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To cite this version:

Guylaine Molina, Jean-Marc Fabre. Conflict between two dichotomies: Dichotomization of stimuli and judgments. Current Psychology Letters/Behaviour, Brain and Cognition, 2001, 5, pp.91-103. hal-01421055v3

HAL Id: hal-01421055

https://amu.hal.science/hal-01421055v3

Submitted on 25 Feb 2018

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Running head: Dichotomized judgments

Conflict between two dichotomies: Dichotomization of stimuli and judgments

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Abstract

Following the experiments by Marsh and Parducci (1978) and Molina and Fabre (2000), this research investigates the role of a dichotomous pre-established norm in judgment tasks. This norm remains anchored at the middle of the scale, while the range-frequency compromise operates separately on each side of the norm. The originality of the present study rests on a crucial condition in which a discrepancy between the dichotomizing criteria of stimuli (the zero-point with positive and negative numerals) and ratings (the pass-fail value with exam grades) is introduced. In this case, only the rating criterion operates, and asymmetric endpoints about the norm do not produce symmetrical extensions of the range. The discrepancy condition was crucial in showing that the symmetrizing effect is not sufficiently robust to overcome a conflict between the two criteria, and therefore that this effect is not independent of all rating criteria.

Key words: judgment, context, dichotomy, norms, subjective range.

Introduction

Category ratings are frequently used in psychological research for studying context effects in perceptual and social judgments. The experimental paradigm consists of adjusting a rating scale (such as bad-good) to a set of stimuli that vary along a single dimension (such as exam grades varying in performance). The question that arises is how the category rating of each stimulus is affected by the context of other stimuli presented for judgment. Indeed, category rating scales are known to be relativistic: The rating assigned any particular stimulus reflects its position within the context. These context effects loom large in research on evaluative judgment (Fabre, 1993, 1998; Parducci, 1995; Parducci & Fabre, 1995). In this paper, the guiding theoretical framework was the range-frequency model (Parducci, 1965, 1983). This model accounts for context effects by assuming that the rating of the stimulus depends on both its location in the range and its rank in the distribution of contextual stimuli. According to the model, judgments reflect a compromise between two principles: (1) The response categories are assigned to successive, subjectively equal subranges of the contextual stimuli (a principle referred to as the range principle), and (2) the same number of stimuli are assigned to each of the available categories (a principle referred to as the frequency principle). These range-frequency principles can account for various phenomena. In the domain of person perception, a similar compromise between a dialectical contextualization process (based on a theoretical range) and a normative contextualization process (based on empirical distributions) provides an analysis of impression formation (Lamiell, 1988).

The present paper deals primarily with the range principle (Parducci, 1983). This principle was first articulated by Volkmann (1951), a psychophysicist who foresaw its application to social judgments. According to Volkmann, the rating scale is a flexible elastic scale which becomes adapted to the features of the stimulus range. As a consequence, the width of response categories varies directly with the stimulus range, inversely with the number of categories. This "rubber-band" model emphasizes the stimulus endpoints as anchor values by assuming that the lowest and the highest of the contextual stimuli are mapped onto the most extreme of the available categories, with intermediate stimuli assigned to intermediate categories in proportion to their positions in the range. The assumption that the rating of any particular stimulus reflects its distance from the endpoints is shared by Witte's theory of reference systems (Witte, 1960a, b). This algebraic model is applicable to everyday judgments on a familiar dimension, and assumes that each stimulus is judged in relation to a set of similar stimuli stored in memory. Volkmann's notions are further developed in the range principle, whose algebraic form is similar to Witte's theory. In accordance with earlier range theories, this range principle asserts that equal segments of the scale of judgment are assigned to equal segments of the contextual range. However, one major interest of Parducci's theory lies in its power for inferring the endpoints of the range even with an unfamiliar stimulus material.

