3). Question: Can PROCESS estimate a model that includes series mediation and moderation (e.g. a combination of Model 6 and Model 8)? Answer: This can be done in THE PROCESS 3 version. Models 83-92 are moderate models of serial mediation, and you can schedule yours if none of the pre-programmed models match what you want to do. See Appendix A and B to the second edition of Introduction to Mediation, Moderation and Conditional Process Analysis. Question: I am interested in estimating a moderation model (model 1 process), but my independent variable X (or moderator) is definitely with more than two categories. Can I use PROCESS for this? Answer: PROCESS v3 allows focal predictor or moderator to be multicategorical for any process model you can estimate. PROCESS will automate the construction of indicator, sequential, Helmert, or effect codes, or you can schedule your own codes. I published a tutorial on this topic that you might find help to make analysis and process output. This topic is also discussed in Chapter 10 of the 2nd edition of Introduction to Mediation. Moderation, and Conditional Process Analysis. Question: Can PROCESS estimate a moderate model (such as models of process Analysis), and conditional Process Analysis. Question: Can PROCESS v3 allows the independent multi-categorising or moderator variable? Answer: PROCESS v3 allows the independent multi-categorising or moderator variable? estimates, as well as in any custom program model. See the second edition of Introduction to Mediation, Moderation and Conditional Process Analysis. There must be something wrong with your code. Answer: There is nothing wrong with the code. After being discussed in Introduction to Mediation, Moderation, and Conditional Process Analysis, bootstrap sampling is a random resampling is a random resampling process. The end points of a confidence interval are determined by the percentiles in the distribution of bootstrap estimates of indirect effect. If this bothers you, use the PROCEDURE with a custom seed for the random number generator and use this seed every time you do the analysis. See Appendix A for instructions. Alternatively, set the number of bootstrap samples to a very large number to minimize sampling error in estimating the final points of the confidence interval. In process version 2, the corrected trust ranges of bootstrap bias was default, with the percentile method available as an option. In version 3, So even if you use the same seed, you'll find discrepancies in the endpoints of the output confidence intervals between versions 2 and version 3. See the NOTES AND Output Warnings section for information about the method of building the trust intervals for bootstrap. Question: I was told it is wrong to control for a mediator when estimating the effect of X on Y. Is that correct? Answer: If you are only interested in the total effect of X on Y, then you would not want to control for an M mediator when estimating Y from X. If you control for M, then you estimate only the direct effect of X, which means that the x effect estimation does not include the X effect component that works through the mediator. But when you do a mediation analysis, the interest is the indirect effect of X and probably the direct effect. To estimate this, you need to include mediation and whether the total effect is significant or not irrelevant to determine whether you can or should perform a mediation analysis to examine the indirect effect of X on Y. For a discussion about these points, see Introduction to Mediation, moderation and analysis of conditional processes Chapter 15 of the Regression Analysis and Linear Models. Question: I seem to have evidence of an indirect effect of X on Y through a proposed mediator, but is not evidence of an association between X and Y. Is that possible, but is probably much more common than people realize. Modern thinking about mediation analysis does not require evidence of a simple association between X and Y to estimate and test hypotheses about indirect effects. See Hayes, A. F. (2009). Beyond Baron and Kenny: Analysis of statistical mediation in the new millennium. Communication monographs, 76, 408-420. [PDF] or Hayes, A. F., & amp; Rockwood, N. J. (2017). Analysis of regression mediation and moderation in clinical research: Observations, recommendations and implementation. Behavioral research and therapy, 98, 39-57. [PDF]. See also Chapter 15 darlington and Hayes (2017). Question: When I estimate a model using PROCESS and compare with what I get just using SPSS or sas regression. procedure, I get different results. There must be something wrong with PROCESs. Answer: There is nothing wrong with PROCESs. When the same output options, the results will be the same as what you get with the SPSS or SAS regression procedures. There are many sources of discrepancies you may notice when there are discrepancies, and all of them are generated by the user, not the process. The simplest sources involve requesting options in PROCESS that SPSS or SAS will not make by itself. A common one is the request for standard heteroscedastity-consistent errors in PROCES, which are different from standard OLS errors. SPSS and SAS will not generate these standard errors, but the process will (like my RLM and HCREG macros), but only if you ask them. When you