Face Validation of Questionnaires Measuring Pro-Environmental Behavior Towards Energy Conservation and Green Transport Use

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Certificate of the Supervisor

This is to certify that the work titled, "**Face Validation of Questionnaire Measuring Pro-Environmental Behaviour Towards Energy Conservation and Green Transport Use"** is a research work of **Mr. Umesh Shinde**, Research Intern, Psychology Research Unit, Indian Statistical Institute (ISI) Kolkata, carried out under my supervision. This dissertation is submitted by him in fulfillment of the requirements for the completion of the research internship. To the best of my knowledge, the dissertation embodies the results of original work by the researcher and has not been submitted elsewhere for any other degree or distinction.

Date: **Dr. Debdulal Dutta Roy**

Declaration

I, Mr. Umesh Shinde, hereby declare that the research internship dissertation entitled "**Face Validation of Questionnaires Measuring Pro-Environmental Behavior Towards Energy Conservation and Green Transport Use**" is a record of original research work done by me under the guidance and supervision of Dr. Debdulal Dutta Roy, Head & Associate Professor, Psychology Research Unit, Indian Statistical Institute, Kolkata, in partial fulfillment of the requirements for the dissertation submitted as a part of the internship program on Environmental Psychology and that it has not found the basis for the award of any Degree/ Diploma, Fellowship or other similar titles to any candidate of any university.

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Acknowledgment

Abstract

Background Environmental degradation is one of the top issues worlds is facing which has resulted into increased natural calamities, uncertain weathers, exploitation of energy sources etc. The number of questionnaires has been developed in environmental research in recent years. To promote sustainable lifestyle on earth without exploiting earth resources, individuals need to actively participate in pro-environmental behaviors. Behavior is an expression of human internalized system of beliefs, attitudes, values towards a person, thing, or object. **Objective** The current papers explore the construction of comprehensive valid questionnaire for measurement of pro-environmental behaviors. It aims to test the face validity of the constructed items for the pro-environmental behavior questionnaire towards energy conservation and green transport use specifically. Energy conservation refers to behaviors about reducing demand, protecting, and replenishing supplies, developing, and using alternative energy sources, cleaning of the damage from the prior energy processes. However, Green transport use refers to behaviors endorsing convenient, safe, efficient, low pollution humanized and diversified urban transportation system. **Method** After literature review, an item pool of 33 items was constructed and evaluated by referring to Thurstone and Chave's (1929) criteria. Further, all the 33 items sent to 42 environmentally conscious experts from different fields for rating purpose. The items have been sent using Google forms and in random order. **Results** The results revealed that expert raters have given higher ratings for the items which included wordings similar to the operational definition of respective domains, which indicates the high intensity in relevance of items measuring particular domain as well as suggesting good face validity. Item contained wordings such as energy efficient, sustainable transport, energy saving received high mean ratings. It is also observed that items which complemented the operational definition, received higher average ratings and lower withing group variability among expert raters. **Conclusion** The present study explored and validated the two dimension of pro-environmental behavior domains: energy conservation and green transport use. Items matched with operational definition of study domains showed high face validity indicating good internal structure of the test. Findings of this study can be used to construct Pro-environmental Behavior Questionnaire using more specific domains. Also, it can be used further to establish reliability, validity, and exploratory analysis.

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Chapter I

Introduction

Environmental degradation is one of the top issues worlds is facing which has resulted into increased natural calamities, uncertain weathers, increased pollution, exploitation of energy sources etc. To promote environmental sustainability, individual behavioral choices are important. Human behaviour has been regularly major contributor to various environmental issues. (Clayton and Howard, 2011; Wynes and Nicholas, 2017). To address these issues, we need to understand the human behaviors that aggravate or mitigate them. Behavior is an expression of human internalized system of beliefs, attitudes, values towards a person, thing, or object. The pro-environmental behaviors include class of behaviors that includes commission of acts that benefit to the environment e.g. (recycling) and omission of acts that damages it (e.g., avoid air travel). Ability to measure PEB is crucial prerequisite for scientific analysis of PEB. Precision of measurement involves accurate and reliable quantification of some dimensions of the response of interest. These response dimensions encompass characteristics of behaviour such as frequency or rate, duration, and latency, topography, and force. (Kahng et al; 2011). The number of questionnaires has been developed in environmental research in recent years. To promote sustainable lifestyle on earth without exploiting earth resources, individuals need to actively participate in pro-environmental behaviors. The constructed scale will help psychologists in psychological counselling for environmental management. It can also be used for research purposes.

The young population must understand the need for this hour. Youth population is considered as one of the important agents of change. There is need to encourage pro-environmental behaviors among young generation. To measure PEB, the current study has used impact-oriented approach rather than intent-oriented approach. Intent oriented measures usually focus on attitude rather than behavioral component and do not measure behavior with actual environmental impact (Lange & Dewitte, 2019). Many articles have categorized and discussed involving distinction between private-sphere based and public-sphere based behaviors (Larsen et al, 2019).

1.1   Domains of Pro-Environmental Behavior

It is important to understand what factors constitutes engagement in behaviours that protect the environment and reduce human impact on environment (Gifford, 2014). Pro-Environmental Behaviours consist of energy conservation or saving electricity (e.g., turning off lights when not in use), green transport use (e.g., use of public transports, walking, riding bikes, use of electric vehicles), recycling (e.g., reuse of plastic, paper, glass containers etc.), water conservation (e.g., limiting use of water while taking showers or washing activities etc.), reuse (e.g., disposable cups), proper disposal of non-recyclable waste, minimalism is use of paper (e.g., double-sided printing), and buying or consuming sustainable, biodiversity, organic and green products. (Bamberg & Möser, 2007; Bissing-Olson et al., 2016; Chatterjee A., 2021).

1.1.1 Energy Conservation

Energy education for the youth who are future consumers, decision makers, scientists, skilled labor force in new technology, is important for the world. Energy conservation and pro-environmental behavior are linked with each other (Bissing- Olson et al., 2016).

Eco efficiency explains the concept of Energy Conservation. The motives behind the energy conservation behaviors are save utility bills, reduced and protection of environment. Energy Conservation behaviors at household can range from simple such as switching off lights and to extensive home improvements like use of or switching to energy efficient appliances. The behaviors include use of line dryers or sunlight instead of dryers, dishwashing by hand, turning off electric appliances when not in use. Electric appliances consumer almost half of the household utility bills, reduction and control use of appliances results into greatest savings.

1.1.2 Green Transport use

Green Transport Use behavior encompasses of adoption of technology, driving habits, travel mode decisions, and more. The theories of behavior change, and sample interventions used in the past to change transportation behaviour target one of two domains: personal and professional and one of the three types of behaviors: efficient use, purchase behavior or mode switching. Most interventions focus on personal transportation behavior. Green transportation is relatively new concept, and it includes low carbon and environmental travel mode. Green transportation includes two perspectives, means of transportation and vehicle

of transportation. Mean of transportation perspective includes cycling, walking, use of shared or public transport etc. However, vehicle of transportation perspectives includes low carbon vehicles such as running on dual energy, natural gas vehicles, electric vehicles, hydrogen power or solar power vehicles. It also includes electrified transportation vehicles such as buses, trams, light rails etc. Green transportation concept is more people-oriented than vehicle oriented. It advocates less private vehicle use, green energies use. According to Green transportation perspective, it is the low-cost, pollution free, resource saving transportation system for travelers. It is ideal means of transportation to cover short-distance transfer and travelling also indispensable part of urban transport system. The concept of green transport use has been expanded since last past few years, due to the rising gas and petrol prices. Important implication of green transport use is it takes off the burden from the earth's fossil fuels such as oil, natural gas, and petroleum. These natural resources take thousands of years to replenish. Use of fossil fuel is great threat to environment especially to the air, water, and trees. This increases the risk of diseases like asthma. Thus, it is the need for hour to switch to green transportation systems. Scrutinizing people's behavior and recognizing user profiles to reveal the degree to which they practice pro-environmental behaviors will shed light on the critical aspects of behavior relevant to everyday mobility practices. Such information can be used for policy making and enhancement of existing policy practices. (Mikiki et al., 2012). Green transport use behaviors can also be reinforced through implementation of successful green transportation systems. Green Transport systems gives full play advantage to ground traffic, rail traffic, and reasonable labor division based on distance (Han-ru Li, 2016).

