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Superiority of *Form%* Over *Lambda* for Research on the Rorschach Comprehensive System

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Lambda is an important variable in the Rorschach Comprehensive System. However, because of the way it is calculated it has properties that can produce problems for parametric statistical analyses. We illustrate these difficulties and encourage the use of *Form%* (i.e., pure form responses/total responses) instead of *Lambda* in research. *Form%* is easy to calculate, and it is conceptually and mathematically comparable to *Lambda*. Because it is much more normally distributed, *Form%* is suitable to use in parametric analyses (e.g., *t* tests, analyses of variance, correlations, factor analyses, multiple regressions).

Lambda is a key variable in the Rorschach Comprehensive System (CS). It is calculated as the ratio of pure form responses to nonpure form responses. Specifically, *Lambda* = $F/(R - F)$, where F indicates the number of pure form responses, and R indicates the total number of responses. *Lambda* has a long history in Rorschach scoring (see Exner, 1993), and it is frequently interpreted as a dichotomous variable that indicates the tendency to simplify complex stimulus fields (i.e., *Lambda* > 0.99) or not (i.e., *Lambda* < 1.0). As a dichotomous variable, *Lambda* can be used in many nonparametric statistical analyses (e.g., chi-square tests, median tests, sign tests, Mann–Whitney *U* tests) and as a grouping or independent variable in a *t* test or analysis of variance. However, *Lambda* has two undesirable properties that can contribute to problems in CS research.

First, as a ratio, *Lambda* is mathematically undefined when all the responses in a protocol are pure form responses. That is, when $R = F$, the denominator of the *Lambda* formula becomes zero. Because it is not possible to divide any quantity by zero, *Lambda* becomes undefined (or infinity). In practice, making *Lambda* equal to *F* whenever all responses in a protocol are pure form can solve this problem. For instance, when a 17-response protocol is composed of all pure form responses, *Lambda* can be treated as if it were equal to 17. The commercially available software programs that assist with CS scoring already make this adjustment.

The second undesirable property of *Lambda* is its propensity to generate scores that are not normally distributed. As Viglione (1995) and Meyer (1999) pointed out, *Lambda* often has a skewed and kurtotic distribution in clinical samples because it is calculated as a ratio. When no more than half the responses in a protocol are pure form responses, this ratio has a fixed range between 0 and 1.0. However, *Lambda* has an unlimited upper range that is constrained only by *R* itself. Consequently, a single patient with a large proportion of pure form responses can severely skew the distribution. For instance, a patient with 19 *F* responses in a 20-response protocol produces a *Lambda* value of 19.0, which will be a dramatic outlier.

Relatedly, because *Lambda* is computed as a ratio, its distribution can have an unstable upper tail. Whenever a protocol contains more than 50% pure form responses (i.e., as the denominator starts to approach zero), small differences in *F* can produce large differences in *Lambda.* Consider two patients with 20-response protocols. If one has 19 pure form responses, *Lambda* = (19.0 / 1.0) = 19.0. However, if the second patient has just 1 fewer pure form response (i.e., 18 rather than 19), then *Lambda* = (18.0 / 2.0) = 9.0. Even though these patients differ by only 1 *F* determinant, the first has a *Lambda* value that is 10 points and many standard deviations higher than the second. This instability is not present at the other end of the *Lambda* distribution (i.e., when protocols contain less than 50% pure form responses). Again consider two patients with 20-response protocols. If one patient has a single pure form response, *Lambda* = (1.0 / 19.0) = 0.05. If the other patient has two pure form responses, *Lambda* = (2.0 / 18.0) = 0.11. Although these patients again differ by just a single *F* response, unlike in the previous example there is now a relatively trivial change in *Lambda* values. Although these differences do not alter a dichotomous interpretation of *Lambda*, they distort the underlying distribution of scores.[1]

[1]We thank Irv Weiner for appropriately pointing out how the Affective Ratio is calculated as a ratio in much the same way as *Lambda.* There is a critical difference between the two variables, however. The Affective Ratio uses the sum of all responses to the first seven cards as its denominator (and the number of responses to the last three cards as its numerator). Because patients give multiple responses to the first seven cards in a valid protocol, the denominator never approaches zero, and the Affective Ratio does not suffer from the same distributional problems as *Lambda.*

