Optimal number of scale points in likert type scales for quantifying compulsive buying behaviour
Santanu Choudhury¹, Dibyojyoti Bhattacharjee²
1- Assistant Professor in Gurucharan College, Silchar, Assam, India
2- Associate Professor in Assam University, Silchar, Assam, India
choudhuryshantanu11@gmail.com

ABSTRACT

Rating scales are among the most widely used measuring instruments in psychology, education, marketing and many areas of social research. It is therefore not surprising that a great deal of research has been devoted to the effects of variations in rating scale format. An existing Likert type scale is administered on 100 respondents, to detect the optimal number of scale points (from 5 to 9-point) for quantifying compulsive buying behaviour. On analyzing the responses it is seen that for compulsive buying scale 5-point scale may be preferred. With regard to reliability, an increment is noted with increase in the number of scale points, however such increments are found to be insignificant.

Keywords: Rating scale, Box plot, Coefficient of Variation, ANOVA, Critical Difference, Reliability of Scales.

1. Introduction

Circumstances sometimes occur in which researchers or applied psychologists have to compare scores derived from rating scales with different numbers of response categories. In longitudinal research designs in psychology, education, marketing and several other areas of social science great deal of research has been devoted to the effects of variations in rating scale format including differences in the number of response categories. Compulsive buying is a buying disorder. It refers to repetitive shopping, often excessive, as an antidote to tension, anxiety, depression or boredom. Customers perform compulsive buying as if they are not compelled to do so but for them shopping is a pleasurable or functional task. In compulsive buying the consumer has little to no control over consumption (Solomon, 2006). Though compulsive buying is frequently overlooked as a problem, but such customers are often held financially irresponsible. However, the reality of this negative phenomenon is far more complicated than that. Compulsive buying can be devastating not only financially, but also socially, mentally and emotionally (Ergin, 2010). Though the issues relate to compulsive buying are addressed by different authors yet there are very few scales that are developed with an attempt to quantify the extent of compulsiveness in consumers. The most popular of such scales is that of Valence, d’Astous and Fortier (1988). That was the first compulsive buying measurement scale. They identified three constructs associated with compulsive buying behavior

1. A strong emotional activation, resulting in an increase in psychological tension.
2. An acknowledgment that buying will reduce the tension.
3. A high reactivity to the tension, meaning that the buyer is primarily looking for reduced tension rather than object ownership.
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The items on this scale assess three dimensions of compulsive buying
1. A tendency to spend.
2. An urge to buy or shop.
3. (iii) Post-purchase guilt.

In most of the rating scales such as Likert-type scales and other attitude and opinion measures, contain either five or seven response categories (Bearden, Netmeyer, and Mobley, 1993; Peter, 1979; Shaw and Wright, 1967) but the issue of the optimal number of response categories in rating scales is still unresolved. Investigators have studied the response patterns and information retrieval. Symonds (1924) was the first to suggest that. The suggestion was contested by Champney and Marshall (1939), who advocated the use of finer scales, but the case for sevenpoint scales was strengthened by Miller (1956), who suggested in an influential article that the human mind has a span of apprehension capable of distinguishing about seven different items (plus or minus two), which implies a limit of about seven on the number of categories that people are able to use in making judgments about the magnitudes of unidimensional stimuli. This has implications for rating scales: the limit on the human span of apprehension suggests that little if any additional information can be obtained by increasing the number of response categories beyond about seven. The reliability of scores derived from scales with different numbers of response categories was later investigated by Bendig (1953, 1954). The study found relatively constant test-retest reliabilities over scales with two, three, five, seven, and nine response categories, relatively constant inter-rater reliability over scales with three, five, seven, and nine response categories, and a decrease in reliability for 11-point scales. Reliability (in this case inter-rater reliability) of scores is optimized by the use of seven categories. Green and Rao (1970) found that information retrieval is maximized by using six or seven response categories, with little extra information being gained by increasing the number of categories beyond seven. Some researchers confirmed Bendig’s finding that reliability is largely independent of the number of response categories (Boote, 1981; Brown, Wilding, and Coulter, 1991; Matell and Jacoby, 1971; Peabody, 1962). A few subsequent researchers in this area have arrived at different conclusions regarding reliability. Study based on Monte-Carlo simulation methods, Cicchetti, Showalter, and Tyrer (1985) found evidence for an increase in inter-rater reliability from two-point to seven-point scales and beyond 100 response categories there was no substantial. These researchers concluded that “the differences in scale reliability between a 7-, 8-, 9-, or 10-category ordinal scale on one hand, and a 100-point or continuous scale on the other is trivial . . . 7 ordinal categories of response appear at least functionally interchangeable with as many as 100 such ordered categories”. Similar conclusions were drawn by Oaster (1989) with regard to test-retest reliability and inter-item consistency, and a number of other researchers have reported that reliability is maximized with seven-point scales (Finn, 1972; Nunnally, 1967; Ramsay, 1973). These studies provide support in tune with the early findings of Symonds (1924), and more generally for the continued popularity of seven-point scales in practice. But in the case of compulsive buying scale respondent preferences for optimal number of scale points have not been carried out.