1.2 Face validity

Face validity is one of the methods to assess the internal structure of the test. The term face validity has been emerged and discussed throughout psychometric literature in late 1940s and early 1950s which was published very first Standards for Educational and Psychological Tests published by APA (Mosier; 1947, Cronbach; 1949, Anastasi; 1954, APA; 1954). Face validity is the judgement concerning how relevant the items be in accordance with objective. A test said to have high face validity if it appears to measure what it purports to measure on "the face of it". For example, a test labeled as Extraversion/Introversion Scale, which has items that ask test takers whether they have acted in extraverted or introverted manner in specific situation, may be

perceived as having high face validity. In contrast, a personality test which ask the test takers to report what they see in inkblots may be perceived as having low face validity. Poorly designed test items usually result into lower in face validity. And thus, it is important that test items should appear clear and relevant to test takers. One of the ways to carry out the face validation process asking group of test taker who will provide valuable feedback and input in terms of what test items ask as they are the important stakeholders for whom the test is made. Usually, test takers are lay people, and their comments/suggestions are completely subjective in nature. Hence, another method can be employed can be use of Subject Matter Experts (SME's) for test content and process validation. SME's can be of two types based on purpose of validation. Content SME's usually parts of constructing the items however, Process SME's helps to determine, from their perspective, if the test items are relevant and capture the construct of interest in measurement process. To get the best feedback from SME's, it is important to provide them clarity what is being measured. This helps them to be able to indicate which items are deficient and contaminated in terms of missing aspect of the construct that should be included, or items solicit information that not in the construct.

1.3   Q-Sorting method

The Q-method was selected for this research study on its applicability to garner responses related to behaviors especially in the field of pro-environmental practices. Q-Sorting technique is defined as "a modified rank-ordering procedure in which stimuli are placed in order that is significant from the standpoint of a person operating under specified conditions" (Brown 1980, p. 195). Originally developed by physicist-psychologist William Stephenson (1930), Q-Sorting is analytical method help researchers to understand human subjectivity (e.g., person's feelings, opinions, perspectives, or preferences), thinking patterns which represent different stances on specific issues by ranking and sorting of series of items. (Jinbo-He et al, 2017; Zabala et al, 2018, Chatterjee, 2021).

QST is an iterative process where ranking, ratings and sorting by expert judges are taken on whether questionnaire items are valid measures of the being measured construct, just on face of it. In other words, expert judges evaluate if each of measuring items, if matches with conceptual definition of domain, or the construct being measured. This process is carried out in two steps. In first step, expert judges are requested to sort the

questionnaire items by matching questionnaire items with different operationalized constructs, based on which inter-rater agreement is determined. In second step, to improve the agreement between expert judges, items which are identified to be weak, ambiguous are rephrased or deleted (Nahm et al, 2002; Chatterjee, 2021).

A study by Kaitlyn Jean Waters (2020) used Q study method. In this study, participants were asked to place on a Likert scale from 1 to 9 based on how much they agreed with 9 being agree and 1 being disagree category.

For example,

1) After filtering the information, I receive from the media based on my own knowledge, I form

my opinion.

95% agree category, 0% disagree category

2) I want there to be an increase of media coverage related to environmental issues.

95% agree category, 0% disagree category

This study results indicated how media plays important role in disseminating information and how it has effect on actual behaviors of people towards environment which is evident through the 95% ratings given by the participants.

1.4 Summated rating scale

For the present study a summated rating scale was used. Summated rating scale - A summated rating scale or a Likert-type scale is a psychometric scale frequently employed to assess people's attitudes, opinions, behaviors, and perceptions. Here, respondents specify their frequency of past and current behaviors on a never - always scale for the number of statements assessing a respective domain. Frequency is defined as number of responses in which the behavior occurred. It is assumed that the frequency of a behavior is linear i.e., on a continuum from never to always. In responding to each item, the respondents indicated at what frequency they practice specific behaviors ranging from always to never. The numerical values have been assigned to each response depending on the frequency selected by the respondent. The total score of a person on the questionnaire is determined by summing up the values assigned to the individual responses.

1.4.1 Criteria used to construct behavior questionnaire

Extensive literature review has been done on pro-environment behavior topic. Various journals, articles, books, and internet resources have been used.

1.4.1.1 Item generation

Based on review of literature, two domains have been selected and operationally defined i.e., Energy Conservation and Green Transport Use (Chatterjee, 2021). Anchors selected from operational definitions have been used for item generation.

1.4.1.2 Item construction

All the items were constructed which does not include ambiguity or technical words, and double negatives. Constructed items have been evaluated and modified in the light of the informal criteria given by Thurstone and Chave (1929) and Edward and Kilpatrick (1948).

- All statements should be expression of desire behavior.

- Simple, clear, and direct and straight-forward sentences should be used for writing items.

- Statements should be formulated in a way which could tap on present behaviors.

- Statements that may be interpreted in more than one way should be avoided.

- Factual statements should be avoided.

- Statements should be relevant to the present psychological construct.

- Statements should be within 20 words.

- Double negatives should be avoided.

- Items should possess only one principal clause and no subordinate clauses.

Finally, all the 33 items (18 items pertaining to Energy Conservation, and 15 items pertaining to Green Transport Use) were selected to administer.

1.5 Self-report measure of PEB

Self-report assessment, respondents are asked to give information on behaviors they perform every day. It is a popular and low-cost measure which usually attracts researchers and can be used by large scale social research (Tam & Chan, 2017; Pisano et al, 2017). This approach targets behavioral properties such as if they engage in PEB, how frequently they engage themselves etc. The self-report measures usually measures specific or general PEB. The current paper includes items which measure both the types of behaviors. Also, PEB measures can be single item or multi-item based. Multi-item scales are highly diverse as well as they relatively less affected by measurement error (Churchill, 1979' Markle, 2013). Many questionnaires are ad hoc and just been developed for a particular research study (Dono et al, 2010). Other researchers focus on creating tools by using psychometric analysis of item and scale properties. It is preferable to use such approach as it provides evidence-based confidence to measure constructs of interest precisely and cumulative literature in the field of PEB. Globally used PEB measures include specific scales that are population-specific (Kaiser et al, 2007; Evans et al, 2007), context-specific or domain specific. The current scale uses domain-specific approach.

The validity of self-reported measures measuring PEB's always been questioned (Gifford, 2014). It is important for a self-report item to correspond with properties of respective behavior. For example, if Person A often saves electricity more than person B then respondent A should indicate higher frequency of energy conservation to the question, "*I switch off personal electronics when not in use.*" then respondent B. People are impartial observers of own behavior. Sometimes, they respond to questions items the way they would like to behave or according to expectations or preferences of researcher. Social desirability may affect the measurement process and meaning of scores obtained. Hence, these things have be considered and clear instructions have been formed to get the honest responses from the test itself.

1.6 Need for pro-environmental behavior questionnaire

Climate change is existential. We are facing extreme environmental problems and yet we continue to behave in ways which is damaging the planet as well as our health. Human behaviors disrupt the natural environment and become threat to sustainability. Promoting pro-environmental behaviors for conservation of environment has now been discussed extensively in literature and government policies. The conservation messages itself does not include the actual measurement of how and at what extent people are practicing such

environment friendly behaviors which results into need for reliable and accurate need for measurement of behaviors toward Energy Conservation and Green Transport Use. To construct the comprehensive measurement questionnaire requires understanding of behaviors associated with Energy Conservation and Green Transport Use. The current study literature will focus on two domains Energy Conservation and Green Transport Use. Several questionnaires exist in literature which focus on measuring behaviors in general, specific, laboratory based, observation based etc. Hence, the objective of this study is to create valid comprehensive questionnaire measuring pro-environmental behaviors in terms of current lifestyle and crisis sensitive which can be used in psychological counselling for environmental management. The information gathered about degree of pro-environmental behaviors; critical behavioral aspects of everyday mobility practices could be used to enhance green transport policies that presently seems to be inadequate.

