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RESEARCH NOTE
NUMERICAL SCALE-POINT LOCATIONS FOR CONSTRUCTING THE LAM (LABELED AFFECTIVE MAGNITUDE) SCALE

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ABSTRACT

In a recent paper, we described the development and application of a labeled affective magnitude (LAM) scale for assessing liking/disliking (Schutz and Cardello 2001). Here we present the exact numerical scale-point locations corresponding to the verbal labels of the scale, so that investigators can easily construct the LAM scale for use with either paper or computer-based ballots.

INTRODUCTION

In a recent paper, we described the development and application of a labeled affective magnitude (LAM) scale for assessing liking/disliking (Schutz and Cardello 2001). The scale was shown to have equal reliability and sensitivity to the 9-pt hedonic scale (Peryam and Pilgrim 1957), to provide greater discrimination among highly liked foods, and to produce data that were similar to magnitude estimation in terms of the ability to quantify ratios of

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liking/disliking among rated stimuli. The LAM scale was also found to be as easy to use by consumers as the 9-pt hedonic scale.

Since the publication of this paper, we have received numerous requests from investigators asking for the precise locations (in numerical terms) for placing each of the verbal labels on the LAM scale. Although the original publication provided the geometric mean magnitude estimates of all of the verbal labels used in the development of the scale and a figure that depicted the LAM scale with and without numerical anchors, the former data require the investigator to mathematically transform the mean magnitude estimates for the LAM scale labels to a +100 to -100 scale in order to easily place the labels on a line scale of arbitrary length, while the latter figure does not provide the necessary degree of precision for locating the labels on the scale. In addition, further transformations are required if the LAM scale is to be used with certain computer-based data acquisition systems.

In order to enable investigators to more readily utilize the LAM scale with both paper and computerized ballots, we have mathematically transformed the data as required and present a table of the relevant transformations.

METHODS AND RESULTS

Table 1 in Schutz and Cardello (2001) presented the geometric mean magnitude estimates and the standard errors of the geometric means for all 39 positive and negative terms used in the LAM scale development effort. These data are reprinted here in the first numerical column of Table 1 for the 11 verbal labels used to create the LAM scale. Since "neither like nor dislike" received all zero ratings in the original magnitude estimation study, 0.0 is listed next to this scale label in Table 1.

As developed, the LAM scale is a bi-directional scale of liking/disliking, with the verbal label "neither like nor dislike" positioned at the mid-point and equal to zero (0.0). Thus, in order to transform the label positions for placement on a line scale that ranges from +100 to -100, all of the positive (liking) labels were first transformed by setting "greatest imaginable like" to +100 by multiplying the geometric mean magnitude estimate for this verbal label (640.91) by 0.156 and then multiplying the mean magnitude estimates of all of the other verbal labels by the same multiplier (0.156). (Multiplication by a constant does not affect the ratios among the numbers.) A similar transformation was applied to the negative (disliking) labels by setting "greatest imaginable dislike" to -100 by multiplying -624.75 by 0.160, and then multiplying the geometric means for all the other negative labels by 0.160. These transformed values for both the positive and negative labels appear in the second numerical column in Table 1.

TABLE 1.
ORIGINAL GEOMETRIC MEAN MAGNITUDE ESTIMATES FOR THE VERBAL LABELS OF THE LAM SCALE, THE VALUES TRANSFORMED TO +100/-100 FOR POSITIONING THE VERBAL LABELS ON THE LAM SCALE, AND THE VALUES TRANSFORMED FOR USE WITH CERTAIN COMPUTERIZED DATA ACQUISITION SYSTEMS

LAM Scale Labels	Original Geometric Mean Magnitude Estimates (from Schutz & Cardello, 2001)	Original Estimates Transformed to +100/-100 for Positioning Verbal Labels along the Bi-directional LAM Scale	Values Transformed for Positioning Verbal Labels on Certain Computer-generated Line Scales
Greatest Imaginable Like	640.91	100.00	100.00
Like Extremely	475.71	74.22	87.11
Like Very Much	359.64	56.11	78.06
Like Moderately	232.21	36.23	68.12
Like Slightly	72.01	11.24	55.62
Neither Like nor Dislike	0.00	0.00	50.00
Dislike Slightly	-66.40	-10.63	44.69
Dislike Moderately	-199.17	-31.88	34.05
Dislike Very Much	-346.71	-55.50	22.25
Dislike Extremely	-471.75	-75.51	12.25
Greatest Imaginable Dislike	-624.75	-100.00	0.00

The transformed mean magnitude estimates in the second numerical column of Table 1 can now be more easily used to recreate the LAM scale on either paper or computerized ballots. Regardless of the application, the general approach is to place each verbal label at a point on a vertical (or horizontal) linescale such that the ratios among the distances between labels are the same as the ratios among the corresponding transformed mean magnitude estimates. Thus, in the simplest example, if a LAM scale of 200 mm is desired, the line would be divided into two 100 mm sections on either side of the mid-point. The mid-point would be labeled "neither like nor dislike". Positive and negative labels would then be placed along the positive (e.g., upper or right) and negative (e.g., lower or left) portions of the LAM scale at the exact millimeter distances from the mid-point as represented by the numerical values in the second column of Table 1. If a shorter vertical line is desired, e.g., 100 mm in total (two 50 mm lengths — one positive, one negative), then the numerical values in the second column simply need to be multiplied by 0.5 in order to arrive at the necessary distances (in millimeters) that each label must be placed above or below (right or left of) the zero point. Other line lengths can be accommodated by similar multiplicative transformations that take into account the desired length of the finished line (e.g., total length desired = 130 mm; therefore two 65 mm portions — one positive, one negative; multiply all values by 0.65).

