

The Pachod Paisa Scale: A Numeric Response Scale for Health and Social Sciences

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Abstract

The paper presents a new numeric response scale, the *Pachod-paisa* scale for measuring attitudes, intentions, emotions, client/patient satisfaction, pain etc. The *Pachod-paisa* scale is based on the Indian monetary system (100 paisa = 1 rupee) and is a ratio level scale. The scale has cultural relevance within the South Asian region as the "*paisa/anna*" reference is a commonly used analogy in all parts of the region.

Three quantitative examples of the application of the *Pachod-paisa* scale to different public health contexts are presented. These examples illustrate the properties of the scale. The examples are from research studies on diarrhea prevention, reproductive health and sanitation. Specifically, the empirical applications of the scale include – measuring emotional appeal of children in a child-to-community intervention promoting handwashing with soap after defecation; gender attitudes in a reproductive and child health study; and cultural beliefs related to sanitation.

The Pachod paisa-scale enables a direct numerical measurement with culturally appropriate reference categories. The results indicate that the *Pachod-paisa* scale can be used to effectively measure attitudes, emotions, intention, client satisfaction etc. The scale has ratio level properties which enables more calibrated measurement. Other potential applications of the *Pachod-paisa* scale include measuring pain as well as quality of life. The scale can be used in both community and clinical settings.

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Introduction

Valid measurement and its methodology has long been the foundation of health and social science research (Cook and Campbell, 1979 , Nachimias and Nachimias, 1981, Carmines and Zeller, 1979). Advancement in measurement of social determinants of health outcomes such as attitudes, cultural beliefs, gender inequity etc. is essential for improved health and social science research. The present paper describes one such advancement in measurement – the Pachod Paisa scale, a numerical response scale that enables researchers to measure attitudes, beliefs, and perceptions such as client satisfaction, pain etc., with a higher level of precision and hence predictive power.

Newer techniques of attitude and perception measurement can provide researchers with the ability to quantitatively measure variables customarily confined to qualitative enquiry such as socio-cultural beliefs. The Pachod Paisa scale demonstrates a culturally appropriate way of eliciting agreement among respondents to various attitude and perception statements. The objective of the paper is to present empirical evidence for the Pachod Paisa scale and to demonstrate the scope of its application to health and social sciences in the South Asian region.

Measurement Scales

Response scales are used to measure attitudes, attributes, client satisfaction, cultural beliefs, values etc. A response scale has been defined as, “....the way you collect responses from people on an instrument. You might use a dichotomous response scale like agree/disagreeor you may use an interval response scale like a 1 to 5 rating” (Trochim, 2006). A response scale is also

known as an “answer scale” and can have two, three, five and seven choice responses (Comrey, 1988).

The most commonly used response scales in the health and social sciences are the Likert, Thurstone and Guttman scales (O’Keffe, 1991, Clason and Dormody, 2000). The Likert scale typically consists of a five point scale ranging from “strongly agree” to “strongly disagree”. It is most often used to measure responses to a set of statements. The Likert scale is an ordinal scale. The main characteristics of an ordinal scale is that “the categories have a logical or ordered relationship to each other (Nachimias and Nachimias. 1981). The Thurstone and Likert scales permit the measurement of degrees of difference, but not the specific amount of difference. However, there are statistical problems with two and three choice responses as there is a lack of variation. Since the data is not continuous the mean cannot be calculated.

Attitudes and perceptions have traditionally been measured on five point Likert scale and its variants (O’Keefe, 1991). The cross cultural application of the Likert type scale is debatable in contexts where the definitions of “strongly agree to strongly disagree” are not standardized and are subjectively interpreted (Heine, Lehman et al, 2002).