1.7 Objective of the study

Environmental degradation is one of the top issues worlds is facing which has resulted into increased natural calamities, uncertain weathers, exploitation of energy sources etc. It is the need of an hour for everyone to take responsibility and act in favor of environment. The youth including university and college students are among population which can be assessed in terms of practicing environment related behaviors as they are the central aspect to bring the change to reinforce such behaviors. To accomplish this, there is need for domain specific measurement scales which reflects reliable and valid measures of constructs of interest. The present study focuses on examining the pro-environmental behaviors related to Energy Conservation and Green Transport Use.

The main objective of the study includes testing face validity of the items for the Pro-environmental behavior questionnaire measuring Energy Conservation and Green Transport Use.

Chapter II

Literature Review: Perspectives of Study

In this section, review of literature on the following topics has been covered.

2.1   Literature Review: Energy Conservation

Wichitra et. al (2012), to change student's behavior to energy conservation modes of transportation, investigated travel behavior and factors influencing behaviors towards the energy conservative modes of transport through a case study of Mahasarakham University. The study setup on three hypothetical conditions – carpool or ridesharing, car-free day, and Ribbon-Bicycle projects. The study estimated the amount of energy that could be reduced if students participate in each of the three projects. The study showed that most of the student's behaviors such as preference of convenient mode of transportation, personal vehicles over public ones. Study also found locations of students living places, monthly allowance factors significantly impacted their travel choice behavior. It suggests that is important to consider the needs and constraints as key element in travel behavior.

Studies with experimental design had shown how social norm manipulations affect everyday pro-environmental behaviors in the domains of energy conservation (Dwyer, Maki, & Rothman, 2015). In two studies, influence of descriptive norms and personal responsibility was investigated to promote energy conservation behaviors in public bathrooms. Light status was manipulated as on or off signaling the descriptive norm before participants entered unoccupied public bathroom. Participants were more likely to turn off the lights if they were off when they entered. Additional manipulation included in another study was turning off the light was demonstrated by the confederate and participants themselves were not responsible for turning it on. Personal responsibility moderated the influence of social norms on behavior. The studies showed how descriptive norms and personal responsibility regulates energy conservation interventions.

Kunanunt Thayayuth & Paitoon Pimdee (2018), study aimed to study the energy conservation behaviors of university students and comparison of energy saving behavior categorized by gender and university groups. The study findings revealed that students exhibited energy conservation behaviors in a family context with high level, for

themselves and at public context it was moderate level. Males and females showed different energy conservation behaviors. Also, students from students under different university groups also showed different energy conservation behaviors.

Janda (2008) surveyed 1064 Thai vocational students and found that students gained their willingness and knowledge about energy conservation from their families and school. The study also found gender difference, especially women found to have higher energy conservation habits than men do. Similar gender effect found in study done by Varejao, 2010.

A study by Majdi et. al. (2020) aimed to identify the user's pro-environmental behavior, especially, energy conservation behavior of university user of Kuwait. Data on two variables environmental knowledge and awareness of consequences was acquired through questionnaire keeping with Kuwait's social norms and culture. Results indicated indirect effect these two variables on conservation behavior. In addition to it, results also revealed that societal pressure and culture has significant affect on user's intention to engage in energy conservation behavior. The results put light on need to encourage energy conservation behaviors among Kuwaiti academics and eliminating barriers to pro-environmental actions.

Zofia et. al (2021) conducted a study to identify and analyze the behavior of students who study issues related to energy saving, in terms of energy conservation. The study focused on analyzing and comparing the responses surveyed across Czech Republic, Poland, and Ukraine which was carried out using computer-assisted web interview. The study results revealed that 60% students follow principles of energy conservation. It is also observed that educational activities can be effective tool to encourage and implement pro-environmental behaviors.

Another survey research study conducted on university students in Japan investigated the energy conservation behavior and energy consumption to assess the energy saving potential of single households. The study observations revealed that the percentage of possession of appliances for single households was as high as percentage of family household with few exceptions. Single households showed passiveness about actions on saving resources when compared with one-family households. Further, tendency to show preference for energy conservation varied according to household type. The results of the study highlight the importance of measures

adapted for energy efficiency to different household types (Kahori et. al, 2009).

Ikeyama Y. (2019) investigated development of energy conservation education materials that can be incorporated in elementary school to establishing attitude and practicing energy conservation behaviors. In August 2018, with the cooperation of community halls, energy conservation education sessions were conducted for elementary school students using homebrew textbooks, making models of houses etc. The results showed effectiveness of material for consciousness formation about energy conservation for first graders. It is also assumed that the material is suitable for 3rd graders with appropriate difficulty.

2.2   Literature Review: Green Transport Use

A study by Chien-Wen Lo (2014) explored what influences people to choose 'Green Transport' as well as how physical environment conditions affect in Taipei City, Taiwan. The results of the study revealed that facilities satisfaction, diversity, comfort, and convenience in physical environment have effect on Green Transport Use behavior choices. Leisure location selection and benefits also have impact on Green Transport Use. Comfort and diversity also shown effect on leisure behavior. This suggests that built environment and leisure have mutual effect on Green Transport Use behavior. Hence, excellent built environment with Green Transport will encourage people to practice Green Transport Use behavior frequently, which can turn into habits.

It is important to highlight the different aspects on Green Transport Use to understand the construct at deeper level. An experimental study done by Berger S. & AM Wyas (2021) investigated personal behavioral decision-making problem that pitches short-term personal benefits against pro-environmental behavior by using Carbon Emission Task. They assessed pro-environmental behavior in lab, online and classroom. It is observed that people react systematically to incentives set out in the Carbon Emission Task. Higher incentives or bonus prospects decrease pro-environmental behavior and higher environmental consequences increase pro-environmental behaviour in terms of travel carbon emissions set out in the tasks. The study offers understanding of Green Transport Use behaviors with the help of experimental manipulation task. It also offers assessment of actual and consequential pro-environmental behaviors which appeals different scientific fields such as economics, environmental psychology etc.

Puvanesvaran et. al (2021) conducted a study to examine the relationship between intention to use green transport, attitude, subjective norm, service quality and price. An intercept survey approach was employed in the study on 193 respondents. The results of the study indicated that there was no relation between intention and attitude. However, subjective norms, price and service quality were significant found to be significant predictors of Green Transport Use intention. The study helps to understand the green behavior of consumers and insights regarding green transport.

Another study on students in Norway explore the effects of environmental norms and beliefs as well as situational and socioeconomic characteristics on multimodal and monomodal green transport use during winter and summertime. A cross-sectional survey was carried out. Results revealed that norm-activation model was associated with multimodal and monomodal green transport mode use in summertime, while it was not related in wintertime. Situational factors such as accessibility and cycling time were more related to Green Transport Use behavior during wintertime than summertime. It suggests that to activate persons moral obligations during winter towards reduce car use and modal shifts to green transport than car modes, policymakers should take steps to implement measures to provide availability of all green transport modes or safe and reliable bicycle or walking paths. The study helps to understand the situational factors and measures to be taken to encourage Green Transport Use among university goers (Mehdizadeh et. al, 2019).

Chatterjee (2021) conducted a meta-analysis study based on 42 research articles, 1035 literature to explore the correlates of pro-environmental behavior. The study was based on literature mainly from 2010 to 2021. The study employed grouping of articles of interest and time scale respective analysis that resulted into six parameters including two of them as Energy Conservation and Green Transport Use. The current paper focuses on these two domains of pro-environmental behavior identified from extensive literature review.

Chapter III

Method

3.1   Operational definition

3.1.1 Face Validity

Face Validity is defined as the superficial appearance of what a test measures from the perspective of a test taker or any other naive observer. In other words, it is the degree to which a layperson considers the contents of a psychological test or battery as relevant to achieve assessment objective.

3.1.2 Energy Conservation

Energy conservation refers to behaviors about reducing demand, protecting, and replenishing supplies, developing, and using alternative energy sources, cleaning of the damage from the prior energy processes.

