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Stimulus Characteristics and Attraction Effect: Role of qualitative and quantitative attribute values

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Abstract

Though attraction effect, when the choice share of an existing alternative increases with the introduction of an inferior decoy, is well-established in the literature, recent replication efforts have challenged its robustness. In this research, we demonstrate stimulus meaningfulness as a rationale for the lack of replication. In two studies, we show that when quantitative values are used attraction effect results from a lack of meaningfulness of the stimulus ratings; and attraction effect is eliminated when meaningful qualitative descriptions replace the quantitative values. We further demonstrate that such differences—attraction effect versus no attraction effect, emanate from a change in choice strategy from a choice simplifying non-compensatory decision making process, when stimulus meaningfulness is not clear, to a more engaging and normatively convincing compensatory processes with meaningful description of stimuli.

Key words: Attraction effect, non-compensatory decision making, compensatory decision making, stimulus meaningfulness.

1 Introduction

Consumers often encounter difficult choices. For example, a college student may need to choose between two apartments, one is expensive and is close to the campus (target), while the other is inexpensive but far away from the campus (competitor). Such difficult to make trade-offs may often turn out to be relatively simple when a third alternative—expensive and far away from campus (decoy), is introduced, increasing the share of the target, popularly known as attraction effect (AE) in the literature (Ariely and Wallsten 1995; Huber, Payne and Puto 1982; Huber and Puto 1983; Heath and Chatterjee 1995).

While attraction effect (AE) has been replicated in various domains, recent replication attempts question the robustness of the outcome (Fredrick, Lee and Baskin 2014, henceforth referred to as FLB; Yang and Lynn 2014). On the other hand, Müller, Schliva and Lehmann (2014) present findings that show that failure to replicate AE by Fredrick et al. (2014) may well be due to variations in the experimental choice setting. In a similar vein, a recent meta-analysis (Milberg, Silva, Celedon and Sinn 2014) finds a statistically significant effect and concludes (p. 1420), "…the number of missing or unpublished experiments with non-significant results that would be needed to bring the effect size to zero would be 5,440." Thus, the conflicting findings highlight the importance of delineating the process that underlies attraction effect, such that we may have a clear understanding of when and why attraction effect will take place.

One interesting observation is that the studies that failed to replicate AE used more realistic, for example, using pictorial (showing pictures of apartments) compared to numerical (describing the same in terms of numerical ratings—60/100, 75/100) stimulus representation (FLB). Presumably the more meaningful realistic stimuli, attenuates or even completely eliminates AE, but it is not clear why (Simonson 2014)? However, such findings gives us a reason to believe that AE may well depend on the nature of the stimulus representation.

In this paper, we show why the use of numeric or quantitative attribute values (gas mileage is rated to be 75/100), which are apparently less meaningful and confusing, results in AE; while on the other hand, qualitative attribute values (gas mileage is rated to be good), and arguably more meaningful and unequivocal, eliminates it completely. We also demonstrate that such differences—AE versus no AE, result from a change in choice strategy from a non-compensatory decision making process to a trade-off based compensatory decision making process.

To summarize, the present study shows when to expect AE and also provide reasons behind the attempted failure to replicate AE (FLB).The rest of the paper is organized as follows: we first discuss past research in AE, the mechanism that underlies AE, report two studies that support our conjectures and conclude with a general discussion.

2 Attraction Effect

A robust finding in the judgment and decision making literature is the Attraction effect (AE). Imagine a scenario where a consumer has to choose between two equally attractive toasters, toaster A (target) with two slots (wide enough for bagels) worth $30 and toaster B (competitor) with four slots (wide enough for bagels) worth $50. Now if a third toaster (decoy), C, is introduced which is worth $30 but has two slots that are not wide enough for bagels, an asymmetrically dominated option, it increases the choice share of toaster A (Huber et al. 1982). Seemingly the *introduction* of an inferior alternative increases the attractiveness of the target compared to that of the competitor *in situ,* as there is hardly any reason to justify how the introduction of a normatively irrelevant decoy substantially increases the choice share of an existing alternative in a given set of two equally attractive alternatives. These findings are also critical as it violates some key principles of judgment and decision making—similarity and regularity (Tversky 1972). For example, the decoy which is actually more similar to the target increases the target's choice share instead of taking share away from it, challenging the similarity principle. Similarly, the addition of the inferior option increases the probability of choosing an original member of a given set, target, refuting the assumptions of regularity.

