The Process of Numerical Information Judgment and the Scale Range Effect

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EXTENDED ABSTRACT

A two-stage processing model is proposed to conceptualize how people make judgments of the numerical information about a stimulus whose rating score is described along a bounded scale. For example, a product’s satisfaction rating is 8 of 10. In this case, we assume that individuals spontaneously arrive at a subjective impression of the score and judge it as “high” or “low” depending on whether it is nearer to the bottom or upper scale endpoint. If the object has an extreme value and clearly exemplifies the initial judgment, this judgment would directly lead to the final evaluation of the object without engaging in further processing. If, on the other hand, the concept applicability is not clear, people typically compute the numerical discrepancy of the score’s position along the scale from the nearest scale endpoint and modify their initial impression based on the magnitude of this discrepancy.

This model implies the influences of scale range on judgments. A bunch of previous researches have identified the scale range effect (Yamagishi 1997; Price and Matthews 2009; Wertenbroch et al. 2007; Pandelaere et al. 2011). All of them base on the premise that people have a general tendency to judge the quantity on the basis of the number of units without considering the scale or the size of these units, named as a “numerosity” heuristic (Pelham et al. 1994). Regarding a piece of singular numerical information about an object whose score is described along a bounded scale, our model suggests that if people step into the second processing stage, they estimate the discrepancy with the nearest endpoint to be larger when the scale range is large than when it is small. Thus, they judge a stimulus with a moderately high position along the scale to be less favorable, and a stimulus with a moderately low position to be more favorable, when the scale range is large than when it is small. However, when the score is extreme or neutral, implying a certain initial impression, the scale range should not influence judgments because the second-stage discrepancy comparison will not be made.

Employing a 2 (scale range: small-10 vs. large-100) x 5 (score level: 10%, 30%, 50%, 70%, 90%) between-subjects design, Experiment 1 tested the above propositions. 300 participants rated their evaluations of a novel based on its general satisfaction rating as 1 out of 10 or 100, etc.). The results showed that large scale range increased product evaluation at a moderately low score level (i.e., 30%; $M_{large} = 2.71$ vs. $M_{small} = 1.80$; $F(1, 290) = 5.03$, $p < .05$), whereas decreased evaluation at a moderately high score level (i.e., 70%; $M_{large} = 5.56$ vs. $M_{small} = 7.09$; $F(1, 290) = 12.79$, $p < .01$), but had no influences at extreme score levels (i.e., 10%, 90%) or neutral score level (i.e., 50%). Moreover, perceived distance between the score with its nearest endpoint mediated the scale range effect.

The two-stage process we assume takes cognitive effort. Therefore, regarding individual differences of need for cognition (Cacioppo and Petty 1982), we propose that the second stage processing would be more likely to occur among individuals with high NFC than those with low NFC. Experiment 2 provided evidence for this. 114 participants evaluated the teacher of a course they considered to take based on the teacher’s teaching evaluation score of either 8 out of 10 or 80 out of 100. Participant’s NFC was measured lastly (Cacioppo et al. 1984). The results showed that evaluations based on 80 out of 100 were lower than those based on 8 out of 10 ($M_{large} = 4.46$ vs. $M_{small} = 5.02$; $F(1,112) = 12.53$, $p = .001$). Further spotlight analyses indicated that this scale range effect showed up only for participants whose NFC level was one SD above the mean (4.38 vs. 5.28, respectively; $β = -.51$, $t(109) = -4.07$, $p < .001$), but not for those whose NFC level was one SD below the mean (4.49 vs. 4.76, respectively; $β = -.15$, $t(109) = -1.23$, $p > .20$).

Finally, manipulating regulatory focus could motivate individuals to consider more of the positive or negative implications of the score (Higgins, 1997, 1998; Pham and Higgins 2005). Therefore, we assume that regardless of the ambiguity of the initial impression formed in the first stage, promotion-focus individuals tend to consider the discrepancy between the score and the lowest endpoint, whereas prevention-focused individuals tend to consider the discrepancy with the highest endpoint. If this is so, we propose that promotion-focused individuals will judge an object’s score more favorably if its reporting scale range is larger than if it is small. Prevention-focused individuals, however, will judge the object less favorably in the former case. Experiment 3 tested this proposition at the scores of extreme levels (Experiment 3a) and of a neutral level (Experiment 3b).

Experiment 3a applied a 2 (score level: 10% vs. 90%) x 2 (scale range: small: 10 vs. large: 100) x 3 (regulatory focus: promotion vs. prevention vs. control) between-subjects design. The context of teaching evaluation was the same as that used in Experiment 2. Before performing the judgment task, however, participants in the promotion and prevention focus conditions were required to write down either two goals they would like to achieve, or two obligations and responsibilities they had to take (Higgins et al. 1994). The results revealed significant two-way interaction of regulatory focus and scale range ($F(2,329) = 6.89$, $p = .001$). Specifically, the scale range effect showed positively under promotion focus conditions, whereas negatively under prevention focus conditions, but did not show under control conditions. Similar findings were found in Experiment 3b that employed a presidential election scenario in which participants indicated their voting likelihood to a president candidate based on the potential supporting rate at a level of near 50%.

In summary, this model we proposed provides insights of how people process numerical information, and provides implications for the scale range effects.

REFERENCES