3.1.3 Green Transport Use

Green Transport Use refers to behaviors endorsing convenient, safe, efficient, low pollution humanized and diversified urban transportation system.

3.2   Sample characteristics

In present study, expert participants have been presented with operational definitions of the dimensions and they were requested to match the items with operational definition. Data was gathered from 42 male (N=17) and female(N=25) expert raters from different disciplines. The mean age for the expert raters were 34.05 years with SD of 10.52. Refer the following inclusion and exclusion criteria used for selection of expert raters.

3.3   Criteria for selection

Experts aged more than 20 years old, education level to be graduates and above were selected. Expert rater's selection was based on their level of pro-environmental orientations which was measured using Nature Relatedness Scale before the rating process. They have been selected from different spheres of domains such as Agriculture, Environmental science studies, Geography, Tourism, Hospitality Management and Tourism

Marketing, Travel Journalism, Sustainability, Clinical and Organizational Psychology, Community Psychology and Computer Science etc. The expert rater's sample was from different countries like Cambodia, Canada, Central America, Dominica, England, India, Italy, Myanmar, Nigeria, Togo, Uganda, United Kingdom and Zimbabwe. Persons with history of physical and psychological disability were excluded.

3.4 Tool Description

3.4.1 Consent form

A consent form including data privacy, confidentiality, freedom to withdrawal from study and voluntary participation permission has been administered to the expert judges. (Appendix 1)

Personal Demographic Information

Personal demographic information of raters was gathered by presenting 9 items including name, contact number, age in years, sex, address, educational status, area of specialization, designation, and pass time hobby. (Appendix 2)

3.4.2 Nature Relatedness Scale

It's a 21-item scale developed by Nisbet, E. K., Zelenski, J. M., & Murphy, S. A., 2009. It assesses affective, cognitive, and experiential components of individual connection and orientation to nature. The scale uses 5-point Likert scale ranging from 1 (Strongly disagree) to 5 (agree strongly) such that higher scores indicative of a stronger pro-environmental orientation. Cronbach's alpha for the full NR scale was .87, and .84 for NR-Self, .66 for NR-Perspective, and .80 for NR-Experience, demonstrating good internal consistency. Test-retest correlations over a 6-to-8-week period were .85 for NR, .81 for NRSelf, .65 for NR-Perspective, and .85 for NR-Experience. It also has good construct validity. (Appendix 3)

3.4.3 Pro-Environmental Behavior Questionnaire

A rating scale with 5-point response categories ranging from never to always was constructed for the study to assess the frequency of Energy Conservation and Green Transport Use behaviors from one's everyday environment.

3.5 Procedure

An initial item-pool of 33 items was constructed. All the items were constructed which does not include ambiguity, technical words, and double negatives. Finally, all the 33 items (18 items pertaining to Energy Conservation, and 15 items pertaining to Green Transport Use) were selected.

A Google form consisting of the following sections were circulated among expert raters through by sending link –Section I is consisted of a consent form. Section II consisted of the General Demographic Information. Section III comprised of the Nature Relatedness Scale. Section IV contained the Energy Conservation and Green Transport Use Scales consisting of the selected 33 statements in a randomized presentation format. It contained operational definition of domains with instructions to fill the form. This item pool was then administered randomly to the expert sample via a Google form, and they evaluated items on comprehensiveness and representativeness. Expert raters have been asked to match the items with the represented domain to ensure that item reflect the construct of interest and then to what extent the items measure selected domain. 5-point Likert scale has been used varying from very high to very low to capture the range of responses.

To study, environmentally minded behaviors and future directives, a Q-study was developed and administered for 1 month period to expert judges from different fields of study. Total 33 Q-statements that expert judges were asked to place on a Likert scale from 1 to 5 based on how much they agreed on with each statement measuring specific construct of interest. Drawing upon field of pro-environmental behavior and environmental psychology, the Q-statements were emerged only after extensive literature review. These constructed and selected Q-statements by the researcher then to be interpreted by the expert judges in own way to unearth the diversity of opinions within the sample population.

3.6   Statistical Analysis

R (version 4.1.1) opensource coding software has been used for data analysis. Box-Whisker plots were calculated using R script. Expert raters' responses on what extent an item matches with operation definition of a particular domain were averaged. For withing-group variability, standard deviations were calculated for each item.

3.7   Ethical considerations

Consent has been received from each respondent in the research. All the confidentiality and data usage information has been given to participant through consent form at the beginning of the study. They participants were permitted to withdraw at any point of time without any prejudice. After having understood the purpose, respondents had voluntarily given consent to participate in the study.

Chapter IV

Results

The result section has been divided into 4 parts.

o Part 4.1 includes the expert rater's level of pro-environmental orientation based on their raw and average score on the Nature Relatedness Scale.

o Part 4.2 includes the selection of items for the Energy Conservation and the Green Transport Use Scale based on calculated mean score of matching with the operational definition.

o Part 4.3 includes the selection of items for the Energy Conservation and the Green Transport Use Scale based on calculated standard deviations of matching with the operational definition.

o Part 4.4 includes the final selected of items based on both average and SD criteria.

4.1 Level of Pro-Environmental Orientation of Expert Raters

The objective of employing The Nature Relatedness Scale was to ascertain the pro-environment orientation of expert raters. The NRS scale has been scored using standard scoring system given for it. As per NRS scoring norms, all the scores of a respondent for each item were averaged to get the final average score. Raw score indicates the sum of 5-point responses ranging from disagree strongly (1) to agree strongly (5) which can range from 6 to 30. An average score above 4 on NRS indicated high level of pro-environmental orientation, an average score between 3-4 indicated moderate level of pro-environmental orientation and average score less than 3 indicated low level of pro- environmental orientation.

Figure 1

Response format for Nature Relatedness Scale

1	2	3	4	5
Disagree Strongly	Disagree a little	Neither agree nor disagree	Agree a little	Agree strongly

Table 1

Summary of the expert's Mean value of the score on the Nature Relatedness Scale

Raw Score	Average Score
86	4.11

According to Table 2, 'Raw Score' indicates the expert's total score on Nature Relatedness Scale, and 'Average Score' indicates their corresponding mean average score on Nature Relatedness Scale. Raw score i.e., total score is calculated by summing up all the participant responses on each statement. However, the average score is computed by averaging scores of each item together.

The face validity of instrument can be determined using the viewpoints of panel of expert raters. This panel includes lay expert raters and content expert raters. Lay experts are potential research participants and content experts are professionals who have good research experience or work in the field. High score on NRS is the criteria used for expert raters. In another words, respondents who scored high on NRS scale are assumed to have familiarity with construct through direct personal experience, and hence they are considered as expert raters.

Table 1 (Appendix 1) summarizes the total and average score for 42 expert raters on NRS scale indicating their pro-environmental orientation. All the expert raters scored above 3, suggesting they showed moderate to high pro-environmental orientation and hence their data was considered into final data analysis procedure.

Figure 2 indicates location of median is between 2nd and 3rd. quartile. Figure 2 contains plot based on average raw score of expert raters.

