A Truly Person-Centered Analysis of Clinical Data

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Abstract

In a 2013 study conducted at the University of Washington, researchers sought to link modern clinical practices with traditional scientific processes. They recruited participants to complete daily diaries with the purpose of finding what made them the most stressed by using Cognitive Affective Processing System (CAPS) as a theoretical framework. CAPS is a theory of personality proposed in 1995, and it suggests that to best predict behavior other things have to be taken into account. In the present study we re-analyze this data using Observation Oriented Modeling (OOM) rather than Hierarchical Linear Modeling (HLM). Triggers of stress were found for most participants and OOM proved to be an outstanding statistical analysis tool for use in clinical and counseling settings. Intuitive and straightforward in nature, OOM would be a great addition to any psychological practitioner who wishes to reintroduce research into their practice.

A Truly Person-Centered Analysis of Clinical Data

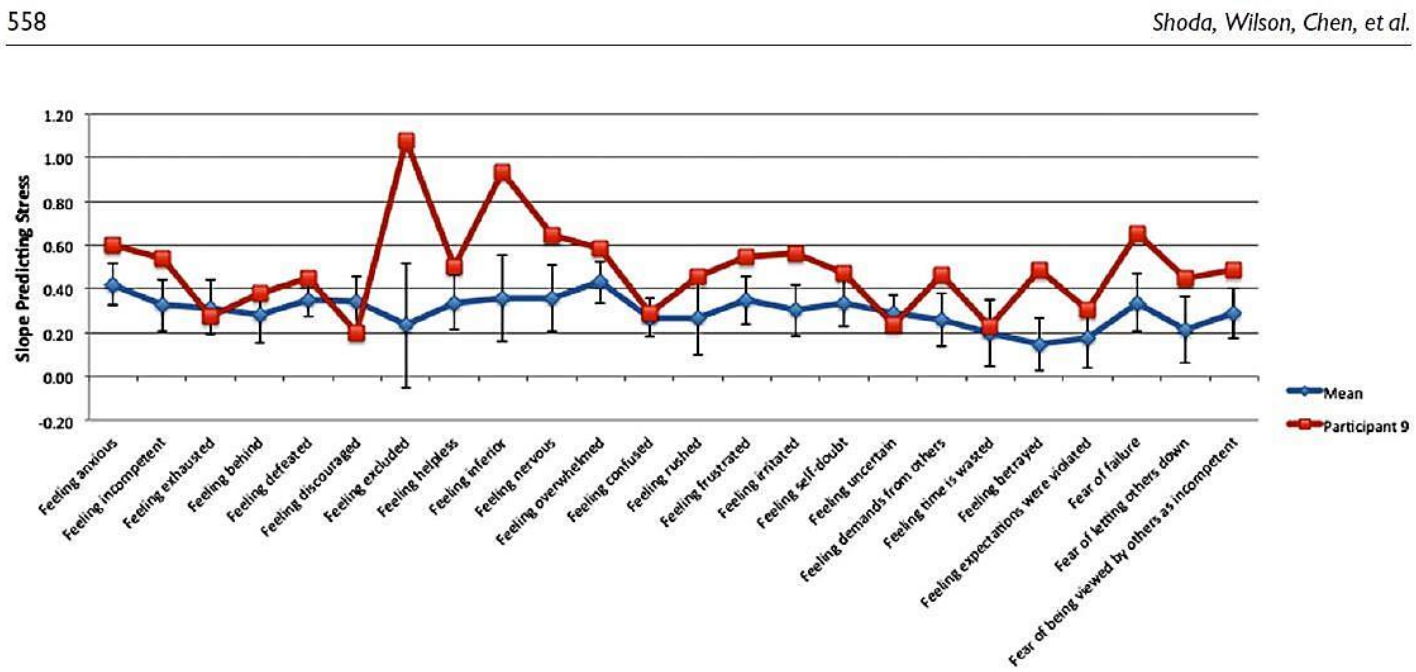
From fingerprints to personality, if there is one thing that always holds true for humans is that not one person is like another. We are unique in many ways, and even though as a species we have many traits in common, the amount of variability is undeniable. Magazines like Forbes, Time, and National Geographic have published articles that say that in years to come we will look more and more like one another due to globalization and the mixing of races. Even then there will be differences that remain within us. Traits like preferences, temperament, and overall personality. This is why it makes no sense to treat one clinical patient with the same intervention as any other patient. Some believe that we are alike enough that certain variability can just be averaged out allowing for the same treatment to be applied to all. On the other hand, some researchers such as Shoda, Wilson, Chen, Gilmore, and Smith (2013) believe that "…variability, rather than "noise" to be averaged out, contain[s] key information about an individual's functioning that could be fruitfully harnessed into therapeutic processes."