Several explanations have tried to unravel such an interesting effect. For instance, Wedell and Pettibone (1996) mention three categories of models: (i) weight-change model: weights of attributes (price and toasting slots) changes when a decoy is added but values remain constant, (ii) value-shift model: subjective values of attributes change in the presence of decoy but weights remain unchanged and finally, (iii) value added model: presence of a decoy provides the consumer with a justification for choosing the target, akin to use of dominance heuristic (Simonson 1989). To explore AE, and in line with explanations (i) and (ii) above, Huber et al. (1982) introduced different types of decoys (Figure 1), based on range-frequency distribution (Parducci 1974). However, the results were not consistent across different decoy strategies. For example, range-frequency theory would predict that magnitude of AE would be more for RF decoy than the corresponding R and F decoys as the RF decoy combines the effect of both the range and rank differences. In a similar vein, the magnitude of AE for the R* decoy should also be more than a R decoy. However, these predictions are not borne out in many of the findings in the past (e.g., Huber et al. 1982; Dhar and Glazer 1996).

Though the explanations and findings in the AE literature are at odds, an overarching theme that seems to run through the above discussion is the use of short cuts in choosing an alternative. Whether it is the change in attribute space (weight or value) or the dominance of the target over the decoy, both use a simplification strategy that establishes the overall attractiveness of the target without engaging in a more thoughtful decision strategy. In other words, use of non-compensatory decision making processes. In the ensuing section, we discuss why AE can be attributed to non-compensatory decision making processes, the adoption of such a strategy and when can AE be completely eliminated.

2.1 Non-compensatory, Compensatory Decision Making and Attraction Effect

A key distinction that sets apart decision strategies is the use of compensatory versus non-compensatory processes (Bettman, Luce and Payne 1998). In a compensatory decision making process, a high value of an attribute can compensate for a low value of another (Bettman et al. 1998). For instance, an extremely high rating of fuel efficiency can compensate for a poor ride quality of a car. Moreover, such a decision making process invariably entails attribute trade-offs—how much of a ride quality is one going to compromise for a reasonably fuel efficient car, before arriving at a reasonable mix of the given set attributes and making a satisfactory choice.

On the other hand, in a non-compensatory decision making process, a high value of a given attribute does not compensate for a low value of the other. For example, in Elimination by Aspects (Tversky 1972), a non-compensatory decision making process, the most important attribute is chosen first (e.g. fuel efficiency) and alternatives that do not meet the pre-set value of that attribute are eliminated, following which the second most important attribute (e.g. ride quality) is chosen and the process is repeated until one zeroes down to a particular alternative, the preferred one. Presumably, such a process does not comprise of explicit attribute trade-offs but involves a choice simplification strategy—selecting attributes in order of importance and choosing alternatives that best satisfies the agenda (Hauser 1989).

The majority of the reasons that are proposed to explicate AE can broadly be classified into non-compensatory decision making processes, as they do not involve "thorough relative comparisons" (cf., Khan, Zhu and Karla 2011; p. 64). For example, the introduction of decoy predominantly leads to two types of effects: (i) perceptual based: either the weights of the attribute changes or the values associated with it, or (ii) reason based: the target looks more attractive in the presence of the decoy (Dhar and Glazer 1996; Simonson 1989). Neither of these strategies involves attribute trade-offs but tries to select the contextually more attractive alternative. Such theorizing is indeed in line with the findings in the past literature. For example, in Simonson's (1989) seminal paper; thought analysis of an AE scenario reveals non-compensatory decision making processes. The listed thoughts were categorized into: "(1) choice based on the relative importance of the two attributes, (2) choice explicitly based on the dominance relationship, and (3) choice based on the "overall attractiveness" of the alternative" (p.169). Results of thought analysis showed that more than seventy per cent of the thoughts were categorized into latter two, highlighting a non-compensatory process that precludes any "relative" attribute trade-offs. In a similar vein, Huber et al. (1983) also show that participants listed more brand-related thoughts compared to attribute comparisons in decisions involving AE scenarios. Focussing on brand related thoughts tentatively, indicates a process that primarily considers the attractiveness of the alternatives in itself, akin to a non-compensatory decision making process, rather than how the alternatives fair in the given set of attributes, which emulates a compensatory decision making process.