Figure 2

Box-Whisker plot of pro-environmental orientation of expert rater's (Based on average scores)

Pro-Environmental Orientation of Experts
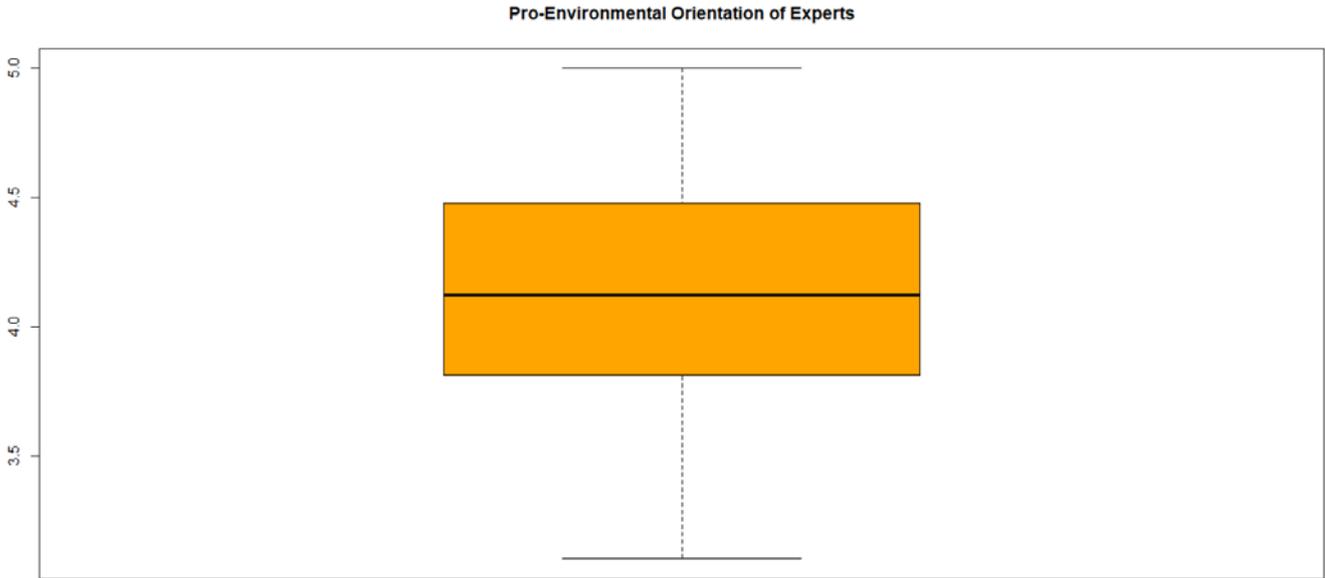
Since, box-whisker plot cannot reveal number of individuals located higher than the median, further analysis was made by using scatter plot (Figure 3). Figure 3 contains plot based on average raw score of expert raters. Also, it depicts that all the average scores on NRS Scale fall above mean score of 3 suggesting high pro-environmental orientation among the expert raters.

Figure 3

Scatter plot showing distribution of rating locations (Based on average scores)

Pro-Environmental Orientation of Experts
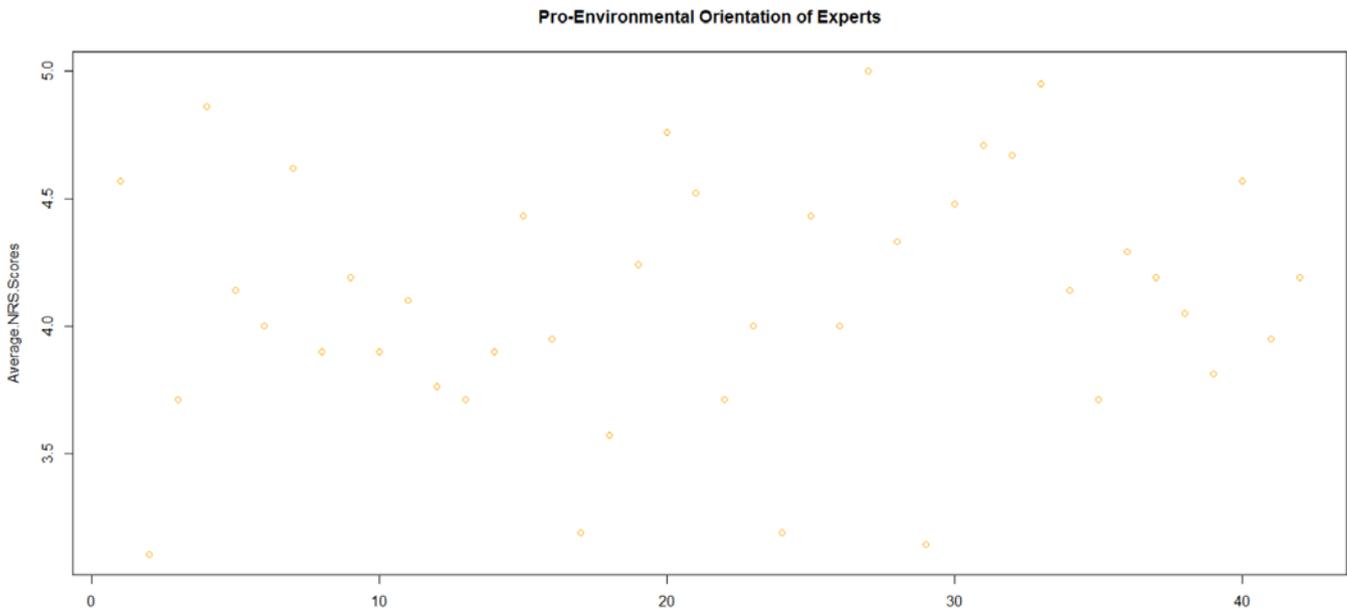
4.2   Selection of items based on mean criterion

To see what extent an item measures the specific domain, the mean scores have been calculated based

on expert rater's ratings. According to mean criteria, it is assumed that an item with mean ratings 3 or greater than 3 indicates that expert raters had agreed that those specific items matched with the given operational definition of respective domain they measure. Hence, only those items were selected whose mean rating scores were 3 or greater than 3. Table 2 describes the frequency distribution based on mean criterion of correct matching item with its corresponding operational definition. Based on this mean criterion, out of the 33 items 31 items (17 items from Energy Conservation and 14 items from Green Transport Use) have been selected.

Table 3

Mean distribution of correct matching of each item with its corresponding operational definition

Mean of Items	Energy Conservation	Green Transport Use	Total
Less than 3	1	1	2
Between 3 and 4	15	13	28
Greater than 4	2	1	3

Table 3 shows domain-wise selected and non-selected list of items along with their respective means and extent of matching based on mean criterion from Energy Conservation and Green Transport Use Questionnaire. Table 3 includes total number of items constructed to measure Energy Conservation and Green Transport Use behavior. Mean column indicates mean ratings calculated for corresponding items and matched item column indicates whether the items meet the mean criterion i.e., mean value greater than 3.

Table 4

Domain wise distribution of selected items based on mean

Sr. No.	Energy Conservation Items	Mean	Matched Item
Item 1	I adjust heating and cooling systems as per season.	3.88	Yes
Item 2	I replace the old appliances with energy-efficient ones.	3.79	Yes
Item 3	I use low voltage lamps.	3.74	Yes
Item 4	I change my daily habits to save energy.	3.69	Yes

Item 5	I keep electric appliances clean and in good condition to achieve greater efficiency.	3.76	Yes
Item 6	I reduce energy use by closely following electricity bills.	3.50	Yes
Item 9	I check refrigerator doors to make sure it is completely closed after use.	4.10	Yes
Item 10	I use clothesline for soaking cloths.	3.43	Yes
Item 11	I keep windows and doors closed when heating or cooling systems are on.	3.90	Yes
Item 16	I experiment on developing and using alternative energy sources.	3.29	Yes
Item 20	I use daylight as much as possible.	3.86	Yes
Item 22	I use energy saving light bulbs.	3.90	Yes
Item 23	I invest in renewable energy resources.	3.50	Yes
Item 25	I switch off personal electronics when not in use.	4.10	Yes
Item 26	I use solar power source as a convenient alternative.	3.14	Yes
Item 28	I usually forget to remove cell phone chargers from socket. *	2.48	No
Item 30	I spend time learning on energy conservation.	3.50	Yes
Item 31	I change electronic appliances if they adversely affect energy consumption.	3.55	Yes

Sr. No.	Green Transport Use Items	Mean	Matched Item
Item 7	I use bicycles as eco-friendliest means of transport.	3.17	Yes
Item 8	I check on my current vehicle emission levels.	3.36	Yes
Item 12	My travels are as ecologically as possible.	3.45	Yes
Item 13	I travel by train instead of air.	3.50	Yes

Item 14	I use public transport.	3.71	Yes
Item 15	I do not use electric vehicles. *	2.79	No
Item 17	I follow sustainable transport policies.	3.52	Yes
Item 18	I consciously search for sustainable ways to travel for vacations.	3.57	Yes
Item 19	I use carpool to reduce emissions.	3.36	Yes
Item 21	I cut down vehicle use to reduce my fuel expense.	3.48	Yes
Item 24	I drive less and use other forms of transportation.	3.69	Yes
Item 27	I walk or pedal conveniently to cover short distances.	4.02	Yes
Item 29	I recommend green transport use among my friends and family.	3.64	Yes
Item 32	I adjust my travels to reduce emissions.	3.50	Yes
Item 33	I use other ways to make my travels less pollutant.	3.57	Yes

Further, Figure 5 describes graphical representation of selected and non-selected list of items from Energy Conservation Questionnaire. Orange bars indicate selected and green bar indicates non-selected items based on mean criterion.