In their 2012 study, Shoda et al. sought to connect clinical assessment research with cognitive behavioral interventions using CAPS theory. CAPS stands for Cognitive Affective Processing System (Mischel & Shoda, 1995) and was proposed to account for variability in a person's behavior across situations and consistency of behavior across time. CAPS theory posits that in order to best predict human behavior, it is necessary to understand the person, the situation and the interaction of the two, as perceived by the person. Shoda et al. applied this theory in his study by collecting diary data from participants. A sample of 13 non-clinical participants were recruited and required to record their daily stress on a diary. Stress levels were reported on a 10-point scale. In addition to reporting overall stress for each day, participants were required to rate, on a 10-point scale, 24 psychological features of stressful situations every

day (see full list on Appendix A). The amount of days completed by each participant varied between 51 and 71 days.

The information gathered was analyzed using Hierarchical Linear Modeling (HLM). This resulted in a set of slope coefficients that represented the change in self-reported stress of each participant as a function of a given psychological feature from the list of 24. Shoda et al. were looking for consistent co-variation between, one or more of, the psychological features and the level of stress. In this way triggers of stress would be distinguished and a tailored intervention plan can be achieved for each participant or patient. **Figure 1** below shows a featured image from the Shoda et al. paper. In this image the researchers highlight participant #9 and what seemed to be her obvious triggers of stress: feeling excluded and feeling inferior.

Figure 1: Feature Image in Shoda et al. (2013)



The use of HLM allows the researcher to take large amounts of data and condense them into slope coefficients and graphs such as the ones sown in **Figure 1**. This condensed data makes I easier for the clinician to make an assessment and devise an intervention plan. The goal of his

study was to help close the science-practice gap in psychology by reintroducing research into a clinical setting. But what if HLM is not the best statistical analysis tool to use in this scenario? This question leads us to the present study. We requested the data from the Shoda et al. study with the interest of re-analyzing it using Observation Oriented Modeling (OOM).

Methods:

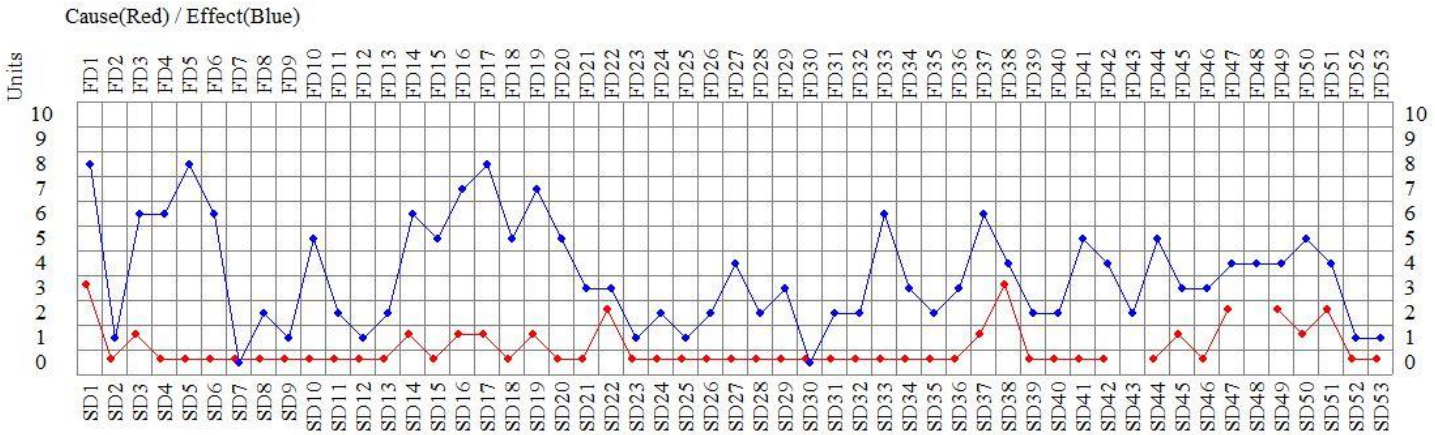
Given that we were only re-analyzing their data; our participants were the same (13 non-clinical participants who completed daily diaries). Instead of using HLM we used OOM to analyze the data. In OOM there are no aggregate statistics, it is only a way to see what connections are really present in the data. This program has a numerical index called Percent Correct Classification (PCC). The PCC indicates how similarly two variables changed over time. In this case, the two variables were overall stress compared to each of the 24 psychological features of stressful situations. The more similarly two variables change over time, the higher the PCC index. As an arbitrary cut-off point we decided that a score of 60 on the PCC index would indicate a potential trigger of stress. However, not only did a psychological feature have to be at least 60% correctly classified, but the graph of said psychological feature had to pass the eye test (i.e. the graph looked very similar to the graph for overall stress).