Based on the above discussions we see that AE scenarios motivate consumers to engage in non-compensatory decision making processes, setting aside any attribute related trade-offs, though it is not clear why?

2.2 Attribute Meaningfulness, Quantitative and Qualitative Attribute Values and Attraction Effect

Most of the research in the past has used numeric attribute values—a rating of 65/100 on ride quality, to establish AE (Huber, Payne and Puto 1982; Huber and Puto 1983; Heath and Chatterjee 1995). Arguably such numeric stimulus representation seems to be ambiguous in nature as it may mean different things to different consumers. Consequently, the difficulty in uncovering the real meaning of raw numbers motivates consumers to play safe and focus on strategies that help them to justify their decision to themselves and one that enhances their self-esteem (Simonson 1989). Certainly the target fulfils that goal in such situations, as the introduction of the decoy enhances both the contextual attractiveness of the target and the justifications favouring its choice (dominance). Thus, ambiguous quantitative attribute (QT) values, precludes any compensatory trade-offs that necessitates an understanding of the meaning of the attribute ratings and off-sets a choice process that inevitably motivates non-compensatory decision making processes, resulting in AE.

On the other hand, being normatively more convincing, consumers prefer to indulge in compensatory decision making process (Frisch and Clemen 1994). One factor that may induce a compensatory process and, potentially, eliminate AE is the presence of qualitative attribute (QV) values. Presumably QV values like excellent, good, average etc. are more meaningful than their numeric equivalents, 90/100, 80/100, 65/100 etc., as we are more prone to store an overall evaluation of a brand or a product rather than remembering some concrete numbers that depicts the same. Consequently, a more meaningful QV stimulus representation will motivate consumers to indulge in *attribute* related trade-offs as consumers will arguably shift their focus from a choice simplification strategy to one which will enable them to pick the right mix of attribute values. Indulging in such a process will lead to a realization that the decoy has the worst combination of the given attribute values, and reverting from a three alternative choice set (target, competitor and decoy) to the core choice set (target and competitor), thereby eliminating AE completely.

Indeed, in the real world, people look for meaning underlying a stimulus and base their judgments on that meaning (Reyna 2012). Research shows that consumers are predisposed to using meaning based representation of a stimulus (excellent ride quality) rather than its verbatim representation (90/100 on ride quality) (Reyna 1991). For example, framing effect increases when qualitative (Program A**:** Some people will be saved versus Program B**:** Some people will be saved or no one will be saved) against quantitative qualifiers (Program A is adopted, 200 people will be saved. If Program B is adopted, there is a 1/3rd probability that 600 people will be saved and a 2/3rd probability that no people will be saved) are used to frame decision problems.

To summarize, ambiguous quantitative attribute (QT) values lead to a non-compensatory choice process resulting in AE; while meaningful qualitative attribute (QV) values motivates a compensatory decision making process, mitigating AE. In the next section we report two studies that test our conjecture. In study 1, we show that the use of QT values result in AE, which is eliminated completely when QV values are used. In study 2, we show that AE results from a non-compensatory decision making process and is eliminated when consumers invoke a compensatory decision making process.

3 Study 1

The goal of this study was to establish that AE is eliminated when QV values are used. Two product categories commonly used in past research—beer and grill (Dhar and Glazer 1996; Ratneshwar et al. 1987), were used for the studies. Two attributes, price and quality, were used to describe different brands of beer; while cooking speed and cooking space were used to describe the grill brands (please refer to Appendix 1 for a description of the stimuli).

3.1 Method

We used a 2 (attribute values: quantitative, qualitative) × 2 (choice: decoy, without decoy) × 2(product categories: beer, grill) factorial design, and randomly assigned participants. One hundred and seventy two students from a large Midwestern university completed the study for partial fulfilment of course credit. The participants chose a brand from either a set of two (target and competitor) or three (target, competitor and decoy) different grills/beers. Following past research (Mishra, Umesh, and Stem 1993), participants were asked to distribute 100 points among the brands. The distribution of points is a metric scale, rather than the categorical scale of the choice data, and supports a more sensitive statistical tests (our analysis revealed no difference in product preference between inferences based on choice data or the distribution of points, according to a chi-square test in studies 1 and 2). Following the distribution of points, the participants responded to task related questions: how confident are you that you made a satisfactory choice? How difficult was the task? How much thought they put in the task? Finally, they indicated their demographic traits, before being debriefed and dismissed.