Although the above transformation will enable the production of the LAM scale on paper ballots, it may not suffice for use with certain computer applications. The reason for this is that most sensory software programs will only allow you to specify the points for placement of verbal labels on a line in terms of distances from one *end-point* of the line. For such applications, a different transformation of the data is needed. In this case, one must convert the label points so that the end-point label of "greatest imaginable dislike" is set at 0.0, the other end-point label of "greatest imaginable like" is set at +100, and "neither like nor dislike" is set at 50.0. This can be done by taking all of the values in the second numerical column of Table 1, adding 100 to them, and then multiplying by 0.5. Applying this algorithm to the data in the second column results in the values seen in the right-most column of Table 1. Note, however, that because this transformation involves the use of an *additive* constant, the ratios among the data are no longer preserved (see discussion below).

DISCUSSION

The numerical values in Table 1 can be used to create both paper and computer-based versions of the LAM scale. However, there are several important caveats of which the user must be aware. The *first* is that, even though one places the labels on the line scale in accordance with the data in Table 1, it is still essential that the investigator either use *no* numerical anchors on the scale (i.e., no numbers are printed on the scale) or else numerical anchors that range from -100 (greatest imaginable dislike) to +100 (greatest imaginable like). While other numerical anchors *could* be used, those anchors must be only multiplicative transformations in order to preserve the interpretation of ratios among the LAM scale data. In other words, it would not be appropriate to list numerical anchors on the scale that range from 0 = "greatest imaginable dislike" to +100 = "greatest imaginable like" (e.g., in accordance with the transformation shown in the last column of Table 1), even if a computerized version of the scale is being used. The reason for this is that such a transformation of the numerical scale point labels requires the use of an additive constant (+100). As such, the transformed data will be inconsistent with the ratios of the semantic relationships among the labels as originally determined. Although it has been shown that respondents pay greater attention to the verbal labels than the numerical anchors on labeled magnitude scales

(Green *et al.* 1993), it would not be prudent to place numerical anchors on the scale that do not correspond to the ratios of semantic meanings among the verbal labels. Thus, the transformed values shown in the last column of Table 1 should *only* be used to position the labels on a computer-based (or other) line scale. The numerical anchors that actually appear next to the line should be bi-directional with zero in the middle.

This brings us to the *second* caveat. When the data are being transcribed (from measurements taken with a ruler, in the case of paper ballots) or collected on-line, the investigator must be sure that the data are not inadvertently transformed in a manner that is inconsistent with maintaining the ratios of the numbers as reflected on the original LAM scale. For example, when measurements are taken along a printed version of the LAM scale using a ruler, the measurements must always be taken by starting at the mid-point of the scale, i.e., at zero = "neither like nor dislike" and measuring in either direction (positive or negative). One cannot take measurements with a ruler starting at one end-point, e.g., at "greatest imaginable dislike", and measuring the distance to where the respondent placed a slash mark near "like moderately" (for example). Such a measurement procedure will destroy the ratio nature of the data, since the ratios among liked (or disliked) items are only maintained when "neither like nor dislike" is assigned a value of zero. Thus, valid data can only be obtained by making distance ruler measurements starting at the zero point (neither like nor dislike) in the middle of the scale.

Similarly, with computerized ballots, where a cursor is placed by consumers somewhere along the vertical or horizontal line, it is essential that the response "read" by the computer is in terms of numerical values ranging from −100 to +100 (with "neither like nor dislike" at 0.0) or some constant multiplicative function of these values. Unfortunately, most computer software applications will "read" a cursor position in terms of distance from the *end-point* of the line. Thus, even though one may have positioned the labels on a computer-imaged line using the right-hand column of Table 1, it is usually necessary to retransform the computer's "read" values back to a −100 to +100 scale. This can be accomplished by taking each computer-read value and then multiplying by 2.0 and subtracting 100.

Although the above transformations may seem cumbersome and not always intuitive, they become much easier to understand if one keeps in mind that the primary goal is to preserve the numerical ratios that relate the semantic meanings of the verbal labels to one another. It is these semantic ratios that empower the user of the LAM scale to be able to make statements about the ratios of liking or disliking among samples and to be able to directly compare the hedonic experiences of different people on a single "ruler". The mathematical and interpretive power of the LAM scale, combined with its better discriminability at the extremes and its ease of use by consumers, dwarf in importance the minor inconveniences required to preserve the accuracy and integrity of the data.

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