Understanding Correlations
The Powerful Relationship between Two Independent Variables
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In this scientific paper we will discuss the significance of the Pearson r Correlation Coefficient and why it is important for you to understand it and to use it in your counseling practice. This can become a very powerful aid on a number of fronts in your efforts to understand a client and to aid them in recovery from any type of significant issue.

During this paper we will be using the correlations between the Addiction and Dependency Scale coupled with the items from the Personality Spectrum Analysis. These two tools used together provide a powerhouse of information for helping those in addictive and compulsive behavior situations. Effective use of the correlational material presented may indeed shorten the process of recovery and may provide a framework of understand that will allow the recovery to be more lasting than other methods.

In spite of the fact that we will be using the ADS/PSA results as a framework for our study of correlations, you can transfer this new knowledge to any correlational study that we produce in the future. Once you understand how correlations work and what they mean, you will be able to interpret any other correlational studies that we post.

What is a Pearson r Correlation?

The Pearson r Correlation Coefficient measures the relationship between two independent variables. It is important to understand, first of all, the meaning of the word “independent.” Independent signifies the fact that neither of these variables is the cause of the other’s occurrence. They are totally independent of making each other happen.

This might best be understood by looking at a dependent variable – one that causes the other. Let’s take, for example, the issue of high blood pressure and excessive body weight. The medical community has established that overweight people tend to have higher than normal blood pressure. While this is not a comprehensive correlation, we can assume that the more excess body weight a person has, the more they are likely to have high blood pressure. In this case, the excessive weight causes the high blood pressure (also combined with other dependent variables). There is a direct cause and effect relationship between the two.
By design, the Pearson r Correlation Coefficient is not structured in a way to be used in dependent situations wherein one variable directly causes the other to happen. It should only be used in cases where the two variables involved have no relationship of causing each other to happen.

In this study we are measuring only independent variables. In the ADS/PSA case, we are measuring every Personality item (e.g., Antisocial Construct) with every component in the Addiction report (e.g., alcohol, drugs, shame, fear of failure, etc.). There are 300 possible correlations that exist when we look at each personality construct and each personality maladaptation combined with each of the fifteen ADS fields.

How is the Pearson r Correlation Coefficient Calculated?

The Pearson r Correlation Coefficient revolves around the deviation of two independent scores focusing on their independent distance from the average score for each. I will explain this technically even though this may not be of interest to some. But, it may help some understand what is being measured and how that measurement is taking place.

To figure the Pearson score, we need two sets of data from two independent variables. Let’s say Antisocial Personality Construct and the use of alcohol abusively.

The first question that we need to clear up is regarding dependent relationships. We must ask, “Is there a causal relationship between these two variables?” “Does the Antisocial Construct actually cause alcohol abuse?” The answer is “no.” Does alcohol abuse actually form the Antisocial Construct? Again, the answer is “no.” Therefore, we have two independent variables that can co-exist despite each other. A person can abuse alcohol and have a Dependent Personality Construct and score very low on the Antisocial scale.

The next question is this: “Is there some type of independent relationship between the Antisocial Construct and alcohol abuse?” In other words, as a person’s Antisocial score rises can we expect that their potential for alcohol abuse will also rise? This will provide us with valuable information concerning all of the potential pitfalls of each of the personality spectrum areas – especially the maladaptation areas. It will also potentially pinpoint a specific set of actions and therapy methods to reduce negative behaviors, simply because we understand that certain personality issues are relationally associated with specific behavioral issues.

Now for the technical part. Here’s the formula used to figure a Pearson Correlation. First, we need a substantial population of independent scores. In this case, we have 114 ADS/PSA pairs. Any number of results over 100 is a very significant population and when you get a correlation at that level there is a “real” correlation that exists.

To figure the correlation we will obtain the independent average score for each of the variables and we obtain the standard deviation for each of the scores. Using a computerized method of performing these mathematical functions makes the process easy.

Once we have the averages and the standard deviations, we are ready for the next step. For each individual’s Antisocial Construct we subtract the average and divide that difference by the standard deviation. We do the same for the alcohol abuse score. We end up with two separate numbers. Then, we multiply those two numbers together. This process is repeated for all 114 pairs of results that we have. We continue to add each new total to the previous one creating a single number.

When this process is done, we end up with one single number that is the product of multiplying the two differences together. The higher this number, the more certain that we are that there is a “connection” of some type independently between those two variables. In the real world, two independent variables over time will likely yield a combined score approaching zero. That would indicate that there is no relationship at all between the two variables.
One final step is done with that final combined number. Omitting the details, we simply multiply that final number with a multiplication factor to create a standardized score that always ranges between -1 and +1 – always. That is our final Pearson r Correlation Coefficient.