Scales such as the Likert type scale are well accepted and tested in Western countries, but their applicability can be questioned in cross-cultural use (Heine, Lehman et al, 2002). The major problem with the cross cultural applicability of the Likert type scale lies with construct validity (Van de Vijier and Tanzer, 2004). The categories “strongly agree ...agree” and “strongly disagree ... disagree” have a hazy distinction in the Indian cultural context. In rural India, attitude measurement with a Likert type scale has been problematic because the “agreement” categories when translated into the local language are prone to subjective interpretation as within the Indian culture, and hence within Indian languages, there is no clear cut distinction between “strongly agree” and “agree” or “strongly disagree” and “disagree”.

Heine, Lehman et al (2002) discuss the problems of “subjective Likert type scales” in cross cultural applications. For example, the limit set to define “maximum agreement” may vary from individual to individual, within the same culture too. Therefore numerical response scales that provide more objective response categories have been suggested as one of the alternatives to overcome the subjective Likert response categories (Heine, Lehman et al, 2002).

The Likert scale typically consists of a five point scale ranging from “strongly agree” to “strongly disagree”. It is an ordinal scale. The main characteristics of an ordinal scale are that the categories have an ordered relationship to each other. Ordinal scales permit the measurement of degrees of difference, but not the specific amount of difference. Often, ordinal scales are treated as interval scales but we do not know if the distances between the response categories in an ordinal scale are equal. Hence only the mode and median can be calculated but not the mean (Clason and Dormody, 2000).

The Pachod Paisa Scale

The Pachod Paisa scale is based on the monetary currency in India, the “rupee” which has a total of “100” paisa. The cultural dimension of the scale comes from the traditional 16 point “anna” denomination of the rupee which has been used since hundreds of years in India as part of daily speech to denote various analogies. Sixteen *annas* equal one rupee (an *anna*¹ is one-sixteenth of a rupee; the currency of India is the rupee). Therefore 25 paisa = 4 *annas*, 50 paisa = 8 *annas*, 75 paisa = 12 *anna*, 100 paisa = 16 *annas*.

For example, it is common in India to state during daily interactions among people that, “this year the crop was only 50 paisa good” or “boil the potatoes 75 paisa”. The scale elicits

¹Rupees and annas were the units of currency from medieval times to the 1950s when the decimal system (Rupees and paise) was introduced. However anna measures continue to be used in daily speech.

agreement in paisa, “0-100”, thereby providing the researcher with a continuous variable ranging from 0 to 100. The scale is advantageous because it contextualizes a way of measuring agreement among respondents within the existing culture. Lack of literacy does not become an obstacle while using the Pachod Paisa scale, since everyone, literate or non-literate deals with money and can therefore relate to the "amount" of agreement.

0 paisa -----100 paisa

The Pachod Paisa scale uses a culturally relevant categorization to measure attitude; one in which the sorting criterion matches a preexisting cultural category. The origin of the Pachod Paisa scale represents the wisdom of an elderly non-literate village woman in Pachod village, India.² Hence the name “Pachod Paisa” scale. The Institute of Health Management, Pachod (IHMP) continues to use the “paisa”/anna” analogy for its nutrition education programmes. The cultural dimension provides respondents familiarity with the criterion on which to sort attitude statements.

Categories based on numerals will most likely have greater uniformity in terms of distance between categories, as perceived by the respondents. As a result, it can be expected that there will be less variation in the interpretation of “75%” and “100%” than in the interpretation of “agree” and “strongly agree”. The Pachod Paisa scale enables a direct numerical measurement

2 Origin of the Pachod-paisa scale

An elderly rural woman from Pachod village, Maharashtra, suggested the use of “annas/paisa” to describe degrees of malnutrition in children under three years (healthy = 16 annas or one rupee, first degree malnutrition = 12 annas, second degree malnutrition= 8 annas and third degree malnutrition = 4 annas). The paisa criterion was subsequently applied for measurement of attitudes and perceptions.

with a set of culturally appropriate reference categories. The Pachod Paisa scale has the following properties:

1. It is a numeric response scale
2. It is a ratio-level scale and can also be used as an interval scale
3. Its cultural appropriateness enables a higher level of precision in measurement