The aim of the present study is to provide further empirical tests regarding the applicability of the range principle. This range principle can be subjected to a limitation when a normative dichotomization of ratings is available. These limitations, initially pointed out by Marsh and Parducci (1978), consist of a neutral-point anchoring and of a symmetrization of the subjective range if the two endpoints are not symmetric about the neutral-

point. In this initial experiment, positive and negative numerals were presented as the outcomes of gambles including both wins and losses, and participants rated their satisfaction with each simulated monetary outcome. The results showed that, regardless of context, the zero-point remained firmly anchored at the middle of the scale, while contextual manipulations had powerful effects upon ratings of other stimuli. Furthermore, asymmetry of the stimulus range produced a corresponding asymmetry in the use of end categories. The introduction of an extremely negative loss introduced the possibility of an extremely positive win. As a consequence, the highest of the actual wins seemed less favorable and was not rated with the top category. Similarly, the introduction of an extremely positive win suggested the possibility of a value perhaps equally extreme in the opposite direction, and made the most negative losses seemed more favorable. The concurrent observation of the two effects, symmetrizing of endpoints and neutral-point anchoring, emphasizes the concept of subjective range for studying category rating scales, but that is in accordance with the range principle (Parducci, 1983). Since the subjective endpoints are symmetric around the zero-point, the subjective range, which is inferred from category ratings, is indeed divided into equal subranges associated with various categories.

More recent studies (Parducci & Fabre, 1995; Molina, 1998; Molina & Fabre, 1999, 2000) demonstrated that an asymmetry of the stimulus range with an immunity of the middle of the scale to range effects could occur without a corresponding asymmetry in the use of end categories. These data were inconsistent with the assumption of the range principle (Parducci, 1983): Since the subjective range was not symmetric about the zero-point, the invariance of subranges of the contextual stimuli could not be preserved. In particular, Molina and Fabre (2000) pointed out that the

relation between the anchoring and symmetrizing effects could not be interpreted so easily than suggested by earlier research. The experiments showed that these effects depend upon various processes linked to response scales or to stimuli, and thus that each of them can be observed separately. In the present study, participants were presented with either positive and negative numerals or all-positive numerals representing grades achieved by different students in an exam. Depending on conditions, the pass-fail criterion was centered on zero (with positive and negative numerals) or on a conventional value (57 with all-positive numerals). The stimuli were presented successively (i.e., one after the other) or simultaneously (i.e., the entire set of stimuli presented on the same page). These presentation method manipulations allowed us to affect the level of uncertainty about actual values and, in particular, about endpoint values. The only condition in which participants could not observe the range of actual values from the beginning of the judgment task corresponded to the successive presentation. Thus, this presentation mode was more prone to suggest the possibility of two endpoint values equally extreme (see Molina & Fabre, 2000, Expt. 1, for further discussion of presentation mode effects, based on the "law of small numbers", Tversky & Kahneman, 1971).

The results suggested that the anchoring and symmetrizing effects were independent. Whatever the numeral material, the rating criterion (zero or 57) remained anchored at the middle of the scale. However, two conditions were necessary to obtain the symmetrizing effect: The use of positive and negative numerals, as shown by Experiment 3, and the successive presentation of these stimuli, as shown by Experiment 1. In sum, the experiments by Molina and Fabre (2000) showed that symmetrical extensions of the range were linked to the availability of a clue about the dichotomous material structure, and the uncertainty about endpoint values.

Furthermore, when there was no clue about a dichotomization of the response scale and thus no neutral-point anchor, the successive presentation of positive and negative numerals, presented as numerals with no particular meaning, produced the symmetrizing effect without the anchoring effect, as shown by Experiment 4. The latter result, obtained with ratings of the subjective magnitude of numerals, emphasized the role of the dichotomous material structure in subjective range cognitive representation. When no dichotomizing criterion of ratings was available, and the entire set could not be previously observed, only the clue about the material structure operated, and participants had a tendency to equalize the absolute values of numerals around the zero-point. Since the symmetrizing effect could occur in the absence of a rating criterion, we concluded that this effect was independent of all rating criteria. The present study was carried out to test this proposal.

The major interest of the Molina and Fabre (2000) data is that both the anchoring and symmetrizing effects can be observed separately. This result suggests the possibility of two distinct dichotomizing criteria: A normative criterion which allows to dichotomize ratings (the pass-fail value), and a criterion linked to the dichotomous material structure which produces the subjective equalization of absolute values (the zero-point). In this previous study, the assumption that two dichotomizing criteria operated could not be tested, since the two criteria were always the same (the zero-point separating success from failure). However, an alternative method consists in introducing a discrepancy between criteria. In the present paper, this crucial condition allows us to differentiate the role of each of the two criteria on the anchoring and symmetrizing effects, and to test whether the symmetrizing effect is indeed independent of all rating criteria.