Figure 4

Mean distribution of items on Energy Conservation Scale
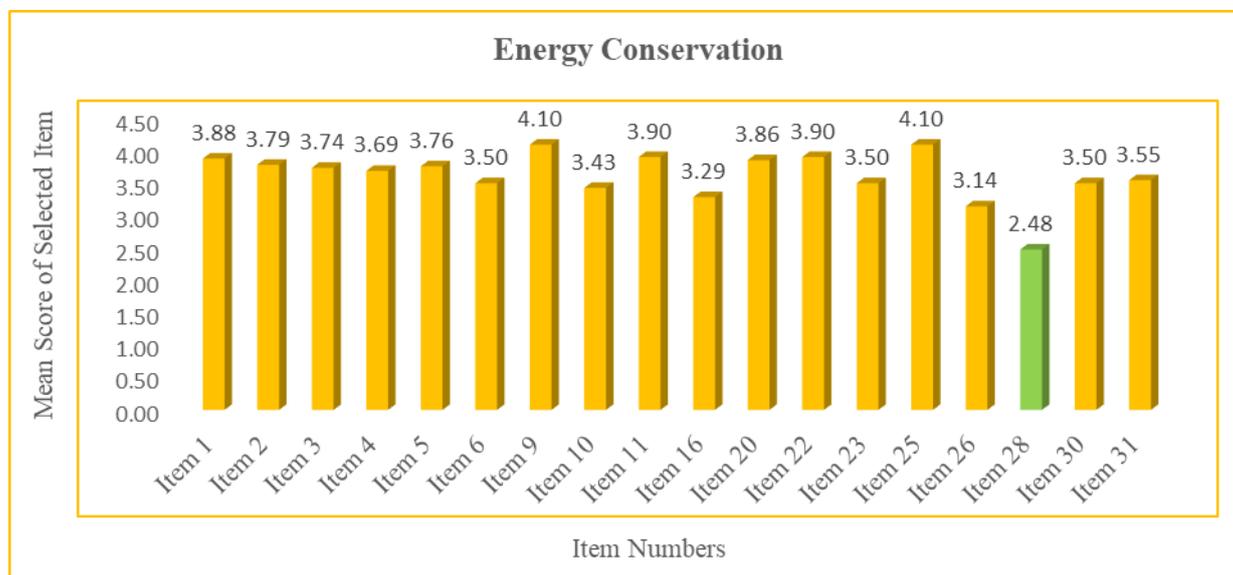
Figure 6 describes graphical representation of selected and non-selected list of items from Green Transport Questionnaire. Here also, orange bars indicate selected and green bar indicates non-selected items based on mean criterion.

Figure 5

Mean distribution of items on Green Transport Use Scale
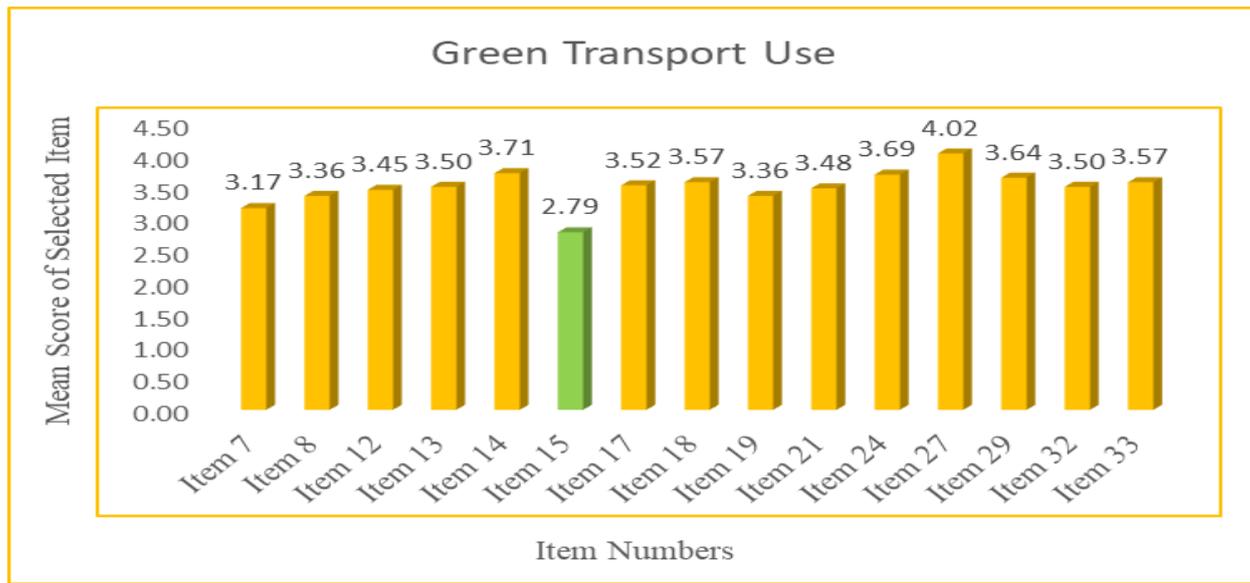
Figure 7 indicates the location of the median is closer to the third quartile suggesting the mean distribution of items. Box-Whisker plot revealed that two items located below the median and rest of the items were located almost above first quartile whose mean scores are greater than 3.

Figure 6

Box-Whisker plot for the mean distribution of items
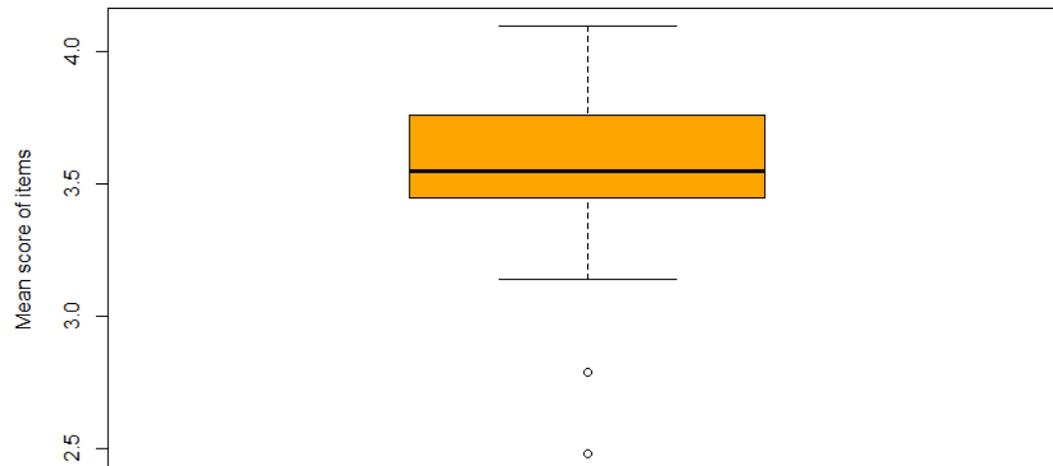
4.3 Selection of items based on SD criterion

Other criteria set for selecting items was calculation of SD to measure the within group variability on each item measuring specific domain. To see what extent an item measures the specific domain, SDs were calculated for each item based on ratings of expert raters. According to SD criteria, it is assumed that an item with SD lesser than 1 have less within group variability among expert raters. Hence, only those items have been given importance and got selected whose SD scores based on ratings were less than 1. Table 4 contains selected and non-selected items along with their respective SD scores and extent of matching based on SD criterion from Energy Conservation and Green Transport Use Scale.