Methodology

This paper presents a new measurement technique that can be applied in the South Asia region. The methodology in the paper for demonstrating the properties and uses of the Pachod Paisa scale include providing empirical examples from three different studies. The first example illustrates the application of the Pachod Paisa scale in the measurement of an emotional appeal scale and its predictive power in the context of a personal hygiene promotion programme in rural Maharashtra (Kapadia-Kundu, 1994). The second example shows the properties of the Pachod Paisa scale as a continuous variable where gender attitudes are measured in a sample of 919 couples in a reproductive health study in an urban slum setting in Pune conducted in 1999. The third example indicates the application of the Pachod Paisa scale to the measurement of cultural beliefs and its ability to predict latrine use in a sanitation study in rural Maharashtra (Dyalchand, Kapadia-Kundu et al, 2001). The Pachod paisa scale has some weaknesses. The questions using the scale need to be formulated such that they provide a reference to the rupee as a whole, “how many paisa **in a rupee** do you think that

rather than “how many paisa do you think that.....”. Field investigators need to be well trained in asking questions on the paisa scale in order to get reliable data.

Results: Application of the Pachod Paisa Scale

Example 1

Demonstration of Attitude Measurement & Scale Development

The study assessed the impact of a 3-year intervention that involved children promoting handwashing with soap after defecation (Kapadia-Kundu, 1994). The study also examined the role of the emotional appeal of children in enabling behavioural change in women. The study was conducted in 10 villages in Maharashtra with a sample of 264 rural women (15-49 years). The Pachod Paisa scale was used to measure the “emotional appeal” of the child messengers who were promoting the use of handwashing with soap after defecation.

Questions using Pachod Paisa scale to the emotional appeal of the Bal Sevaks (child messengers).

1. How many paisa in a rupee do you feel like learning from Bal Sevaks (child messengers)?
2. How many paisa in a rupee do you feel happy when Bal Sevaks come to your house?
3. How much attention in a rupee do you give Bal Sevaks when they come to your house?
4. How many paisa in a rupee do you think Bal Sevaks are serving their village?

The scale for measuring emotional appeal of children has 4 items, with an average inter-item correlation of 0.61 and a Cronbach’s alpha of 0.86. The scale also had a fairly high correlation with the dependent variable of the study – handwashing with soap (0.28).

Table 1 shows the logistic regression model to determine the predictors of handwashing behaviour. The adjusted model indicates that the emotional index is a significant predictor in the model and that women who had a high score on the emotional appeal index were 8.4 times more likely to change their behaviour than women with a low score. Similarly women with a medium score were 3.4 times more likely to change their behaviour compared to women with a low score.

The model explains about 40 percent of the variance. The emotional appeal index has

contributed a significant amount to the variance explained in the model. In large part, this is due to improved, more precise measurement.

Example 2

Demonstration of Pachod Paisa Scale as a Continuous Variable

Survey data were collected from a randomly selected sample of 919 ever married women (15-49 yrs) and their husbands from 27 slums in Pune, India in 1998-1999. The respondents were selected from a census of 6,743 households through systematic random sampling. The sample survey included several outcomes of reproductive health. The sample size was chosen to measure the effect of a reproductive and child health intervention using a pre-post design. The survey included sections on – background information, reproductive history, abortion, women’s health, maternal health, child health, gender attitudes and male involvement. Data on male gender attitudes were collected from 919 men as part of the study.

Questions using Pachod Paisa Scale

Gender Attitudes

- How many paisa in a rupee do you feel that the woman should be given more food during pregnancy?

_____ Paisa

- How many paisa in a rupee do you feel that men work more than women?

_____ Paisa

- How many paisa in a rupee do you feel that a husband should not beat his wife?

_____ Paisa

- How many paisa in a rupee do you feel that a daughter should inherit an equal amount of property as a son?