do this, standard errors, t values, p values, and confidence intervals are different from those produced by the internal regression procedures of SPSS and SAS, so they should be. Most other sources of discrepancies are due to the user does not recognize the existence of missing data. For example, if you refer to the center or univariately standardization (i.e., one variable at a time) before performing an analysis, you will end up with variables in the analysis that are no longer centered or standardized after the missing data are kicked out of the process or SPSS or SAS routine regression. I do not recommend manually calculating centering or standardization calculations. If you do this, do them with a high degree of accuracy (three or four decimal places, generally not enough) and only after removing data from missing cases on variables that will end up in the analysis. In a PROCESS will be centered on you if you ask it to do so and will do it correctly (see documentation. Read about problems with manual average and standardization, as well as my debunking of the average centering myth the second edition of Introduction to Mediation, Moderation analysis, another common mistake I see users make is estimating the X effect on M and the M effect on Y control for X in separate regressions without recognizing the existence of missing data. Suppose, for example, that some cases are missing on Y. In such a situation, the estimation of the Effect of X on M will be based on more data than PROCESS uses, because PROCESS would eliminate cases that are missing on Y before estimating the effect of X on M. Although we can debate the merits and mistakes of deletion by list, it is generally not good practice to piece together a mediation analysis using different subsets of data to estimate the different parts of the model. Before you ask for advice or bring a bug into the process in my attention, please check the residual degrees of freedom for the output pattern produced by PROCES (this appears as df2 in the output process model summary section) and compare it with the residual degrees of freedom from SPSS or routine exit regression sass. If there is a difference between them, you have missing data you are not properly recognizing somewhere. If there is no difference, then the source of discrepancy is something else you have done differently compared to what PROCESS does. Question: Can the process do some kind of mediation analysis within the subject described in Judd, Kenny, and McClelland (2001). Psychological Methods)? Answer: See Montoya, A. K., & amp; Hayes, A. F. (2017). Analysis of statistical mediation with two conditions within the participants: An analytical framework of the track. Psychological methods. [PDF]. In this paper we will discuss the estimation of indirect effect and inference using bootstrap and Monte Carlo confidence intervals. This paper also discusses parallel versions and multiple mediating series of this model not initially addressed by Judd et al. This method has been implemented in PROCESS v2.16, but is not available in version 3. MEMORE is a macro for SPSS and SAS that Amanda Montoya designed for this type of analysis, which is a little easier to use than the process. Since MEMORE exists now, I do not intend to implement this type of analysis in PROCEDURE v3. Question: In my mediation analysis examining the direct and indirect effects of X on Y through M, the path from X to M (or the path from M) to Y) is not statistically significant. That means there is no way that M could mediate the relationship between X and Y. According to baron and kenny (1986), it can't. Should I bother estimating the indirect effect in this case? Answer: The criteria for determining the approach mediated by Baron and Kenny (1986) is historically important, but not consistent with modern practice Advice. These days, we do not rely on statistics the criteria described in Baron and Kenny (1986) for individual paths in a mediation model to assess whether an M variable functions as a mediator of the relationship between X and Y. You should estimate the indirect effect. See Hayes (2009) for a brief discussion [PDF], as well as Hayes and Rockwood (2017) [PDF], Hayes (2017). Yzerbyt, Muller, Bataler, & amp; Judd (2018, Journal of Personality and Social Psychology) recently argued that we should go back to the days of the past, where we focused on hypothesis tests for each of the paths using the common meaning test. I disagree with this and consider this a step backwards, both in time and progress. The potential Type I error is actually higher when using the common meaning test than when using a bootstrap percentile confidence interval, unless the type of clean conditions they simulated. We agree that the signs of the components (pathways a and b) matter, since the sign of indirect effect is determined by the signs of the components. See the 2013 or 2018 editions of Introduction to Mediation, Moderation and Conditional Process Analysis for my discussion about this point. Question: I am interested in mediated moderation rather than moderate mediation. Do you have a macro for that? Answer: So I discuss in my opinion, mediated moderation is rarely very interesting or materially interpretable. The same model can be conceptualized in terms of moderate mediation, and