Results:

After applying these criteria to all the participants' data, we found potential triggers for almost all of the participants. The only exception was participant #6 who did not have any PCC number above 60. The two most common triggers of stress among the 13 participants were Feeling Overwhelmed and Feeling Discouraged. We were curious to see how closely our results for participant #9 matched with the featured image (**Figure 1**) from the Shoda et al. paper. **Figure2** below is the OOM profile plot for participant #9 Feeling Excluded (the cause is the

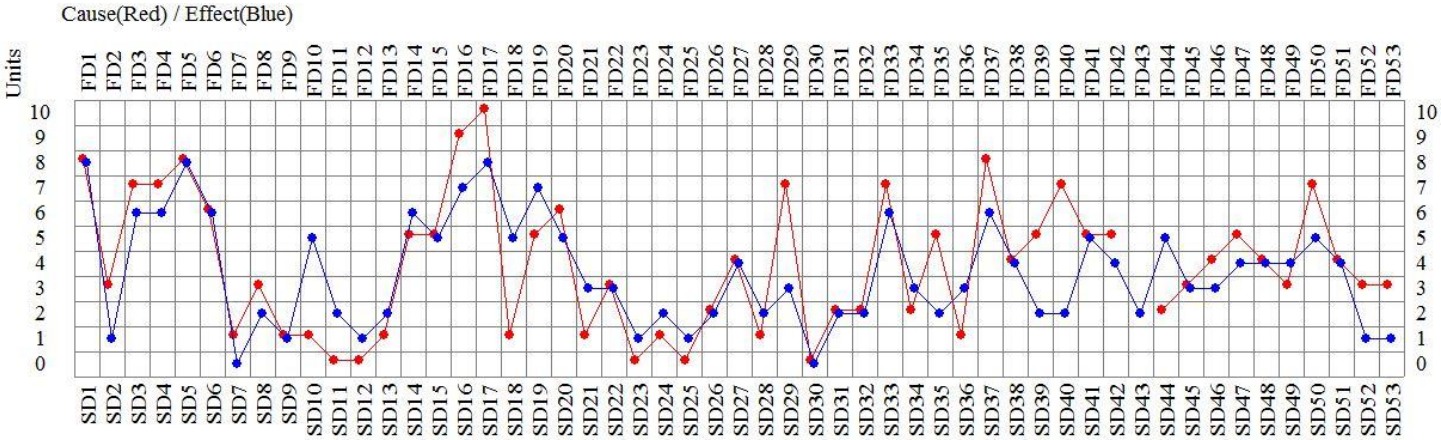
specific trigger and the effect is the stress level). Recall that in in the Shoda et al. paper Feeling Excluded seemed to be the biggest trigger of stress for participant #9.

Figure 2: Participant #9 Feeling Excluded (OOM)



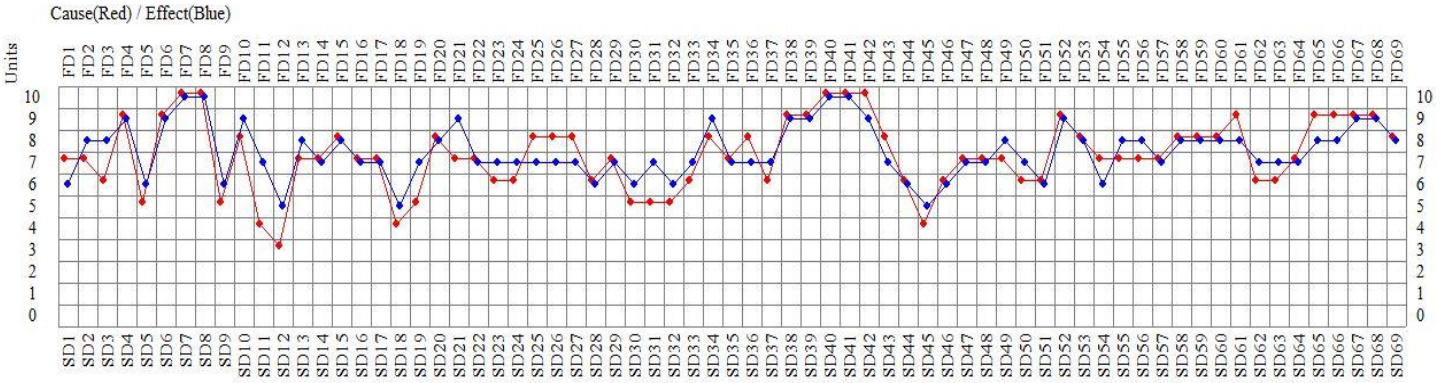
Although in OOM Feeling Excluded did not seem to be a trigger for participant #9 at all, we did find that other psychological features were much stronger possible triggers of stress. One example of this was Feeling Anxious as seen in **Figure 3** below. Notice that in this graph, the cause and the effect lines are not exact matches, but there is still a clear trend.