Overview of the research

By varying the presence or absence of a clue about a dichotomization of stimuli and/or response scales, five conditions were created, as shown in Table 1. Four of them have been already studied by Molina and Fabre (2000), and the purpose of this study was to investigate the fifth. (1) In the absence of a clue about a dichotomization of both judgments (ratings of the subjective magnitude of numerals) and stimuli (all-positive numerals), the usual range effects are of course observed (Molina & Fabre, Expt. 3, "linear rating scale"). (2) With dichotomized judgments (ratings of successful and unsuccessful exam grades) and not dichotomized stimuli, only the rating criterion operates, and it produces the anchoring effect (Molina & Fabre, Expt. 3, "dichotomous rating scale"). (3) If the material structure is dichotomized (positive and negative numerals) but judgments are not, only the symmetrizing effect should occur with the successive presentation of stimuli (Molina & Fabre, Expt. 4). (4) When a clue about a dichotomization of both stimuli and rating scales is available, two cases can be identified. (4a) First, the dichotomizing criteria of stimuli (the zero-point) and ratings (the pass-fail value) are the same: The symmetrizing and anchoring effects can then occur together when the presentation method is successive (Molina & Fabre, Expt. 1). (4b) Second, which is studied here, a discrepancy between the two criteria should be observed.

<Insert Table 1 about here>

The aim of the present study was twofold: (a) to replicate Experiment 1 of Molina and Fabre (2000), also using successive and simultaneous presentations of positive and negative numerals, and (b) to introduce a discrepancy between the two dichotomizing criteria. Indeed, our assumption is that in previous research the concurrent observation of the

anchoring and symmetrizing effects in successive presentation is directly linked to matching the dichotomizing criteria of stimuli and ratings. As a consequence, a pass-fail criterion different from zero cannot yield the symmetrizing effect. We assume that this effect is not independent of all rating criteria, and thus cannot be preserved when a conflict between criteria is introduced. To test this assumption, we have chosen as pass-fail criterion +15 or -15 depending on conditions. In sum, we expected a pass-fail criterion anchoring without the symmetrizing of endpoints whatever the presentation method, and usual range effects upon ratings of other stimuli. Our predictions were tested in this experiment.

Method

Material

The material was a subset of that used in Molina and Fabre (2000). Four contexts with different endpoints were used, with 43 stimuli in each context. Two distributions were symmetrical around the zero-point and served as control conditions to study the possible symmetrizing effect, the narrow range varying between -30 and +30, and the wide range between -50 and +50. Our hypotheses concerned especially two experimental distributions which were asymmetrical about the zero-point, the negative range varying between -50 and +30, and the positive range between -30 and +50. There were 13 stimuli common to the four contexts (ranging from -30 to +30), with numerals varying in steps of 5.

Instructions

Each experimental session began with judgment instructions which were read aloud by the experimenter. The experimenter told participants that the study concerned how people judge the quality of grades achieved

by different students in an exam. For this exam, a grade was considered successful if it was superior to +15 or -15 depending on conditions. The experimental instructions required participants to rate the performance represented by each stimulus, using numerals 1 through 5, with 1 corresponding to "Very bad" and 5 to "Very Good".

Procedure

The stimuli were displayed in the center of a computer screen. They were either presented at the same time (simultaneous presentation) or one after the other (successive presentation). For the simultaneous presentation, participants were instructed to first read an entire set of 43 stimuli and then to judge each stimulus. Thus, participants could encode the different stimuli and, in particular, the endpoint values. For the successive presentation, participants could not observe the range of actual values from the beginning of the judgment task, and were instructed to judge each stimulus one after the other.

The first six stimuli were always from the contextual set, and common and contextual stimuli were alternated in the remaining stimuli. The same serial position was used for each common stimulus in all four contexts. Within these constraints, the order of the stimuli was randomized.

Design

The experiment involved a 2 X 2 X 4 X 13 factorial design with the first three factors as between-subjects factors: pass-fail criterion (+15 or -15), presentation mode (simultaneous or successive), and range (negative, wide, narrow, or positive). The within-subjects factor was common stimuli (-30, -25, -20, -15, -10, -5, 0, +5, +10, +15, +20, +25, +30). The dependent variable was the rating (1, 2, 3, 4, 5) for each stimulus.