Table 2 demonstrates the use of the Pachod Paisa scale as a continuous variable. Since the Pachod Paisa scale has a meaningful zero, it possible to calculate the mean. Also, statistical tests such as t test can be used instead of chi square tests that are used for ordinal data. The data indicate that women on average are more likely to feel that they require more food during pregnancy than their spouses. Similarly there is difference on average between women and men on how strongly they feel that “compared to men, women work more” (Table 2). The table indicates that women feel more strongly than men that they should not be beaten. Only in the instance of obtaining equal property rights do men feel more strongly than women on gender issues (Table 2).

The data also provide us with an example of the distribution of the responses to the scale. The responses indicate that there is clustering around 25, 50, 75 and 100 paisa. This is expected as previously the rupee was often expressed in four quarters – 25 paisa (4 annas), 50 paisa (8 annas), 75 paisa (12 annas) and 100 paisa (one rupee). However the clustering varies according to the statement or item that is being measured. The difference between the Pachod Paisa scale and an ordinal scale is that despite clustering on the “0 25, 50, 75 and 100” paisa points, it does elicit responses along the 0-100 continuum. For example for variable “more food during pregnancy” the distribution indicates that about 69 percent of the responses clustered around the quarter markers in the scale (refer Figure 1). However there were 31 percent who responded on other numerals other than 0, 25, 50, 75, 100. It is this 31 percent that contributes to a higher level of variance in response. The clustering around the 5 points ranges from 60 to 80 percent. About 15 percent to 31 percent of the responses on the four variables were for numerals other than “0, 25, 50, 75 and 100”.

Example 3

Measurement of Cultural Beliefs on Pachod Paisa Scale

The third example demonstrates how the Pachod Paisa scale can be used to quantitatively measure cultural beliefs and practices. The example provided illustrates how the cultural beliefs of purity and pollution were measured in the context of a sanitation study in rural India. The study was conducted in rural Maharashtra in 11 villages where every household had been provided an individual latrine free of cost by the government. The sample for the study was 334 households with the respondent being the head of household. However latrine use in these villages was only 13 percent. The study assessed the determinants of latrine use.

The cultural variables measured on Pachod Paisa scale were – (1) level of impurity assigned to latrine and (2) level of impurity assigned to open field.

The study examined the relationship between the Indian belief system of “purity and pollution” and the willingness of rural households in Latur to use latrines. Impurity ratings were given to defecation sites such as latrine and open field. There is a clear difference in the amount of impurity accorded to the open field versus the latrine. While 47 percent felt that the latrine had 75 paisa or higher level of impurity, only 27 percent rated the open field as highly impure (Figure 2). The data indicate that latrines are considered highly “impure” by almost half the respondents.

A predictive model was fit for latrine use with 9 independent variables using logistic regression (Dyalchand, Kapadia-Kundu et al, 2001). The variables were divided into the following categories: socio-demographic (age and education), community characteristic (village), technical knowledge (time required fill pit), group influence (perceived latrine use in neighbouring households) and attitudes towards defecation (disgust towards latrine; will use latrine even if pit is close to house; impurity of open field) and distance of latrine from the kitchen.

The final model explained about 50 percent of the total variance of latrine use (Pseudo R square = 49.6) indicating that the independent variables have a high explanatory power. The Indian belief system of purity and pollution received strong ratification in its relation to latrine use. Respondents with a low level of disgust towards the latrine were 2.9 times more likely to use it than those with high levels of disgust. Those who strongly agreed (> 75 paisa) that they would use a latrine even if the pit is close to the house were 3.6 times more likely to use the latrine. Those who felt that the open field had high impurity (> 75 paisa) were 6.0 times more likely to use a latrine.

Discussion and Conclusions

The examples provided in this paper demonstrate the use of the Pachod Paisa scale to measure attitude and cultural variables. Based on the *rupee-paisa* currency denomination, it is a culturally appropriate numerical response tool. The high reliability coefficients for various scales based on the Pachod Paisa measurement suggest that the scale has potential for further application and use in the Indian subcontinent. The Pachod Paisa scale offers the possibility to strengthen measurement in the social and health sciences in the Indian subcontinent. Other regions of the world could experiment with using “monetary” categories as response scales and see how it works in their context. The advantage of monetary categories is that they provide researchers with an objective numerical scale.