The skew and upper-tail instability of *Lambda* are illustrated in Figure 1, which shows a distribution derived from 1,134 psychiatric inpatients and outpatients. The vast majority of patients have *Lambda* values in the range between 0.0 and 2.0, although several patients have scores of 14.0, 15.0, or 16.0. One patient even has a score of 29.0. With such extreme scores, the distribution becomes severely skewed in the positive direction (i.e., with a long tail off to the right) and highly kurtotic (i.e., very peaked at the left end of the scale where the vast majority of scores occur). Indeed, the left column of data in Table 1 indicates how this sample produces a *Lambda* distribution with a skew of 6.68 and kurtosis of 60.88. A normal distribution has a skew of 0.0 and kurtosis of 0.0, a moderately nonnormal distribution has a skew greater than 2.0 or kurtosis greater than 7.0, and a severely nonnormal distribution has a skew greater than 3.0 or kurtosis greater than 21.0 (see Curran, West, & Finch, 1996). According to these guidelines, *Lambda* has a

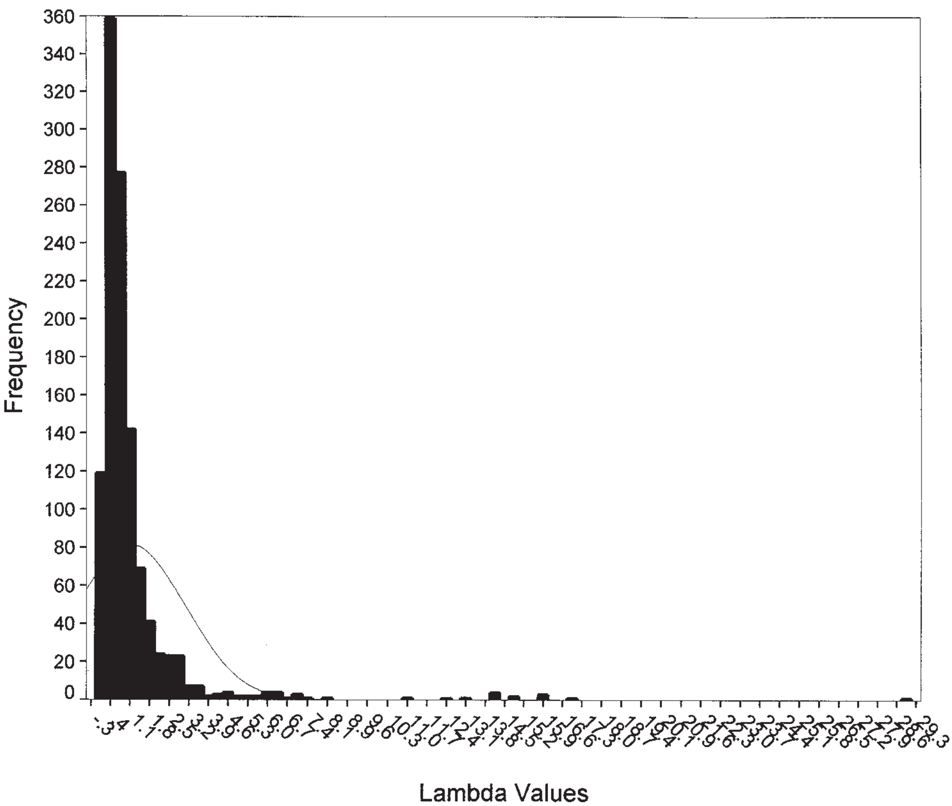

FIGURE 1 The distribution of *Lambda* values in a large sample of psychiatric inpatients and outpatients (N = 1,134).

TABLE 1
Descriptive Statistics For *Lambda* (*F*/*R* – *F*) and *Form%* (*F*/*R*) in the Same Sample

Statistic	*Lambda*	*Form%*
Measures of central tendency		
M	1.12	.41
Mdn (Q_2)	0.64	.39
25th percentile (Q_1)	0.36	.27
75th percentile (Q_3)	1.12	.53
Measures of dispersion		
Minimum	0.00	.00
Maximum	29.00	1.00
Range	29.00	1.00
Interquartile range	0.76	.26
Variance	3.84	.04
SD	1.96	.20
Normal-based *SD*[a]	0.57	.20
Skewness	6.68	.47
Kurtosis	60.88	–.05

Note. N = 1,134. Q_2 = second quartile (i.e., the median); Q_1 = first quartile (i.e., 25th percentile); Q_3 = third quartile (i.e., 75th percentile).

markedly nonnormal distribution in this sample. However, the values in Table 1 are similar to those found in Exner's (1993) reference samples for patients with schizophrenia (skew = 6.08, kurtosis = 41.06), depressive disorders (skew = 7.50, kurtosis = 60.29), and character disorders (skew = 4.96, kurtosis = 33.89).