3.2 Results

Computing Attraction Effect. We followed the procedure used by Mishra, Umesh, and Stem (1993) to calculate AE. To illustrate, assume that participants have distributed 50 points each to the target and the competitor in the no-decoy condition. In the decoy condition, the distribution is 60 points for the target, 30 points for the competitor, and 10 points for the decoy. If the proportion of points between the target and competitor does not change with the introduction of a decoy, both of them should receive 45 points: (100 – 10) × 50/100 = 45. Then, AE would equal the difference between the observed and expected values of the target, 60 (observed) – 45 (expected) = 15. We prefer this method, because if the decoy takes any choice share, AE magnitude can best be captured by this computation instead of any test of the difference of target share proportions across decoy and no-decoy conditions. In the no-decoy QT conditions, target share was 33.55 and 50.32 for beer and grill respectively; while the target share in QV condition were 58.25 and 53.96 for the beer and grill respectively. These were used to calculate AE in Studies 1 and 2.

Attraction Effect. An ANOVA (product categories vs. attribute values) showed only a main effect of attribute values ($F(1,78) = 7.23$, $p = .009$). Consistent with the findings in the AE literature and our expectations, there was an significant increase in the share for the target in both the beer and grill product categories under QT condition ($AE_{Beer} = 14.76$, $t(24) = 3.49$, $p < .05$, Cohen's d = .69, and $AE_{Grill} = 10.35$, $t(24) = 2.91$, $p < .05$, Cohen's d = .58, compared with AE = 0). However, AE was eliminated for both the product categories when QV values were used ($AE_{Beer} = 1.76$, $t(15) = .35$, $p > .1$, $AE_{Grill} = -.68$, $t(15) = -.10$, $p > .1$, compared with AE = 0). We found no significant differences ($p > .1$) across the quantitative and qualitative conditions for other questions pertaining to respondents' self-assessed confidence, perceived difficulty of the task, and effort expended.

3.3 Discussion

Thus the results of study 1 show that AE depends on the nature of attribute values. AE occurs when QT values are used and is eliminated with QV value descriptions of the attributes. However, it is not clear why changing the nature of attribute values from QT to QV values eliminates AE. We explore this in study 2 and offer a process explanation for the results.

4 Study 2

The goal of this study is to establish the underlying mechanism of AE. In this study, participants were asked to list the thoughts as they made the choice. As discussed earlier, AE results from a non-compensatory decision making process. For example, by considering the overall attractiveness of a particular brand by rank ordering them (Huber et al. 1983) or by providing reasons that allude to the contextual superiority of the alternative (Simonson 1989). Such processes will subsequently influence the listed thoughts. For example, the rank ordering of brands should lead to more brand related thoughts, while judging the contextual superiority of a particular alternative may shift one's focus to a particular attribute on which the chosen alternative is judged to be best. Both these processes will, therefore, substantially reduce the proportion of thoughts concerning attribute trade-offs in the QT condition.

On the other hand, use of QV values will make the attributes more meaningful, thereby, shifting the decision maker's focus from considering the contextual superiority of a particular brand to the attribute values that represent them. And consequently, selecting the one that satisfies the decision maker's optimum mix of attribute values—a car with an average value on both fuel efficiency and ride quality. Accordingly, such a process will significantly increase the number of thoughts concerning attributed trade-offs compared to brand-related thoughts or thoughts concerning a particular attribute in the QV condition.

4.1 Method

We used a 2 (attribute values: quantitative, qualitative) × 2 (product categories: beer, grill) factorial design, and randomly assigned participants. One hundred five students from a large Midwestern university completed the study for partial fulfilment of course credit. Participants chose a brand from a list of three, following which they distributed hundred points among them and, finally, listed the thoughts as they made the choice. All else were similar to Study 1. The distribution of points in the no decoy conditions of Study 1 were used to calculate the AE in Study 2.