1.1 Objective

The objective of the present study is to find the optimal number of scale points in Likert type scales for quantifying compulsive buying behaviour.
2. Research methodology

As the objective goes the main focus of the work is on implementation of the optimal number of scale points in Likert type scales i.e., compulsive buying scale on subjects belonging to a given geographical location. The population selected is an urban population i.e. customers belonging to Silchar town of Assam. As the purpose of the study, stated above the simplest way is to select a sample using the formula \( n = \frac{1}{e^2} \), where \( e \) is the proportion of error present in the study. An error of 10 percent requires a sample of size 100 which would be the final sample size. The sample would be selected using systematic random sampling which is a popular technique of randomly selecting subjects for a market surveys. We obtained responses on a variety of 5-point to 9-point rating scales from 100 respondents throughout the Silchar town (75 men and 25 women, aged from 25 to 60). The respondents were recruited by Systematic Random Sampling. Each respondent filled in a questionnaire consisting of a compulsive buying scale (See Appendix). Respondents were required to tick the appropriate number in each case depending on their opinions or judgments. The respondents first gave their opinions on a 5-point scale (“When I have money, I cannot help but spend part or the whole of it”) and they then gave their opinions from 6-point to 9-point scales. Each respondent completed a questionnaire between one and three weeks, the second questionnaire was issued after the receipt of the first questionnaire. The third questionnaire was issued again after three weeks. Similarly the other two questionnaires were issued. After collecting the data, the information is entered in SPSS 15.0. The box plot for all the scale points with average response values is drawn. If no conclusion about consistency can be drawn from the box plot then researchers take the help of Coefficient of Variation (CV) to find the consistency among the scale points. The researchers calculated the CV for each of the 100 respondents for all the thirteen statements of the 5-point compulsive buying scale. The same procedure is repeated for 6-point to 9-point scales. With the average CV obtained across the different statements for the 100 respondents, Analysis of Variance (ANOVA) is performed with 5-point to 9-point scale as the source of variation. A rejection of the ANOVA test shall lead to the conclusion that the average CV’s are significantly different across the different point scales. In case of significant difference of average CV’s across different scales, the Critical Difference (CD) test can be performed to find out the scale pair which would result to a significantly different average CV. To check the consistency of the data, reliability statistics (Cronbach \( \square \)) of the different scale points is calculated. Greater the value of reliability more is the consistency.

3. Analysis and interpretation

The box plot is drawn for the average response values obtained from the same rating scale with the different scale points. As expected the average responses of the scales and the variation kept on increasing as one moved from the 5-point to the 9-point scale.

Table 1: The ANOVA table for comparing the average CV amongst the compulsive buying scales (5 point to 9 point)

<table>
<thead>
<tr>
<th>Source of variation</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>P-value</th>
<th>F-crit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Scales</td>
<td>8468.098</td>
<td>4</td>
<td>2117.024</td>
<td>4.217021</td>
<td>0.00229</td>
<td>2.389948</td>
</tr>
<tr>
<td>Within Scales</td>
<td>248499.4</td>
<td>495</td>
<td>502.019</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>256967.5</td>
<td>499</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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Figure 1: Box plot for visualizing the average and variation amongst the compulsive buying scales (5 point to 9 point)

From Figure 1, it is clear that as the number of scale point increases mean as well as variance also increases. So, no conclusion about consistency can be drawn from the box plot. Table 1 shows that the calculated value of F is greater than the critical value at 5% level of significance for (4,495) d.f., so the null hypothesis of homogeneity of average CV across the different scales are rejected. Now to find which pairs of average CVs are significantly different, the critical difference is calculated by the formula

\[
CD = \text{Standard Error (SE) of difference between two treatment means} \times \text{t} \% \% \text{ for error d.f.} \]

\[
= 6.210565
\]

Table 2: Difference table of the average CVs

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Mean</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>CV8</td>
<td>53.51319</td>
<td></td>
</tr>
<tr>
<td>CV9</td>
<td>53.23508</td>
<td>0.278112</td>
</tr>
<tr>
<td>CV7</td>
<td>45.93162</td>
<td>7.58157</td>
</tr>
<tr>
<td>CV6</td>
<td>45.32242</td>
<td>9.26158</td>
</tr>
<tr>
<td>CV5</td>
<td>43.9735</td>
<td></td>
</tr>
</tbody>
</table>