the results are usually more significant when you change your interpretive focus from the indirect effects. We recommend avoiding the use of the mediated moderation term or any attempt to bite support for such a process. See Hayes (2018). Although PROCESS can be used to build the indirect effect of a product in a mediated moderation index, and the moderation is much more interesting and materially significant. Question: I do not see a moderate mediation index in the output process. do I realize if an indirect effect is a linear function of a single moderator. In some models with a continuous moderator (for example, models 58, 59), the indirect effect is a nonlinear function of the moderator, so no moderate mediation index is provided. See a discussion in Hayes (2015, Multivariate Behavioral Research) or Chapter 14 of the second edition, and analysis of conditional processes. If the model has more than one moderator, an indirect effect can be a function of two moderators simultaneously, in which case no index is provided. For a discussion about different moderate mediation tests in models with multiple moderators, see Hayes (2018, Communication Monographs) and Hayes and Rockwood (2020, American Behavioral Scientist). Question: can I say whether I can request full or partial mediation from the end of the trial? Answer: These are outdated concepts with little room in the analysis of modern mediation. They are based on the size and significance of the total and direct effects. All this information is in output, but we recommend that you avoid using these terms or interpreting the analysis based on the significance of the total and direct effects and whether the X effect becomes insignificant after adding the mediator to the model. For a chat, see Hayes (2018) or Hayes and Rockwood (2017), which you can download from here. Question: I have missing data. PROCESS can manage the imputed data or implement other forms of analysis or missing data procedures, would it be FIML? Answer: PROCESS requires complete data. It has no internal procedure to deal with missing data other than deletion from the list. PROCESS does not integrate with multiple imputation routines embedded in SPSS or SAS. If the data file you are analyzing is labeled as derived from the multiple imputation routine, it will not analyze it and is likely to result in an error (The problem in SPSS is that the MATRIX language does not honor split file names). Before using PROCESS, impute anything you want, but PROCESS expects complete data and, if it does not comply, complete data will be made before analyzing by throwing missing cases on any of the variables in the model. You can read about bootstrap with multiple imputation in mediation analysis here. Question: The Johnson-Neyman technique is neat, but the PROCEDURE does not produce meaningful regions in model 1, when X is multicategorical. Why not? Answer: Mathematics for deriving meaningful regions are guite complicated and even impossible with more than a few groups. So the PROCEDURE does not produce JN results when X is a multicategorical and specified as such, using the mcx option. But check out a macro written by Amanda Montoya called OGS, which will find border points for regions of significance using an iterative approach rather than a purely analytical one. OGRS is illustrated in a Hayes and Montoya (2017). Question: Why does the process have an implementation of the Johnson-Neyman method for regions of indirect effect significance that is implemented in MODMED? Answer: Derivatives for JN regions of importance for a conditional indirect effect discussed in Preacher, Rucker, and (2007, (2007, Behavioural research) assumes that the distribution by sampling of the conditional indirect effect is normal. This is a flawed assumption, and the reason for bootstrap or another method is preferred for inference about an indirect effect. For this reason, this method is not implemented in PROCES, and I do not recommend the use of MODMED for this purpose. MODMED is now obsolete, given that the process can do everything MODMED can do and much more (except for this!). Question: Why isn't the process version 3 producing conditional effects of a focal predictor or showing Johnson-Neyman output when I ask for it? Answer: In version 3, PROCESS produces information relevant to probing an interaction only when the corresponding interaction has a p value of 0.10 or less. This is the default value, but can be changed to a higher or lower value using the intprobe option. See the documentation. Question: Will the sas version of the PROCESS recognize a class command to deal with categorical variables? Answer: The only options that the PROCEDURE recognizes are in the documentation for PROCESS. See Appendix A and B to the second edition of Introduction to Mediation, Moderation and Conditional Process Analysis. Use the mcx, mcw, or mcz options to specify X, W, or Z as multicategorical. Question: An editor/reviewer insists I use a structural equation modeling program instead of PROCES. Respond? Answer: I address some of the differences between PROCESS and SEM in Introduction to Mediation, Moderation and Conditional Process Analysis and also in Hayes, Montoya and Rockwood (2017) and Hayes and Rockwood (2020). There are advantages to using SEM, but some