As already stated, most independent variables will tend to center around the score of zero. That means that we cannot project or expect to find any type of relationship between the two factors at all. In the current case that we examined, if the correlation was zero then we could not make any assumption or estimation about the other variable. If, for example, a person’s Antisocial score was high, we could make no assumptions about their alcohol score.

On the other hand, if we do have a correlation, we can expect to see some occurrence of one with the other. Thus, if the correlation between Antisocial and alcohol was 0.7 (in the correlation world that’s really high!) we could assume that if a person’s Antisocial score is elevated we will most likely find that alcohol abuse is also an issue. This correlation lets us know what we can expect. More will be said about this later when we look at creative ways to use the results.

Understanding the Numbers

In the ADS/PSA study we only display significant correlations and exclude those that do not reveal some significant relationship. Otherwise, the results would be clouded with information that is not of any substantial meaning and it would make it much harder to sift through it all to find applicable meaning.

In the statistical world, there is an accepted scale that indicates when a relationship is present and how strong the relationship is. As already stated, it is expected that has more and more results are accumulated the tendency will be for two independent variables to gravitate toward no relationship at all – a correlation of zero. When any score above zero is found in larger sample sizes that correlation is significant because it reveals a dynamic and independent relationship between the factors. The importance of this relationship will be understood shortly.

The current statistical world accepts the following correlational scale as significant:

- An absolute score from 0 to .09 (+/-) is insignificant.
- An absolute score from 0.10 to 0.29 is moderately significant.
- An absolute score from 0.30 to 0.49 is strongly significant.
- An absolute score above 0.50 is extremely significant.

This is due to the fact that these variables are independent of each other. To find any correlation from two independent variables is significant. To find a correlation above the score of 0.50 is very significant and it always indicates that there is a non-causal relationship between those two variables. In this case, we can expect that as one variable rises, so will the other.

I have taken the liberty to make the standards for correlation acceptance a little stricter than industry standards. I personally feel that they are somewhat “noisy” and sometimes lead to the assumption of a significant relationship when there is really only a minimal relationship. Therefore, correlational relationships indicated by this scale are very significant.

As already explained, the normal Pearson scale ranges from -1 to +1. That means that all numbers will be fractions. That makes it hard to read. I have taken the liberty to multiply all Pearson scores by 100. That will give you a number ranging from -100 to +100, rather than the fractional numbers. That’s much easier to read. Here is the scale of significance that I use.

- An absolute score (+/-) below 15 is insignificant and will not be displayed.
• An absolute score between 15 and 29 is considered as a moderate correlation and will be displayed in black.
• An absolute score between 30 and 54 is considered a strong correlation and will be highlighted in bold black.
• An absolute score between 55 and 70 is considered a very strong correlation and will be highlighted in red.
• An absolute score above 70 is considered a comprehensive correlation and will be highlighted in bold red.

Negative or Inverse Correlations

As already stated, the possible scores range from -100 to +100. A positive score indicates that both variables tend to move in the same direction. As one goes up, the other goes up. As one goes down, the other goes down.

But there is also the possibility of a negative correlation. This indicates an inverse correlational relationship. That means that as factor A goes up, factor B will go down. As factor B goes up, factor A will go down. The lower the number the more significant that inverse relationship is. Only inverse relationships less than -15 are displayed. These can be quite significant in your understanding of the two variables in question. All inverse relationships are displayed in italics.

Understanding the Correlations

The relationship between two variables allows us to visualize potential issues that might be present with the client. In order to do so, we need to understand the numbers. First of all, let’s look at four different graphic representations of correlation relationships. They are described as:

• **Group 1.** No relationship at all – a score of zero. Notice that the scores are all over the chart when X and Y are plotted together.
• **Group 2.** A score of 30. There is a distinct difference between this and Group 1. There is some relationship between the X and Y scores.
• **Group 3.** A score of 60. At this point, we can see that there is a distinct relationship (although still somewhat broad) between X and Y.
• **Group 4.** A score of 90 (unrealistic). There is a distinct and direct correlation between X and Y.
Now that we have seen a graphic representation of the scores, let’s look at some specific applications of the data from the ADS/PSA results. First, let’s look at the issue of personality and alcohol use. You will note while examining the statistics that out of the twenty potential personality areas that could have elevated alcohol scores only seven of them do. Now, we must bear in mind that these variables are independent and that means that alcohol issues can occur in any personality type. However, statistically, only seven areas score with significant correlations. Those are (areas bolded are strong):

- Antisocial Construct
- Antisocial Maladaptation
- Borderline Maladaptation
- Dependent Construct
- Histrionic Maladaptation
- Narcissistic Maladaptation
- Paranoic Maladaptation

Alcohol problems are more likely in those personality areas than others.