Figure 3: Participant #9 Feeling Anxious (OOM)



Another example of a strong possible trigger of stress found from the OOM re-analysis can be seen in **Figure 4** which shows participant #3 Feeling Rushed. Here it is easy to see a definite trend between the psychological feature and the level of stress for each day.

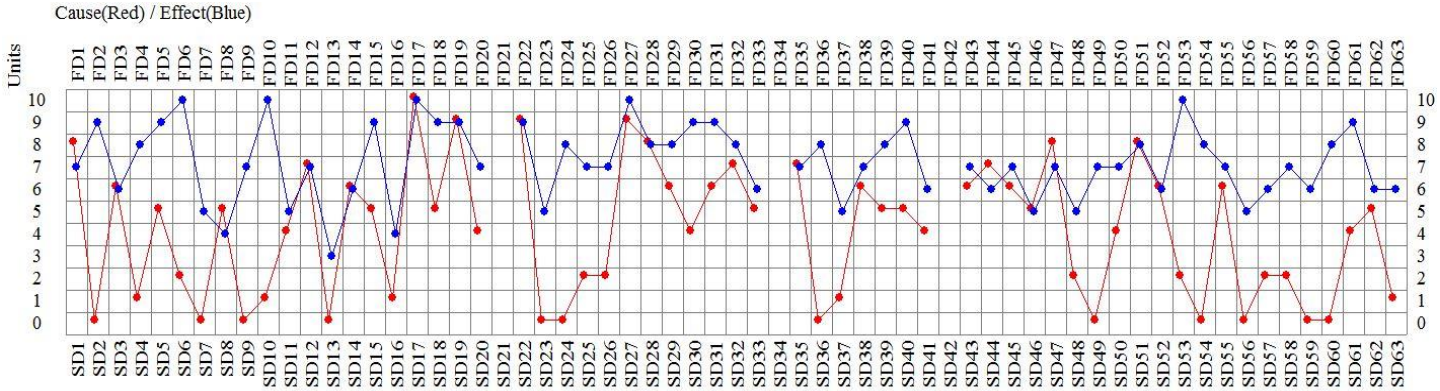
Figure 4: Participant #3 Feeling Rushed (OOM)



Notice that figures 3 and 4 look very different from each other in terms of magnitudes and spread, but they are both good trends. This only reminds us of the arbitrary nature of the 10-point scale in Psychology. Feelings are not on a continuous scale, and therefore we have treated them only in terms of overall trends when making intra-feeling comparisons. We can only judge how similarly they change over time, rather than assuming they must change equally.

Although we did find at least one trigger for almost all participants, not all the profile plots passed the eye test. In **Figure 5** for example, Feeling Nervous for participant #5 was one of the more visually scattered results. This particular case had a PCC of 48.21.

Figure 5: Participant #5 Feeling Nervous (OOM)



Discussion:

A few interesting observations arose during the re-analysis of this data. One of them is the obvious disconnect between the original HLM analysis (see **Figure 1**) and the OOM re-analysis (see **Figure 2**) of Feeling Excluded for participant 9. Both HLM and OOM are valid

analytical tools to use, but why is there such a contradiction on this particular trigger? The answer might lie in the raw data itself. Looking at closer at **Figure 2**, it is easy to see that there was very little variability in the participant's answers for the overall duration of the diary. However, there were just a few days in which participant #9 had spikes in Feeling Excluded. These spikes may have very well caused an outlier effect in the HLM, thus making it seem like Feeling Excluded was a significant trigger of stress for participant #9. Since in OOM there are no aggregate statistics, this problem did not occur.