disadvantages as well. The hard-line position that the reviewer or editor takes is probably not consistent with his or her own behavior. Any OLS regression analysis is subject to the deficiencies discussed in Chapter 5 and Haves. Montova and Rockwood (2017), including prejudices in estimating effects due to ignoring measurement errors. However, no doubt your critics have probably used the ols of regression and have probably published their own work using it, with all its flaws. And the publisher probably accepted works with regression analyses in them. Thus, to categorically reject the legitimacy of mediation, moderation, or analysis of the conditional process, because a SEM program has not been used is, at a minimum, hypocritical, if not also too ideological. You will find some who say it is better to use a SEM program that is to use PROCESS. I express my position on this in Hayes, Montoya and Rockwood (2017) and Hayes and Rockwood (2020). Question: I was told I'm going to to mean center or standardized focal predictor and moderator before estimating an interaction. Is that true? Answer: You can mean center if you want to, but this is not necessary. If you choose to do that, I. I. using the center option in PROCESS, instead of manually centering. For a discussion of what centering means is a choice you can make rather than a requirement, the dangers of manual centering and standardization, as well as some other myths about centering and standardization. See Introduction to Mediation. Moderation. and Analysis of Conditional Processes. Question: Do I tell the process which group I want to use as a reference category when I use indicator encoding? Answer: For the most part, you can't. After discussing in the documentation, PROCESS treats the group with the lowest numeric number in multi-categorise discating groups as a reference. If you want another group to be a reference, recode the multicategorical variable so that the reference group you want has the smallest numeric code before you run PROCESS. Alternatively, schedule your own code set using the xcatcode, or zcatcode options discussed in Appendix A to mediate, moderate, and analyze conditional processes. Question: I think X's effect on Y is moderated by two variables. between Model 2 and Model 3 Answer: Both Model 3 allow the effect of X to depend on both W and Z. In addition, for both models, the X effect on Y may be statistically significant only for some combinations of W and Z. But there is an important constraint embedded in Model 2 that does not exist in Model 3. You would use Model 2 if you want (or predicts or assumes) to moderate the X-effect on Y of W to be independent of Z. I mean, Model 2 would be appropriate if you want the amount with which the X effect on Y to change as the W changes are the same in Z's values., then model 3 is appropriate. Z's moderation of X's effect on Y is moderating X's and X's and X' of the second edition of Introduction to Mediation, Moderation and Conditional Process Analysis. This is also discussed in the second online course. Question: The model I want to estimate has three moderators. Which model in PROCESS is appropriate? Answer: PROCESS cannot estimate any model with more than two effect moderators of a single variable X. If you want to estimate a moderation model or conditional process with three or more moderators, PROCESS cannot be used. Question: My advisor told me that I should use baron and Kenny's strategy to evaluate mediation. But my reading of literature that this is not recommended these days. What am I supposed to do? Answer: You have relied on your guidance and support advisor during your Now return the favor. All the more stubborn among advisers are open to new ideas, and many are too busy to be informed of recent developments. Give him a copy of the relevant literature or a copy of Introduction to Mediation, Moderation and Analysis of Conditional Processes and present your case. See also Chapter 15 of Darlington and Hayes (2017). Question: Will the process produce standardized coefficients? Answer: The regression/path coefficients that the process produces are in non-standard form. PROCESS v3.2 and later has an option available through the command syntax for generating standardized regression coefficients for mediation-only models. See the addendum to the documentation that came with version 3. Note that if X is a dihotomic variable, the standardized regression coefficients for X will be in a partially standardized form. See the 2nd edition of Introduction to Mediation, Moderation and Analysis of Conditional Processes for a Discussion of Partially and Fully Standardized Regression Coefficients. In any version of PROCES, you can standardize the variables first before using the PROCESS, and this will generate standardized coefficients. However, the confident bootstrap ranges you get from PROCES should not be interpreted as confidence intervals for standardized effects, because that is not what they are. If you want an appropriate confidence interval for a standardized indirect effect, use the effsize or stand options. See the documentation. Be very careful when manually standardized variables. PROCESS will remove cases from data by using listing mode. Make sure that before you standardize, discard all cases of the data that PROCESS will