Let’s look a little deeper. Let’s say that you have a person with a Narcissistic Construct. There is a possibility that during therapy the person could decompensate into Narcissistic Maladaptation. That would indicate that the person started engaging in some consistent maladaptive behaviors rather than the desired optional behaviors. Here is the complete Narcissistic correlation.

**Narcissistic Construct**

Narcissistic Construct vs. Sex = 22.86  
**Narcissistic Construct vs. Work = 34.29**  
Narcissistic Construct vs. Control Issues = 29.84  
Narcissistic Construct vs. Fear of Rejection = 24.48  
Narcissistic Construct vs. Thrill-Seeking = 16.37  
Narcissistic Construct vs. Fear of Failure = 23.99

**Narcissistic Maladaptation**

Narcissistic Maladaptation vs. Alcohol = 24.98  
**Narcissistic Maladaptation vs. Drug = 36.84**  
Narcissistic Maladaptation vs. Religion = 22.18  
**Narcissistic Maladaptation vs. Sex = 55.32**  
Narcissistic Maladaptation vs. Work = 43.00  
Narcissistic Maladaptation vs. Coping Skills Issues = 34.57  
Narcissistic Maladaptation vs. Instant Gratification Needs = 50.26  
Narcissistic Maladaptation vs. Fear of Rejection = 38.92  
Narcissistic Maladaptation vs. Shame Issues = 53.30  
Narcissistic Maladaptation vs. Past Relationship Issues = 40.85  
Narcissistic Maladaptation vs. Thrill-Seeking = 23.11  
**Narcissistic Maladaptation vs. Fear of Failure = 32.35**

At the Construct level there is only one area that is strongly elevated and that is work. If the person decompensates into maladaptation, however, a host of other areas become elevated strongly. Sex even becomes very strongly elevated (it didn’t even score at the Construct level). When a client scores at the Construct level, the correlational chart shows what can happen if decompensation to maladaptation occurs.

Conversely, if a client came in with Narcissistic Maladaptation we can understand that moving them toward the Construct level might indeed result in a reduction in many of the traits found in the maladaptation level. Do you have a Narcissistic person with a sex problem? Will it help to move them rapidly toward optimal Narcissistic Construct behaviors?

We must remember that the variables are independent and affecting one does not demand that the other respond in like manner. However, in the case above, the sexual issue with the Narcissistic Maladaptation is at 55. That should result in at least a 30% reduction in sexual issues if you can move
them toward a construct mentality. (This is projected using the *Coefficient of Determination* discussed later.)

Notice that *fear of failure and rejection* are much more prominent in *Narcissistic Maladaptation* than in the *Construct*. Also notice that *past relationships* become an issue in maladaptation.

Generally, if you have an individual who has a maladaptation, you can see what may very well happen if you reduce that maladaptation to the construct level.

There is one more way to use the correlations. That relates to multiple scores on the personality assessment. You already understand that the *PSA* report will list as many as four areas that a person has scored as significantly elevated. In the future, we may do an analysis of those areas in connection with this information and provide those facts for you in the *ADS* report.

For now, however, you can do that work manually. Look at the *PSA* report. If the client has more than one area elevated, write them down and consult the correlations. Here’s an example of how this can be effective.

Here is an example from one of my own client records. The individual has the following personality characteristics:

- Obsessive-Compulsive Maladaptation
- Dependent Maladaptation
- Borderline Construct
- Avoidant Construct

We can consult the correlation chart for each of these areas and generally understand what each of the personality scores looks like independently. That may be helpful. However, we can also combine all four of these personality areas and get an idea of the cumulative effect of the four personality areas. In order to do so, we have to quantify each of the fifteen areas on the *ADS* assessment.

We have posted a document titled *ADS/PSA Correlation Checklist*. That document contains all fifteen areas on the *ADS* assessment. It also contains a line in front of each of the fifteen areas. Here are the general instructions for use.

- Write down the personality areas that are found in the *PSA* report.
- With the *ADS/PSA Correlation Checklist* in hand, consult the correlations.
- Start at the top and scroll down to find each of the person’s personality areas.
- For each of the *ADS* areas found on the correlation report use the following method for compiling a score for the *ADS* area.
  - If the *ADS* area is black, record one checkmark on the area’s line.
  - If the *ADS* area is bold black, record two checkmarks on the area's line.
  - If the *ADS* area is red, record three checkmarks on the area’s line.
  - If the *ADS* area is bold red, record four checkmarks on the area’s line.