Highly skewed and kurtotic distributions can create problems for parametric statistical analyses because the assumption of normality is clearly violated. Thus, including *Lambda* in a correlation, multiple-regression equation, factor analysis, or as the dependent variable in a *t* test or analysis of variance can produce misleading results when the findings are to be used inferentially (Viglione, 1995). Because Rorschach researchers may wish to use *Lambda* in inferential parametric analyses, it would be optimal if its distributional problems could be rectified. An optimal alternative would be a normally distributed score that also retains the same interpretive meaning as *Lambda*. Fortunately, such an alternative is readily available.

Instead of computing the ratio of pure form to nonpure form responses (i.e., *F*/non-*F*), *Lambda* problems can be corrected by computing the percentage of responses that consist of pure form (i.e., pure *F*/*R*). This simple change, from *Lambda* to the easily understood *Form%* score, produces a variable that is interpretively equivalent to *Lambda* yet always has a distribution that more closely approximates the normal bell-shaped curve. With the exception of Beck, most other Rorschach systematizers have historically preferred *Form%* to *Lambda* (see Exner, 1974).

Figure 2 shows the distribution of *Form%* in the sample of 1,134 patients. As in Figure 1, Figure 2 superimposes a normal curve onto the graph. It is obvious that the *Form%* distribution has no outliers and more closely approximates the normal curve. The far right column of data in Table 1 provides specific evidence of improvement. First, *Form%* has near optimal values for skew and kurtosis (i.e., values near zero). Second, the *Form%* distribution has very similar mean and median values (.41 and .39, respectively), whereas these values are quite divergent for *Lambda* (1.12 and 0.64, respectively). This demonstrates how skew markedly distorts the mean as an index of central tendency in the *Lambda* distribution. Third, the standard deviation and the normal-based standard deviation (i.e., the estimated standard deviation based on the 25th and 75th percentiles) are identical in the *Form%* distribution (i.e., .20 and .20, respectively), although they are markedly different in the *Lambda* distribution (i.e., 1.96 and 0.57, respectively). This indicates how skew and kurtosis markedly distort the standard deviation as an index of the dispersion of *Lambda*. In combination, these data indicate how *Form%* is a clear improvement over *Lambda* and how *Form%* is suitable for parametric statistical analyses.

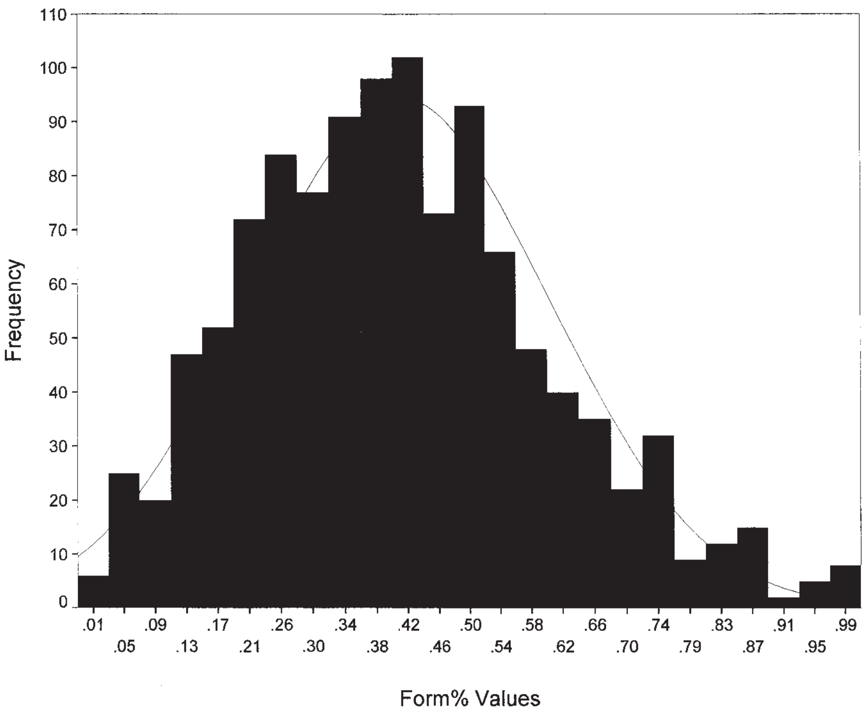

FIGURE 2 The distribution of *Form%* values in a large sample of psychiatric inpatients and outpatients (N = 1,134).