Another interesting point worth elaborating on is the fact that participant #6 was the only participant for whom we did not find a trigger. This happened because we used an arbitrary cut-off point of 60% for the PCC. As seen on Appendix B, participant #6 had PCC scores that were very close to that. If something like this were to occur in a real clinical or counseling setting, the cut-off point would not be as rigid. We only did that for brevity purposes. In a real clinical situation, it would be up to the discretion of the counselor or clinician to address those possible triggers even if they don't adhere to the arbitrary criteria. On a similar note, participant #7 had a "passing" PCC score for Feeling Frustrated (64.00%), but they did not have a very compelling visual trend. This caused us to not consider Feeling Frustrated a possible trigger of stress for participant #7. However, if this were a real clinical situation, it would be up to the clinician or counselor to examine this further.

In addition, after looking at all the triggers for any given participant we noticed that the combination of their triggers seemed to tell a story; the triggers seemed to be of the same type. For example, for participant #7, the triggers were: Feeling Overwhelmed, Feeling Helpless, and Feeling Frustrated. For participant #10, the triggers were: Feeling Defeated, Feeling Discouraged, Feeling Self-doubt, and Feeling Time is Wasted. This is interesting to see because

we only had the data; we did not have a person telling us what happened all those days, but we can still get a sense of what was happening during the duration of the diary from their potential triggers. This is reminiscent of the underlying theory (CAPS) of the original research which highlights the need to get a sense of the person, the situation and how the person perceives the interaction between the two.

Re-analyzing the Shoda et al. study, was insightful in many ways. One of the most important lessons being that there are many great statistical analysis tools out there, but it is better to use the most appropriate tools available. In the case of analyzing person-centered, clinical data OOM is one of the best tools available. This is especially true if there is an interest in closing the science-practice gap in Psychology. This program is intuitive, straight-forward, and appropriate for uses in a clinical or counseling setting.

References

Mischel,W., & Shoda, Y. (1995). A cognitive-affective system theory of personality: Reconceptualizing situations, dispositions, dynamics, and invariance in personality structure. Psychological Review, 102, 246–268.

Shoda, Y., Wilson, N. L., Chen, J., Gilmore, A. K., & Smith, R. E. (2013). Cognitive-Affective Processing System Analysis of Intra-Individual Dynamics in Collaborative Therapeutic Assessment: Translating Basic Theory and Research Into Clinical Applications. *Journal of personality*, *81*(6), 554-568.

Appendix A

24 Psychological Features of Stressful Situations:

1. Feeling Anxious
2. Feeling Incompetent
3. Feeling Exhausted
4. Feeling Behind
5. Feeling defeated
6. Feeling Discouraged
7. Feeling Excluded
8. Feeling helpless
9. Feeling inferior
10. Feeling nervous
11. Feeling overwhelmed
12. Feeling confused
13. Feeling rushed
14. Feeling frustrated
15. Feeling irritated
16. Feeling self-doubt
17. Feeling uncertain
18. Feeling demands from other
19. Feeling time is wasted
20. Feeling betrayed
21. Feeling expectations were violated
22. Fear of failure
23. Fear of letting others down
24. Fear of being viewed by others as incompetent

Appendix B

Person 6 Results :

	Cause Observations	Effect Observations	Classifiable Pairs of Observations	Correct Classifications	Percent Correct Classifications	Binomial p-value
Feeling Anxious	71	71	70	41	58.57	0.09
Feeling Incompetent	71	71	70	37	52.86	0.36
Feeling Exhausted	71	71	70	38	54.29	0.28
Feeling Behind	71	71	70	38	54.29	0.28
Feeling Defeated	71	71	70	35	50.00	0.55
Feeling Discouraged	71	71	70	29	41.43	0.94
Feeling Excluded	71	71	70	26	37.14	0.99
Feeling Helpless	71	71	70	35	50.00	0.55
Feeling Inferior	71	71	70	37	52.86	0.36
Feeling Nervous	70	71	68	39	57.35	0.14
Feeling Overwhelmed	71	71	70	36	51.43	0.45
Feeling Confused	71	71	70	39	55.71	0.20
Feeling Rushed	71	71	70	32	45.71	0.80
Feeling Frustrated	71	71	70	33	47.14	0.72
Feeling Irritated	71	71	70	33	47.14	0.72
Feeling Self-Doubt	71	71	70	36	51.43	0.45
Feeling Uncertain	71	71	70	37	52.86	0.36
Feeling Demands from Others	71	71	70	38	54.29	0.28
Feeling Time is Wasted	71	71	70	25	35.71	0.99
Feeling Betrayed	71	71	70	30	42.86	0.91
Feeling Expectations were Violated	71	71	70	33	47.14	0.72
Fear of Failure	71	71	70	37	52.86	0.36
Fear of Letting Others Down	71	71	70	33	47.14	0.72
Fear of Being Viewed by Others as Incompetent	71	71	70	32	45.71	0.80