throw away due to lack of data. If you do not do this first, then the variables you give to the process after manual standardized variables, and the regression coefficients that the process generates will not be in standardized form. For a discussion, see the 2nd edition of Introduction to Mediation, Moderation and Conditional Process Analysis. Question: I have no theoretical basis to believe that there is a direct effect of X. Is it possible to establish the direct effect in a multiple serial mediator model, can I limit some paths to zero, would it be from one of the mediators to the Y? Answer: PROCESS version 3 allows you to impose some zero constraints in a model, it would be on a direct effect. See Appendix B to the second edition and Conditional Process Analysis, But do it at your own risk. See my position in this in Chapter 15 of Darlington and Haves (2017). Question: Can PROCESS estimate the model of inter-interdependence actor-partner extended to (APIMeM), which is discussed in Leadingermann, Macho, and Kenny (2011)? Answer: Kind of, but the PROCESS isn't really designed to do it. The problem is that APIMeM requires two Xs, at least two Ms, and two Ys. PROCESS allows you to specify only one X and one Y in a PROCESS, but it takes four-fold running process. Here is a document that discusses. But you will find that MEDYAD, a new macro available for SPSS and SAS designed for mediation analysis with dyadic data, is a much better tool for APIMeM. You can find MEDYAD here, along with a paper describing it. Question: I get an error message in v3 that reads:>Error # 12410>Source operating non-symmetric for EVAL.>Execution of this command stops.>Error encountered in source line # 9224Answer: Updating to a newer version could make this disappear. But I've seen this appear on some newer versions too. It seems that sometimes occur, depending on the data, when using the center option. I found that disabling the centering option in the process often makes the error go away. Because centering is not necessary to estimate or interpret any model that PROCESS will estimate, this seems to be the easiest solution to the problem at the moment. I'm investigating what I do in future versions to remove the code section that sometimes generates this error. Question: I get an error message in PROCEDURE v3 that reads:>Error # 12306>The ark for the EXP function is too large and caused the overtaking. The>maximum is about 709.78Answer: This error may occur in some older versions of PROCES when Y is dichotom. This was set in version 3.2.01, uploaded to processmacro.org on December 27, 2018. If you are using a downloaded version before this error, update to the latest version and the problem should go away. Question: I get an error message in PROCEDURE v3 that reads: >Warning # 206 in column 3. Text: \>An invalid character was found in an order. >Warning # 206 in column 4. Text: \>An invalid character was found in an order. 206 in column 7. Text: \>An invalid character was found in an order. >Warning #208 in column 35. Text: +>A text string is not correctly enclosed in guotation marks on the command >line. Literals cannot be continued over command lines without using > the continuation symbol +. >Warning # 226>The input string is longer than the maximum allowed, 32767, and will be>cut. Was the final guote from a text string omitted?>Warning # 209>A cropping error while writing to the command log file. Check>ti before using it as an entry in Statistics SPSS. >Warning # 207 in column 2. Text: calculate hasw=0. calculate hasz=0. calculate inok=0. calculate inok=0. calculate nm1vls=0. nm1vls=0. nm1vls=0. nm1vls=0. calculate focpred4={}. intprint calculate graphixs={WITH, outnames(1,i), BY}. calculate focpred4={}. intprint calculate graphixs={WITH, outnames(1,i), BY}. calculate focpred4={}. was not a guotation mark or apostrophe. Answer: This error occurred after the release of SPSS27 and affects both version 3.5 and earlier versions of PROCESS. It appears to appear for some users of version 27 of SPSS, but not others. I haven't been able to replicate in on SPSS27 on my Windows machine; PROCES works well on my version of SPSS 27. Because it appeared suddenly for some users after installing SPSS 27, even if the process, this tells me this has nothing to do with PROCESS and so there is nothing I can do to help you. Contact IBM technical support for assistance. They will probably blame me for the problem, but in the past, new versions of SPSS that fixes bugs in a new version. Note that the repeated instances that appear in the last warning is a representation of the characters of a line stream in the code. never actually appears in the code. So it seems to me that the SPSS code is misinterpreted by some SPSS27 installations and operating systems. Question: I get an error message in PROCESS v3 that reads: ERROR: You specified an M variable in a model that you are not using. In this version of PROCESS, the moderators are W and Z in models 1, 2 and 3. Answer: Either use the version, rely on outdated version 2 templates when you configure the model. Many of the 2 template versions (such as you might find being distributed online through a source other than processmacro.org. Older versions that you will find online will have a copyright date of 2013) are not the same as version 