4.2 Results

Attraction Effect. An ANOVA (product categories vs. attribute values) showed only a main effect of attribute values ($F(1,101) = 20.63$, $p < .001$). Consistent with study 1, our analysis yielded a significant AE for beer and grill product categories under QT condition ($AE_{Beer} = 9.74$, $t(29) = 2.51$, $p < .05$, Cohen's d = .45, and $AE_{Grill} = 9.06$, $t(29) = 2.34$, $p < .05$, Cohen's d = .42, compared with AE = 0). However, AE was eliminated for both the product categories under QV condition ($AE_{Beer} = -15.27$, $t(22) = -2.88$, $p > .1$, $AE_{Grill} = -6.30$, $t(21) = -1.28$, $p > .1$). We found no significant differences ($p > .1$) across the quantitative and qualitative conditions for other questions pertaining to respondents' self-assessed confidence, perceived difficulty of the task, and effort expended.

Thoughts. Following past research (Simonson 1989) and with some modifications, the listed thoughts were categorized into brand-related thoughts, thoughts focussing on a particular attribute and thoughts related to attribute trade-offs. For example, "Brand X cooks the fastest and has a decent cooking area, Brand B is not much more expensive than the other choices and is the best quality, Brand A is 50/100 and is close to a dollar cheaper to Brand B which is the most expensive and best tasting." were classified as *brand-related thoughts*, "The prices are very close to one another so I chose the one that had the best quality, I would rather have a grill that is able to cook at a fast speed than a grill which gives me a large cooking area and is slow, I thought about the cooking area the most. I want to feed the most people" represents thoughts that *focus on one attribute* and "How large, compared to how fast it cooks, I looked at the cheapest one that also had a good rating, how much can i cook at one time and how fast," "I would compromise on speed to get more cooking area, How big of a cooking area do I need? Initially thought 8, then settled for 6 based on the speed in which Brand X cooks." reflect *attribute related trade-offs*. The first two thought categories were coded as non-compensatory decision making thoughts while the last category was coded as compensatory decision making thoughts.

Analysis of the thoughts showed that participants in QT condition (the pattern of results were same for both the beer and grill product categories and thus was combined for analysis) listed a significantly large number of non-compensatory versus compensatory thoughts ($M_{Non\text{-}compensatory} = 1.46(.63)$ vs. $M_{Compensatory} = .43(.62)$, $t(59) = 4.75$, $p = 0.00$). While in the QV condition, participants listed a significantly large number of compensatory versus non-compensatory thoughts ($M_{Compensatory} = .42(.49)$ vs. $M_{Non\text{-}compensatory} = .15(.36)$, $t(44) = 2.45$, $p < .05$).

5 General Discussion

Frederick et al. (2014) while drawing conclusions after their attempted failure to replicate AE observed, "We found attraction effects when stimuli were represented numerically, but not otherwise" (p.488) and "The boundary conditions of the effect seem to be so restrictive that its practical validity should be questioned." (p. 493). Echoing the same theme Yang and Lynn (2014) state, "…our data indicate that the use of meaningful qualitative-verbal descriptions, as well as pictorial depictions, to differentiate choice options significantly reduced the size of our effects. Indeed, we find attraction effects only at chance levels using these type of stimuli, but the effects were produced at expected levels when we used only numeric representations of choice attributes.” (p. 510). Simonson (2014) provides various reasons for the replication failure of AE and contends that a more important question to explore is, why? Or in other words, what do the stylistic properties—using more realistic or pictorial stimuli (FLB), have in common that mitigate AE? Similarly, what properties do numerical attributes have that brings forth AE. Moreover, and as discussed earlier, the present debate of whether AE is robust or not has inadvertently overlooked several unanswered questions in the AE literature.