Participants

Participants were 192 undergraduates from the University of Provence in Aix-en-Provence, France. All participants were volunteers, and they were tested individually, with 12 participants randomly assigned to each condition.

Results

To statistically test the effect of each of the two pass-fail criteria, we broke the full design into separate analyses. We performed a 2 (presentation mode) X 4 (range) X 13 (stimuli) analysis of variance (ANOVA) on the ratings obtained with each of the two criteria, +15 and -15. The effect of presentation mode was not statistically significant, nor did it interact with either Range or Stimuli (all Fs < 1.0). Figure 1 shows the mean ratings of 13 stimuli common to the four contexts, for the +15 (Panel 1A) and for the -15 (Panel 1B) criteria, after collapsing over the two types of presentation. Whatever the criterion values (positive or negative), the interaction between Range and Stimulus was the same. The four curves met at the pass-fail criterion, while the asymmetry influenced the ratings of other stimuli and, in particular, the zero-point (because it did not allow the segregation of two functionally-distinct categories, success and failure). The essential characteristics of neutral-point anchoring were found but, contrary to Experiment 1 in Molina and Fabre (2000), the symmetrizing of endpoints occurs with none of presentation mode. There was an adaptation of the scale to the endpoints of the range: The most extreme of the contextual stimuli were mapped onto the most extreme of the available categories. Since negative and narrow contexts both stopped at stimulus +30 and thus presumably shared the same higher endpoint, ratings of these highest stimuli were the same in these two contexts. Similarly, ratings of

the lowest stimuli were the same for positive and narrow contexts, given that both stopped at stimulus -30. The concurrent observation of the two effects, adjustment to stimulus range and neutral-point anchoring, was contrary to the assumption of invariance of subranges of the contextual stimuli associated with each response category (Range principle, Parducci, 1983). Since the midpoint of the scale remained firmly anchored at the pass-fail criterion, which was not located at the median in ranges, subranges could not be the same above and below the pass-fail criterion.

<Insert Figure 1 about here>

Pass-fail criterion +15

The results obtained when the pass-fail criterion was +15 are illustrated in Figure 1A. An analysis of variance (ANOVA) conducted on the mean ratings showed that the asymmetrical effect and the interaction between Stimuli and Asymmetrical ranges were significant. A contrast test showed that judgments of the common stimuli were higher for the negative range (M = 2.88) than for the positive range (M = 2.10), $F(1,88) = 121.88$, $p < .0001$. However, the curves met at the +15 grade, as indicated by the significant Stimuli X Asymmetrical ranges interaction, $F(12,1056) = 6.75$, $p < .0001$; thus, judgments of the particular stimulus did not vary with contextual range.

Indeed, a simple test of the ratings of the +15 grade showed no evidence of a systematic asymmetrical effect. This stimulus was anchored at the median response, regardless of range, negative or positive: M = 3.08. The independent Student t-test has been used to make inferences about the deviation from the null hypothesis within the parent population. This procedure was used here to compare two means (Lépine & Rouanet, 1975).

The Fiducial method provided us with an evaluation criterion in order to establish whether the asymmetrical effect was negligible. For this purpose, we have selected a criterion a priori: A discrepancy between the two means obtained with negative and positive ranges was negligible if it did not exceed 5% of the rating scale (.20). The confidence level selected was one-sided because we assumed that all discrepancy would go in the direction of the usual contrast effects, with a higher rating of the negative set compared to the positive set. In this case, we have concluded with 93% confidence that the asymmetrical effect was negligible.

Pass-fail criterion -15

The results obtained with the pass-fail criterion -15 are shown in Figure 1B. The ANOVA indicated the immunity of -15 to dramatic contextual changes: Asymmetrical effect did occur on both sides of the pass-fail criterion but not at the pass-fail criterion itself. Common stimuli were rated higher in the negative range ($M = 3.72$) than in the positive range ($M = 3.02$), $F(1,88) = 102.98$, $p < .0001$. A Stimuli X Asymmetrical ranges interaction was proved significant, $F(12,1056) = 5.34$, $p < .0001$, indicating that judgments of the pass-fail criterion varied less with stimulus context than endpoints.