The paper presents a new response scale that can be further applied to many areas of measurement such as: intention, quality of life, pain, client satisfaction, provider satisfaction etc. This is an important, especially if more systematic variance is to be accounted for from survey data. Better measurement also means more valid estimates and inferences.

In the first example, the Pachod Paisa scale enabled the measurement of the intensity of emotions. In the second example, the measurement of gender attitudes was shown as were the properties of obtaining a continuous variable. Finally, the measurement of the cultural concept of

purity and pollution and its significance in predicting latrine use was demonstrated. The advantage of the Pachod Paisa scale is that it provided non-literate respondents with a culturally meaningful set of response categories. The cultural appropriateness of the Pachod Paisa scale and its application for social and health science measurement in the South Asia region, indicates there is scope in other cultures to adapt locally relevant constructs to improve measurement of attitudes, beliefs and perceptions.

The main strength of the Pachod Paisa scale is that it combines a numeric scale with a relevant cultural construct, thereby enabling more valid measurement. It also leads to greater variance and more calibrated measurement and provides researchers with options of quantitatively measuring socio-cultural and perception related variables. However the scale requires further testing in different settings and contexts. It has been used to measure quality of life in a cataract surgery study in Hyderabad and has also been used in Bangladesh. The Pachod-Paisa scale has enabled the establishment of an empirical association between gender attitude and women's health (Kapadia-Kundu and Tupe, 2001). The Pachod Paisa scale has also been used to measure social influence (IHMP, 1999).

In conclusion, the Pachod Paisa scale provides a new way of measuring attitudes, intention, cultural beliefs etc in the South Asian region. Its properties include numeric measurement and cultural appropriateness. It has shown us that people can provide numeric estimates of attitudes, perceptions and intentions in the context of a culturally relevant sorting criterion. Several examples demonstrate how the Pachod Paisa scale has enhanced the predictive value of the variables measured, thereby offering researchers an opportunity to quantitatively measure social determinants of health.

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Table 1 :Predictive Model of Handwashing Behavior

Variables	Study Group (N=264)	
	Odds Ratio (OR)	95% Confidence Intervals OR
Literacy 0: Non-literate 1: Literate	3.1**	1.2-7.6
Age _ 31 yrs > 31 yrs	0.5	0.3-1.1
Occupation 0: Agri+ 1: Pt time lab 2: Other	2.2* 1.5	1.0-5.0 0.5-3.3
Soap location 0: No soap 1: Inside+ 2: Outside	0.6 4.5**	0.2-1.7 1.6-12.5
Perceived Bar.: Soap 0: Difficult 1: Not diff	7.7***	3.6-16.5
“Dabba” 0: Low belief+ 1: Med. Belief 2: High belief	1.5 3.1**	0.4-5.9 1.2-7.8
Knowledge 0: Low 1: High	1.4	0.7-2.9
Emotional Index		
0: Low+ 1: Medium 2: High	3.4** 8.4***	1.4-8.3 2.7-26
Universalization 0-10	1.2***	1.9-8.6
Log likelihood		-105.48
Chi ² (df)		138.3***(13)
Likelihood Ratio test chi ² (df)		33.8 *** (3)
Pseudo R ²		0.40
Hos-Lem. Good. of Fit Chi ² (df)		6.4 (8)

* p<.05 ** p<.01 *** p<.001 +Reference category

Table 2: Mean Comparison of Gender Attitudes Among Women (15-49 yrs) and their Husbands in 27 Slums, Pune (N=919)

Gender Attitude	Mean (in pasia)		t-value
	Male	Female	
More food during preg.	59.8	69.4	6.76***
Compared to men, women work more	66.3	74.9	6.05***
Husband should not beat his wife	62.1	74.3	8.35***
Equal sharing of father's property	82.5	72.2	-7.81***

*** p < .001