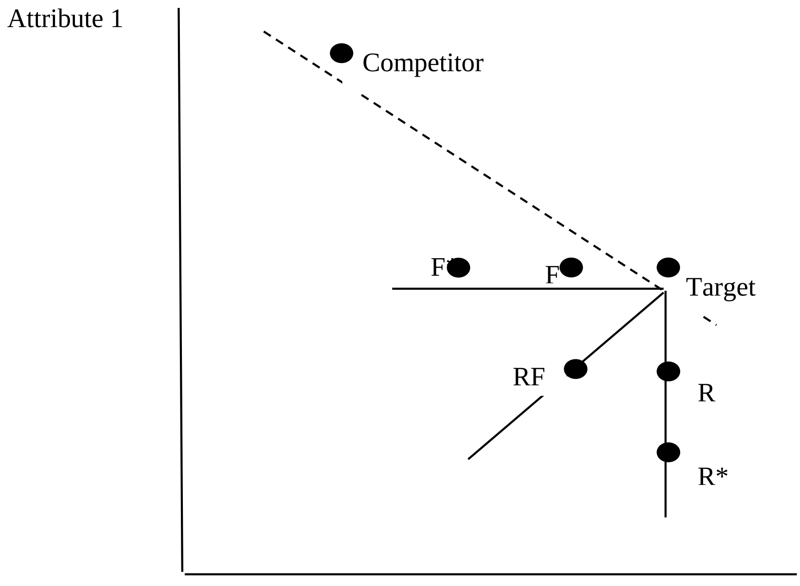
In our studies, we addressed both the issues. Results of Study 1 show that quantitative attribute values (similar to the numeric values in the replication studies) lead to AE, while the effect is eliminated when qualitative attribute values are used. The qualitative attribute values—excellent, good etc. used in the present research are much more meaningful and unambiguous compared to the “noisy” (Simonson 2014, p. 517) verbal and the pictorial descriptors used in the replication studies. Presenting stimuli in the form of pictures, may shift one’s focus to the liking and disliking of the pictures rather than differentiating the same for the purpose of making a choice. On the other hand qualitative attribute values like excellent, average etc., provide an unambiguous representation of the stimuli. For example, we are more prone rate Nike as being excellent rather than giving a concrete number—90/100 to represent the same; based on our overall evaluation of the brand in general. Thus the more meaningful QV vales gives a much clearer context to establish when AE will be eliminated—making the attribute values more meaningful. On the other hand, less meaningful QT stimulus representation lead to AE.

Results of Study 2 show that AE results from non-compensatory decision making processes, attributed to lack of meaningfulness of the quantitative QT attribute values. Though past research (William and Rao 2009) has indicated why trade-off aversion may lead to AE, the contributing reason was not clear. Analysis of the listed thoughts in Study 2 shows that lack of meaning of quantitative attribute values substantially reduces attribute related trade-offs, ensuing from non-compensatory decision making process, which results in AE. On the other hand, meaningful QV attribute values motivates consumers to engage in attribute related trade-offs and a more convincing compensatory decision making process, mitigating AE. Results of the thought analysis in Study 2 also support the adoption of such a process.

Results of our studies also help to find a probable reason why the magnitude of attraction effect may not vary with the change in the position of the decoy—Figure 1 (Huber et al 1983). It is evident that when quantitative attribute values are used, the lack of meaningfulness of the attribute values motivates consumers to non-compensatory decision making processes that seek to find the most attractive alternative. Thus, the magnitude of AE will arguably not vary significantly as long as the decoys are used to justify the choice or reflect a change in the attribute space. For example, target car rating of 90/100 on fuel efficiency compared to a decoy of 70/100 or 65/100 will not be much different as long as the meaning of 75/100 versus 60/100 is not vastly different for different consumers. Consequently, range and extreme range extension strategies may yield the same result. This rationale will also hold true for other decoy strategies.

Figure 1

NOMENCLATURE OF DECOYS USED IN PAST RESEARCH AND OUR STUDIES



R = Range extension decoy

R* = Extreme range extension decoy

RF = Range and frequency extension decoy

F = Frequency extension decoy

F* = Extreme frequency extension strategy

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Appendix 1

Quantitative Attribute Values

Beer

Brands	Price/six pack	Average Quality rating (100 = best)
Brand a	$5.80	50
Brand b	$6.60	70
Brand c	$6.00	30

Grill

Brands	Cooking Area (1 = very small; 10 = very large)	Cooking Speed (1 = very slow; 10 = very fast)
Brand X	6	8
Brand Y	8	6
Brand Z	5	7

Qualitative Attribute Values

Beer

Brands	Price/six pack	Average Quality rating
Brand a	average	average
Brand b	high	very good
Brand c	average	low

Grill

Brands	Cooking Area	Cooking Speed
Brand X	average	good
Brand Y	good	average
Brand Z	below average	good

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