A specific test of the ratings of the -15 grade showed no evidence of a systematic asymmetrical effect. This stimulus remained firmly anchored at the midpoint of the scale, negative or positive: $M = 2.96$. A one-sided Fiducial test allowed us to conclude with 94% confidence that the "true" difference between mean ratings obtained with negative and positive ranges was not greater than .20. Therefore, the discrepancy from the null hypothesis could be considered as negligible with this confidence level.

Discussion

The present study extends findings from Molina and Fabre (2000), showing that the symmetrization of endpoints is affected by a conflict between the dichotomizing criteria of ratings (the pass-fail value) and stimuli (the zero-point). Thus, this symmetrizing effect is not independent of all rating criteria. In earlier research, both the anchoring and symmetrizing effects could be observed separately, which suggested the possibility of two distinct dichotomizing criteria: A normative criterion which dichotomizes ratings, and a criterion linked to the dichotomous material structure which equalizes the absolute values of positive and negative numerals. By introducing a discrepancy between criteria, the present study confirms this assumption. Contrary to Experiment 1 in Molina and Fabre, the crucial discrepancy condition prevents the zero-point from producing the symmetrizing effect. The rating criterion is both at an extreme location in the range and anchored at the median response, which produces a distortion of the rating scale. This result suggests a qualification of the assumption of the range principle (Parducci, 1983) that the response categories are assigned to equal subranges of the contextual stimuli. In contrast, it is in agreement with our hypothesis that the range-frequency compromise operates separately on each side of the normative criterion, as though there was one context for success and another for failure.

In previous research, we demonstrated that the successive presentation of stimuli was the most efficient way to obtain a symmetrizing effect because of the uncertainty about endpoint values (Molina & Fabre, 2000, Expt. 1). This presentation mode even produced the effect when no neutral-point anchor existed, which suggested that the symmetrization of endpoints had to occur in all cases of successive presentation of positive and negative numerals (Molina & Fabre, Expt. 4). As a consequence, we assumed that

the symmetrizing effect linked to the dichotomous material structure was independent of all rating criteria. In fact, the relation between the anchoring and symmetrizing effects seems more complex than suggested by Molina and Fabre (2000). The major new finding of the present study is that the introduction of an artificial criterion separating success from failure discards the impact of the dichotomous material structure (positive and negative numerals). The clue about the dichotomization of stimuli, which can produce an equalization of endpoints around the zero-point, is neglected. A conventional rule is applied to ratings, and the symmetrization of absolute values is inconsistent with the rule. For example, with +15 as the pass-fail criterion, this effect would mean that -15 is as bad as + 15 is good.

All our results allow to conclude that (1) the range-frequency compromise does operate in judgment tasks, (2) within the model, the availability of a central point of the range produces the subjective equalization of absolute values, which is the case when the material structure is dichotomized (positive and negative numerals) with uncertainty about endpoint values, and the normative criterion is centered on the central point of the range (the zero-point), (3) the effect of a rating pre-established norm is linked to the social situation and independent of the range-frequency principles. Whatever its value, the norm remains firmly anchored at the middle of the scale regardless of context, but its median location in the subjective range is affected by the relation between the two dichotomizing criteria (as shown by the comparison between Molina & Fabre, 2000, Expt. 1 and the present data). The results suggest that the normative process, which guides the adjustment of the rating scale, is prior to the range-frequency compromise. On the other hand, the possible central point of the range is included in the compromise process, since it is linked

to the subjective range cognitive representation. However, in the case where a normative criterion is available, the question of the central point is determined by the norm: The symmetrization around the central point seems dependent on the congruence of clues about the dichotomization of both stimuli and ratings. The present demonstration of the normative dichotomization effect encourages generalization to research on the social anchoring of judgments, which are often guided by dichotomous choices. Indeed, the artificial criterion studied here corresponds to a social norm which not only has powerful effects upon the rating scale, but also discards the effect of the material structure, whose dichotomous property cannot be applied.

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Table 1

Effects in the presence or in the absence of a dichotomization of judgments and/or stimuli (with a successive presentation). Conditions 1, 2, 3, and 4a are studied in Molina and Fabre (2000). The purpose of the present research is to study condition 4b.