Results in Table 2 show that calculated differences when compared with CD (6.210565).
1. CV8 differs significantly from CV7, CV6 and CV5.
2. CV9 differs significantly from CV7, CV6 and CV5.
3. (iii)All the remaining differences are not significant.
So for Compulsive Buying Scale since the difference of the treatment means (from Table 2) between (CV₉, CV₇) is 7.303463 and that of (CV₈, CV₇) is 7.58157 are differing significantly. However, the values of average CV for 5-point, 6-point and 7-point do not differ significantly from each other. This implies that the numerical difference between CV₅, CV₆ and CV₇ can be attributed to fluctuations of sampling only. So, the 5-point, 6-point and the 7-point scales are equally consistent in case of compulsive scales. The reliability statistics (Cronbachα), mean and standard deviation (SD) calculated for all the scale points from 5-point to 9-point are given in Table 3.

Table 3: Table for reliability statistics (Cronbachα), mean and standard deviation for Compulsive Buying Scale for all the scale points from 5-point to 9-point

<table>
<thead>
<tr>
<th>Scale</th>
<th>Mean</th>
<th>SD</th>
<th>Reliability Statistics (Cronbach α)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-point</td>
<td>2.79615385</td>
<td>1.16731733</td>
<td>0.788</td>
</tr>
<tr>
<td>6-point</td>
<td>3.136154</td>
<td>1.345971</td>
<td>0.815</td>
</tr>
<tr>
<td>7-point</td>
<td>3.54</td>
<td>1.547695</td>
<td>0.831</td>
</tr>
<tr>
<td>8-point</td>
<td>3.657692</td>
<td>1.798451</td>
<td>0.858</td>
</tr>
<tr>
<td>9-point</td>
<td>4.22</td>
<td>2.019446</td>
<td>0.864</td>
</tr>
</tbody>
</table>

The results in Table 3 show that as the number of scale point increases the reliability statistics (Cronbachα) also increases from 0.788 to 0.864. Using Hakstín-Whalen (1976) test, of significance for differences among k independent Cronbach Alpha Coefficients, it is determined that none of the differences among the alpha coefficients are statistically significant. The test statistic is given by,

\[ M = \frac{\sum_{j=1}^{k} A_j (1 - \hat{\alpha}_j)^{-1/3} - \sum_{j=1}^{k} A_j (1 - \hat{\alpha}_j)^{-2/3}}{\sum_{j=1}^{k} A_j (1 - \hat{\alpha}_j)^{-2/3}} \]

where \[ A_j = \frac{(n_j - 1)(9N - 11)^2}{18n_j (N_j - 1)} \]

and \( n_j \) is the number of items on the \( j^{th} \) test and \( N_j \) is the number of persons taking the \( j^{th} \) test. Evaluating \( M \) as a \( \chi^2 \) on \( K-1 \) df., \( M = 6.1159, p=0.1907 > 0.05 \)

4. Conclusion

The study was conducted to find the optimal number of scale points for the compulsive buying behavior. To quantify the scales having different scale points, data were collected from the consumers of Silchar town. As the study was conducted in an urban area, so the results may differ for customer’s having a rural upbringing. Even to generalize the results for
urban area similar studies must be performed in other urban locations having similar economic and social mosaic. A careful reading of the ANOVA and Critical Difference table suggest that the 5- point, 6- point and the 7- point scales are equally consistent in case of compulsive buying. The average CVs of the 8-point and 9-point scales are significantly higher than the 5-point scale. Also the 5-point scale has minimum value of average CV. So for compulsive buying scale 5-point scale may be preferred as it is easier to implement for having lesser number of scale points. With regard to reliability, an increment is noted with increase in the number of scale points but the difference amongst the reliability of scales in not significant. Thus, the five point scale shall be preferred in studying the consumer behavior through compulsive scale.

Appendix-I

Compulsive Buying Scale (Valence, d’ Astou’s and Fortier Scale)

1. When I have money, I cannot help but spend part or the whole of it.
2. I am often impulsive in my behaviour.
3. For me, shopping is a way of facing the stress of my daily life and of relaxing.
4. I sometimes feel that something inside pushed me to go shopping.
5. There are times when I have a strong urge to buy (clothing, books, etc.)
6. At times I have felt somewhat guilty after buying a product, because it seemed unreasonable.
7. There are some things I buy that I do not show to anybody for fear of being perceived as irrational in my buying behaviour (“a foolish expense”).
8. I often have an unexplainable urge, a sudden and spontaneous desire, to go and buy something in the store.
9. As soon as I enter a shopping centre I have an irresistible urge to go in to shop and buy something.
10. I am one of those people who often respond to direct mail offers (e.g., books, records).
11. I have often bought a product that I did not need, while knowing that I have very little money left.
12. I am a spend thrift.
13. I have sometimes thought, “If I had to do it all over again, I would ……..” and felt sorry for something I have done or said.

5. References