Table 5

Domain wise distribution of selected items based on SD

| Sr. No.	Energy Conservation Items	SD	Matched Item
Item 1	I adjust heating and cooling systems as per season.	0.80	Yes
Item 2	I replace the old appliances with energy-efficient ones.	1.001	No
Item 3	I use low voltage lamps.	1.01	No
Item 4	I change my daily habits to save energy.	0.95	Yes
Item 5	I keep electric appliances clean and in good condition to achieve greater efficiency.	0.96	Yes
Item 6	I reduce energy use by closely following electricity bills.	0.97	Yes
Item 9	I check refrigerator doors to make sure it is completely closed after use.	0.98	Yes
Item 10	I use clothesline for soaking cloths.	1.21	No
Item 11	I keep windows and doors closed when heating or cooling systems are on.	1.03	No
Item 16	I experiment on developing and using alternative energy sources.	1.17	No
Item 20	I use daylight as much as possible.	1.07	No

Item 22	I use energy saving light bulbs.	0.82	Yes
Item 23	I invest in renewable energy resources.	1.02	No
Item 25	I switch off personal electronics when not in use.	0.82	Yes
Item 26	I use solar power source as a convenient alternative.	1.32	No
Item 28	I usually forget to remove cell phone chargers from socket. *	1.42	No
Item 30	I spend time learning on energy conservation.	0.97	Yes
Item 31	I change electronic appliances if they adversely affect energy consumption.	1.02	No

Sr. No.	Green Transport Use Items	SD	Matching Item
Item 7	I use bicycles as eco-friendliest means of transport.	1.38	No
Item 8	I check on my current vehicle emission levels.	1.06	No
Item 12	My travels are as ecologically as possible.	0.97	Yes
Item 13	I travel by train instead of air.	1.06	No
Item 14	I use public transport.	0.97	Yes
Item 15	I do not use electric vehicles. *	1.37	No
Item 17	I follow sustainable transport policies.	1.11	No
Item 18	I consciously search for sustainable ways to travel for vacations.	0.91	Yes
Item 19	I use carpool to reduce emissions.	1.25	No
Item 21	I cut down vehicle use to reduce my fuel expense.	1.09	No
Item 24	I drive less and use other forms of transportation.	1.07	No
Item 27	I walk or pedal conveniently to cover short distances.	0.99	Yes
Item 29	I recommend green transport use among my friends and family.	0.88	Yes

| Item 32 | I adjust my travels to reduce emissions. | 0.97 | Yes |
| Item 33 | I use other ways to make my travels less pollutant. | 0.86 | Yes |

Item 2, 3, 10, 11, 16, 20, 23, 26, 28 and 31 from Energy Conservation domain showed greater within-group variability since their respective SD values were greater than 1.00. Similarly, Item 7, 8, 13, 15, 17, 19, 21, and 24 from Green Transport Use domain also showed greater within-group variability. It may be due, for example, Items 2 and 28 were negatively keyed which might have created ambiguity or caused participants to rate inadequate and irrelevant from the domains operational definition. The high within-group variability might be due to factors such as comprehension, purpose of statements, and individual perception.

Further, Figure 8 describes graphical representation of selected and non-selected list of items from Energy Conservation Scale. Orange bars indicate selected and green bar indicates non-selected items based on SD criterion.

Figure 7

SD distribution of items on Energy Conservation
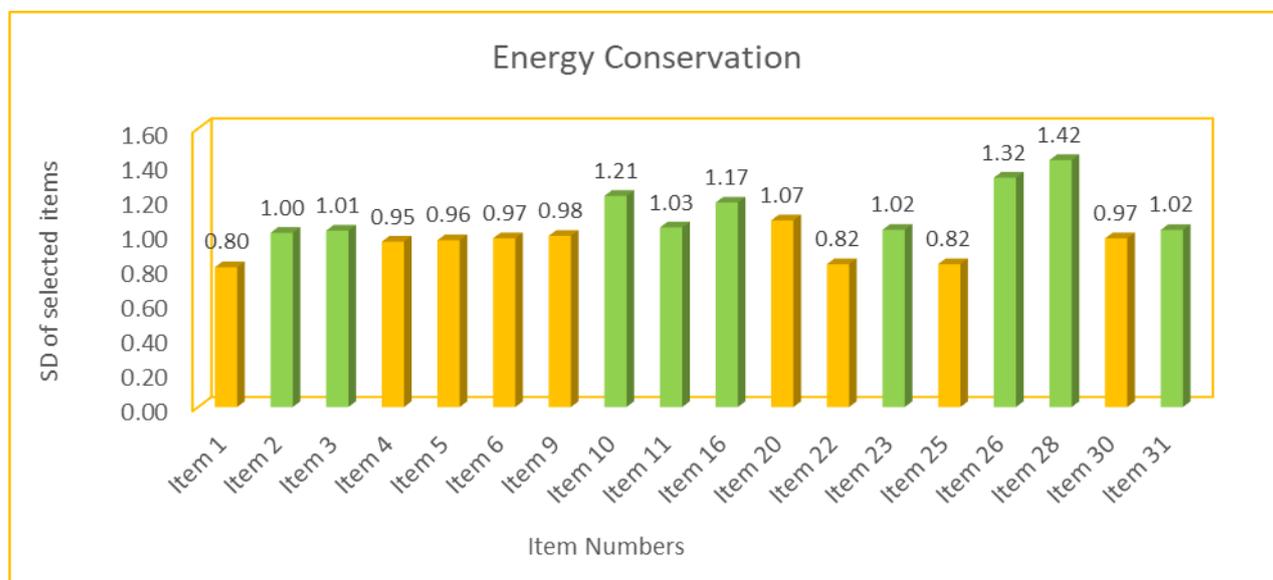
Figure 9 describes graphical representation of selected and non-selected list of items from Green Transport Scale. Here also, orange bars indicate selected and green bar indicates non-selected items based on SD criterion.

Figure 8

SD distribution of items on Green Transport Use
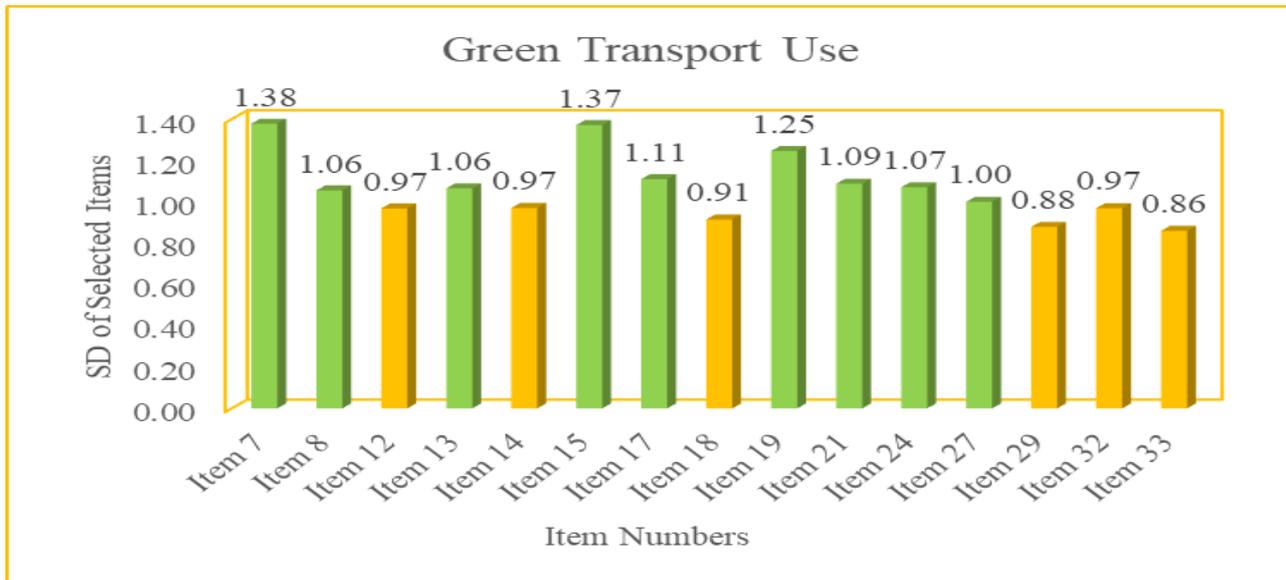
Figure 10 indicates the location of median is closer to second quartile suggesting the standard deviation of the items. Since Box-Whisker plot cannot reveal the number of items located higher than the median, it has shown few outliers, but other items are located near second and third quartile.