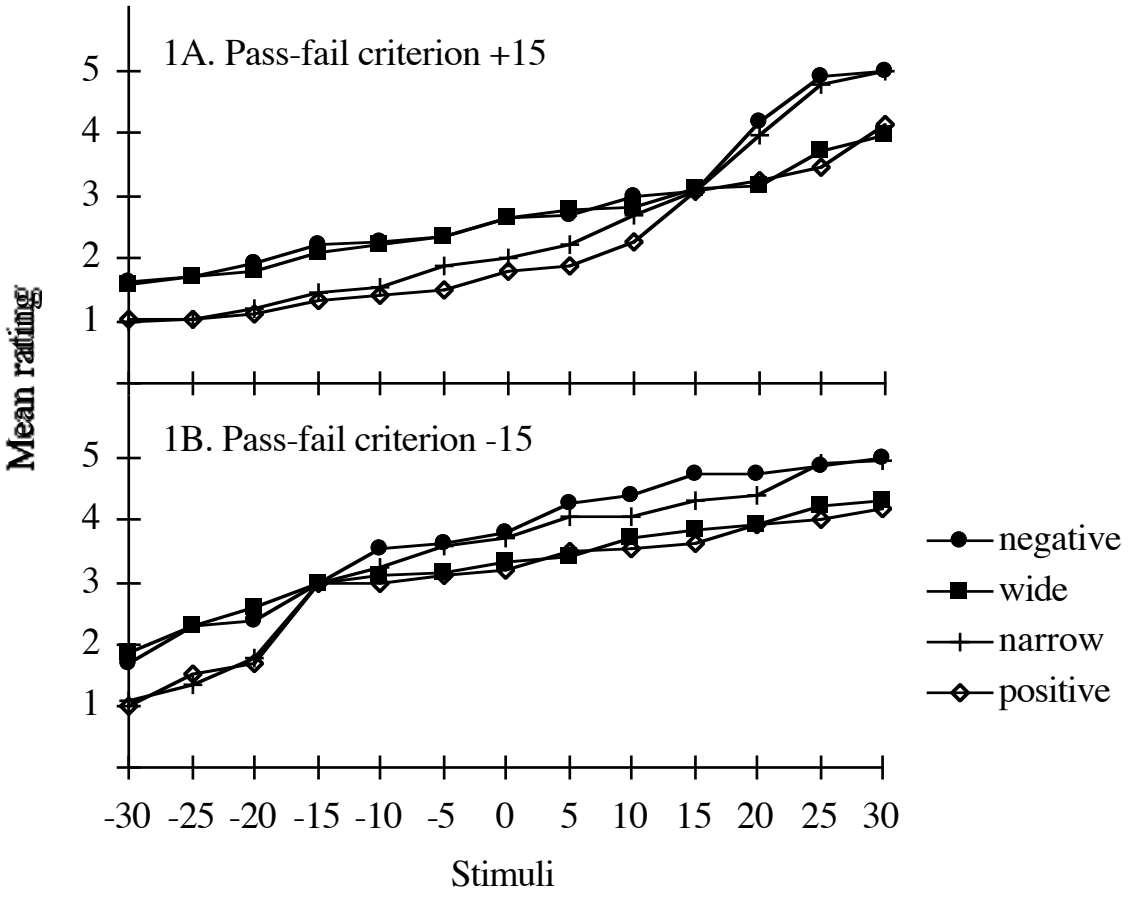
	Judgments		
Stimuli	Not dichotomized	Dichotomized	
Not dichotomized	1. Usual range effects	2. Anchoring effect	
Dichotomized	3. Symmetrizing effect	No discrepancy	Discrepancy
		4a. Anc.-Sym.	4b

Note. Anc.-Sym. = Anchoring and Symmetrizing effects.

Figure caption

Figure 1. Interaction between Range (negative, wide, narrow, positive) and Stimulus with the pass-fail criterion +15 (Panel 1A) or -15 (Panel 1B): mean ratings of stimuli common to the four sets, after collapsing over the two types of presentation (each panel includes the judgments of 96 participants, the responses of 24 participants making up each curve).

Figure 1


1A. Pass-fail criterion +15
1B. Pass-fail criterion -15
Mean ratings
5
4
3
2
1
-30 -25 -20 -15 -10 -5 0 5 10 15 20 25 30
Stimuli
negative
wide
narrow
positive