3 templates. Version 3 templates are only available in the 2nd edition of Introduction to Mediation, Moderation, and Conditional Process Analysis. They are not available electronically. Version 2 syntax will not work in version 3. Question: can I get measures to match the modeling program? Answer: PROCESS is not a structural equation modeling program. It does not produce matching measures for the entire model. With the exception of models 1, 2 and 3, the multiple correlations that you see in the PROCESS output for each model equation are not measures of fit the entire model and should not be reported as such. For information about some of the differences between what PROCESS does and what a structural equation modeling program does, see Hayes, Montoya, & amp; Rockwood Rockwood (2020). Question: Why was kappa-squared removed from PROCES? Answer: Wer and Fan (2015, Psychological Methods) showed that the drift of the maximum possible indirect effect described in the article that introduced kappa-squared (Preacher and Kelley, 2011, Psychological Methods) contains a mathematical error. As calculations in Preacher and Kelley (2011) were used to kappa-squared code in the process, seemed prudent to remove kappa-squared from the process until this issue is fixed. Some have asked me then can I get kappa-squared? The answer is You shouldn't use kappa-square, so let it be debatable. In version 3, we also disabled the production of the ratio between indirect effect, the ratio of indirect effect to direct effect and the R-square dismay described by Fairchild et al. For an explanation of why, see the 2nd edition of introduction to mediation, moderation, and analysis of conditional processes. Question: Is it possible to get bootstrap trust intervals for regression coefficients for all models generated by PROCES are based on the OLS theory. But you can get bootstrap confidence intervals for regression coefficients using the modelbt option. They will appear at the bottom of the exit. In addition, you can build a confident bootstrap range for anything that can be built as a function of regression coefficients using the save option (such as conditional effects or simple slopes, as well as many other statistics that you could invent for an inferential problem). See the documentation in the 2nd edition of Introduction to Mediation, Moderation and Conditional Process Analysis. Question: Does the PROCEDURE produce the proportion of the X effect that is mediated as a measure of effect size for the indirect effect? Answer: PROCESS v2 produced the ratio of the indirect effect of X, as well as a bootstrap confidence interval. I never liked this measure, which is not a proportion because it is not tied between 0 and 1 as a proportion is (it may be negative or greater than 1), but I programmed it in version 2 anyway. I decided to discontinue it in version 3, because I strongly feel that you really shouldn't use this as a measure of the size of the effect for an indirect effect. For a discussion of why, see section 4.3 in Introduction to Mediation, Moderation, and Conditional Process Analysis. Question: Are bootstrap intervals reliable in the process of output products using percentile, corrected bias, or corre

version 3. The PROCEDURE did not corrected and accelerated bias (BCa) bootstrap confidence intervals. If you report confidence intervals from PROCES using the BCa notation or using the corrected and accelerated bias term, you will be misleading your audience about what you've done. The trusted ranges of bootstrap corrected by Bias will be available again in a future version of PROCESS. Question: Do I first have to establish that X's effect on Y is mediated by an M variable before testing whether X's indirect effect on Y to M is moderate? Answer: I heard this said, and I couldn't disagree more. See page 426 of Introduction to Mediation, Moderation, and Conditional Process Analysis (2nd edition), if they say that proof of mediation of x-effect on Y through a mediator is not necessary to test (or even ask the question) whether a minimer whether a mechanism is moderate, you will end up losing a lot of interesting and potentially important findings. Indeed, some of the most interesting and important findings. can I report this? Answer: Most of the time, suspected bugs at all, but it may seem so because of a misunderstanding of what PROCES does, to use it, or a lack of familiarity with documentation. But, as in all programs, real bugs can exist in the process, and when they are found they are finally fixed. Known bugs and fixes are listed on the version history page, where you will also find a form you can use to report a suspected error or recommend a change or a new feature. To make sure you have the most error-free, always use the latest version of PROCESS. Question: Where did you learn to schedule macros? Answer: I'm self-taught. I learned to program first in the base on a Commodore VIC-20 my father bought me in high school in 1980. My first publication was a computer program published in COMPUTE! magazine when I was 14, and for a short time in high school I had a small software company I operated with a friend of mine who produced games and educational programs for Commodore machines. Once you have teearned the

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