When you have gone through each of the person’s elevated personality areas, you will have a summary of all of the potentials for the fifteen areas on the *ADS*. Examining each personality elevation independently and creating a cumulative number of checkmarks for each of the *ADS* items under each of the personalities, we have the following:

- Alcohol – no checkmarks
• Drugs – 3 checkmarks
• Food – 2 checkmarks
• Gambling – 0 checkmarks
• Religion – 2 checkmarks
• Sex – 3 checkmarks
• Work – 7 checkmarks
• Control issues – 1 checkmark
• Coping issues – 2 checkmarks
• Instant gratification – 6 checkmarks
• Fear of rejection – 8 checkmarks
• Shame issues – 8 checkmarks
• Past relationships – 5 checkmarks
• Thrill-seeking – 1 checkmark
• Fear of failure – 7 checkmarks

You should examine the list that is created. In the case of an extensive list, you may choose as many as five items from the list – the top five items. In this case:

• Fear of rejection
• Shame issues
• Fear of failure
• Work compulsion
• Instant gratification

Looking at the client’s ADS results, we find that fear of rejection and instant gratification issues are extremely elevated. This correlates directly with the ADS/PSA correlations. The individual also has a compulsive issue with food. That score is 122. Thus, we can see from combining the correlation results and the actual results are that the issue of instant gratification is probably the key factor in this individual’s case. While work is statistically more elevated than it is in this individual’s case, instant gratification appears to be affecting the person’s food consumption. Thus, the place to start with this individual would be on learning delayed gratification. Fear of rejection is also significantly elevated. Finally, this individual’s shame score is 117 – somewhat above the mean and nearly significant.

Looking through the correlation list again. You can see these correlations related to the person’s actual case.

• Obsessive-Compulsive Maladaptation vs. Instant Gratification Needs = 39.09 (15.28%)
• Dependent Maladaptation vs. Instant Gratification Needs = 37.53 (14.08%)
• Avoidant Construct vs. Fear of Rejection = 46.84 (21.94%)
• Obsessive-Compulsive Maladaptation vs. Fear of Rejection = 36.05 (12.99%)
• Dependent Maladaptation vs. Fear of Rejection = 50.10 (25.10%)
• Borderline Construct vs. Fear of Rejection = 39.40 (15.52%)

Note that the coefficient of determination is included. In relation to the issue of fear of rejection, we note that all four personality areas have significant elevations related to the fear of rejection. Both of the maladaptations are associated with instant gratification needs. Both of these areas scored significantly on the ADS assessment. Now, you have a clear therapy “target.” Deal with the fear of...
rejection and the need for instant gratification – especially by moving maladaptive Obsessive and Dependent behaviors toward optimal behaviors. That will not totally cure the food compulsion, but it will certainly take the wind out of its sails.

The Coefficient of Determination

The coefficient of determination is directly related to the correlation coefficient. In fact, the coefficient of determination is simply the square of the correlation coefficient. What does the coefficient of determination tell us?

The coefficient of determination tells us what percentage of one variable is affected by the other. The coefficient of determination will range from 0 to +1. As such, it can be multiplied by 100 to give us a percentage number that is easier to read and understand.

Here’s how it works. Let’s say that the correlation is 0.36. The square of 0.36 is 0.1296. That’s 12.96% when multiplied by 100.

The coefficient of determination would then be indicating that 12.96% of one variable is due to the relationship between the two. In the program, all coefficients of determination that are above 30 will be reported in parenthesis. Those under the score of 30 will not be reported at all since they are not statistically significant for your purposes.

What do you do with the coefficient of determination? How do you use it practically? Let’s look at the highest CoD related to the ADS/PSA correlations. The correlation between Borderline maladaptation and shame is 69.71 (0.6971). When we square that number we get 0.4859 (or converted to 48.59%). That means that 48.59% of the shame score can be accounted for by Borderline Maladaptation. That is extremely significant. Almost half of the person’s shame is accounted for in its relationship with the personality maladaptation.

In practical terms, that means that moving their maladaptation behaviors toward optimal behaviors (the Borderline Construct) should reduce the person’s shame by 48%.

What about Predictability?

There is an obvious and immediate question that comes to mind. And that is related to the potential for predictability. Even though there is no dependent relationship between the two variables, if we have a strong correlation between them, it would be reasonable to “predict” one factor’s score based on the value of the other. While this is somewhat true, we must remember that these variables are independent and do not influence or cause each other (as in the case of body weight and blood pressure).

One must be careful attempting to do any type of concrete measures of predictability with independent variables. It is possible to make projections based on standardized statistical computations. But those should always be tentative since other dependent variables are likely to be involved.

I do not recommend any type of predictability until the correlation coefficient is at or above 70. Only one score at the present time on the ADS/PSA correlations is close. If and when there are three correlations above 70 I will consider the possibility of including predictability.