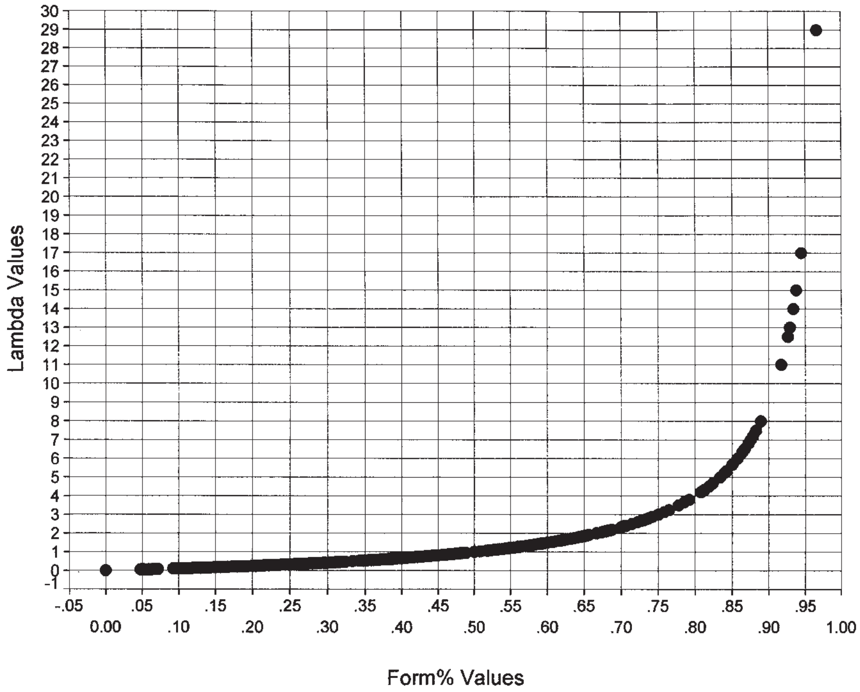

FIGURE 3 Scatter plot showing the relation of *Lambda* values and *Form%* values (N = 1,127).

The information presented so far does not demonstrate the conceptual equivalence of *Lambda* and *Form%*. Figure 3 presents a scatter plot of both variables together. For this figure, we excluded seven patients with undefined *Lambda* scores (i.e., all form responses) and did not round the *Lambda* and *Form%* values. The figure shows that *Lambda* and *Form%* have an exact one-to-one relation. At the same time, the relation is not linear because *Lambda* has a theoretical upper boundary of infinity, whereas *Form%* has an upper boundary of 1.0. Consequently, as *Form%* approaches 1.0, *Lambda* begins to rise dramatically and disproportionately. The one-to-one relation in Figure 3 can be documented mathematically by recognizing that *Lambda* and *Form%* are algebraic transformations of one another. For individual scores (but not group-level statistics), one variable can be translated into the other by the following formulas:

$$Lambda = Form\%/(1 - Form\%)$$

$$Form\% = Lambda/(1 + Lambda)$$

TABLE 2
Benchmark Comparisons Between *Form%* and *Lambda*

Form%	*Corresponding Lambda*[a]	*Lambda*	*Corresponding Form%*[a]
.00	0.00	0.00	.00
.01	0.01	0.20	.17
.10	0.11	0.50	.33
.20	0.25	0.80	.44
.30	0.43	1.00	.50
.40	0.67	1.25	.55
.50	1.00	1.75	.64
.60	1.50	2.00	.67
.70	2.33	2.50	.71
.80	4.00	3.00	.75
.90	9.00	3.50	.78
.95	19.00	5.00	.83
1.00	Infinite or undefined	10.00	.91

[a]Rounded to two decimal places.

For instance, when *Form%* = .50, the first formula indicates that the corresponding *Lambda* value is 1.0 (i.e., .50/[1 – .50] = .50/.50 = 1.0). Alternatively, when *Lambda* = 2.66, the second formula indicates that the corresponding *Form%* value is .727 (i.e., 2.66/[1 + 2.66] = 2.66/3.66 = .727). Because clinicians and researchers have become accustomed to thinking in terms of *Lambda* rather than *Form%*, in Table 2 we present some benchmark values for both variables. For reference purposes, in the CS sample of 700 nonpatients (Exner, 1993), the mean, median, standard deviation, skew, and kurtosis values for *Form%* are .351, .357, .091, .299, and .832, respectively.

Many CS scores have naturally skewed and kurtotic distributions because they are rare (e.g., pure texture, color naming, sex content, Level 2 fabulized combinations, color projection, human movement without form quality). There is no simple way to adjust the distribution for these variables. In contrast, *Lambda* has a problematic distribution because of the way it is calculated. This is correctable. Although clinicians can still interpret *Lambda* values for individual patients, and it can still be used in nonparametric methods of data analysis, researchers should use *Form%* instead of *Lambda* when they wish to undertake mean comparison or correlation-based analyses. *Form%* is conceptually equivalent to *Lambda* but is much more normally distributed and suitable for parametric statistical methods.

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