Figure 9

Box-Whisker plot for standard deviation of items
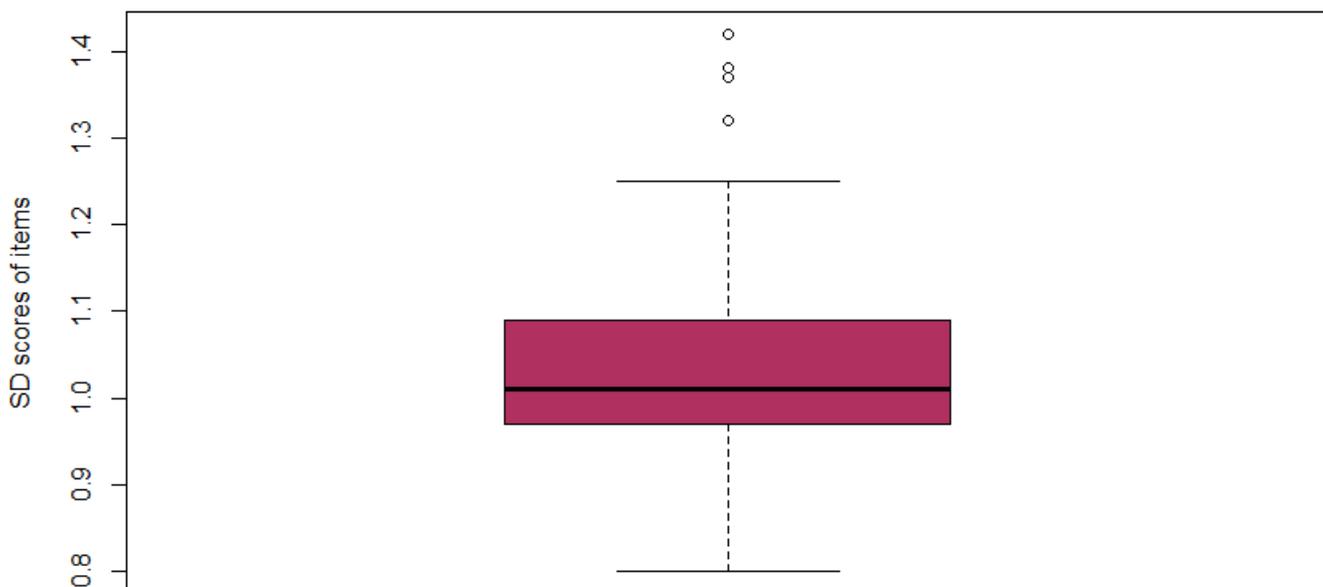
4.4 Final selection of items based on Mean and SD

For the final selection, both mean and SD criterion have been applied. Only those items have been

selected whose mean was 3 or greater than 3 and SD was less than 1. Table 7 and 8 indicates domain-wise selected and non-selected items along with their respective SD scores and extent of matching based on mean and SD criterion from Energy Conservation and Green Transport Scale.

Table 6

Domain-wise distribution of selected items based on mean and SD

Sr. No.	Energy Conservation Items	Mean	SD	Matched Item
Item 1	I adjust heating and cooling systems as per season.	3.88	0.80	Yes
Item 2	I replace the old appliances with energy-efficient ones.	3.79	1.00	No
Item 3	I use low voltage lamps.	3.74	1.01	No
Item 4	I change my daily habits to save energy.	3.69	0.95	Yes
Item 5	I keep electric appliances clean and in good condition to achieve greater efficiency.	3.76	0.96	Yes
Item 6	I reduce energy use by closely following electricity bills.	3.50	0.97	Yes
Item 9	I check refrigerator doors to make sure it is completely closed after use.	4.10	0.98	Yes
Item 10	I use clothesline for soaking cloths.	3.43	1.21	No
Item 11	I keep windows and doors closed when heating or cooling systems are on.	3.90	1.03	No
Item 16	I experiment on developing and using alternative energy sources.	3.29	1.17	No
Item 20	I use daylight as much as possible.	3.86	1.07	No
Item 22	I use energy saving light bulbs.	3.90	0.82	Yes
Item 23	I invest in renewable energy resources.	3.50	1.02	No
Item 25	I switch off personal electronics when not in use.	4.10	0.82	Yes

Item 26	I use solar power source as a convenient alternative.	3.14	1.32	No
Item 28	I usually forget to remove cell phone chargers from socket. *	2.48	1.42	No
Item 30	I spend time learning on energy conservation.	3.50	0.97	Yes
Item 31	I change electronic appliances if they adversely affect energy consumption.	3.55	1.02	No

Sr. No.	Green Transport Use Items	Mean	SD	Matched Item
Item 7	I use bicycles as eco-friendliest means of transport.	3.17	1.38	No
Item 8	I check on my current vehicle emission levels.	3.36	1.06	No
Item 12	My travels are as ecologically as possible.	3.45	0.97	Yes
Item 13	I travel by train instead of air.	3.50	1.06	No
Item 14	I use public transport.	3.71	0.97	Yes
Item 15	I do not use electric vehicles. *	2.79	1.37	No
Item 17	I follow sustainable transport policies.	3.52	1.11	No
Item 18	I consciously search for sustainable ways to travel for vacations.	3.57	0.91	Yes
Item 19	I use carpool to reduce emissions.	3.36	1.25	No
Item 21	I cut down vehicle use to reduce my fuel expense.	3.48	1.09	No
Item 24	I drive less and use other forms of transportation.	3.69	1.07	No
Item 27	I walk or pedal conveniently to cover short distances.	4.02	0.99	Yes
Item 29	I recommend green transport use among my friends and family.	3.64	0.88	Yes
Item 32	I adjust my travels to reduce emissions.	3.50	0.97	Yes
Item 33	I use other ways to make my travels less pollutant.	3.57	0.86	Yes

With respect to Table 5, it denotes items for each domain, 'Mean' indicates mean of the item, 'SD'

corresponds to standard deviation of item, and 'Matched Item' indicates whether item meets both mean value greater than 3 and standard deviation lesser than 1. According to this criterion, 8 items from Energy Conservation and 7 items from Green Transport Use met the criteria and were selected.

Table 6 shows only final selected list of items along with their respective domains based on analysis performed.

Table 7

The final list of selected items

Sr. No.	Item No.	Items	Original Domain
1	Item 1	I adjust heating and cooling systems as per season.	Energy Conservation
2	Item 4	I change my daily habits to save energy.	Energy Conservation
3	Item 5	I keep electric appliances clean and in good condition to achieve greater efficiency.	Energy Conservation
4	Item 6	I reduce energy use by closely following electricity bills.	Energy Conservation
5	Item 9	I check refrigerator doors to make sure it is completely closed after use.	Energy Conservation
6	Item 22	I use energy saving light bulbs.	Energy Conservation
7	Item 25	I switch off personal electronics when not in use.	Energy Conservation
8	Item 30	I spend time learning on energy conservation.	Energy Conservation
9	Item 12	My travels are as ecologically as possible.	Green Transport Use
10	Item 14	I use public transport.	Green Transport Use
11	Item 18	I consciously search for sustainable ways to travel for vacations.	Green Transport Use
12	Item 27	I walk or pedal conveniently to cover short distances.	Green Transport Use
13	Item 29	I recommend green transport use among my friends and	Green Transport Use

		family.	
14	Item 32	I adjust my travels to reduce emissions.	Green Transport Use
15	Item 33	I use other ways to make my travels less pollutant.	Green Transport Use

Chapter V

Discussion

The objective of the present research was to construct the items on pro-environmental behaviors focused on two domains Energy Conservation and Green Transport Use. Initially 33 items were created based on suitable criteria, and item analysis has been done based on ratings obtained from expert raters for each item. The item analysis is done based on mean distribution of correct matching of each item with its respective domain's operational definition. Distribution of SD score across items based on expert raters' ratings also been used to understand the within group variability. Expert ratings usually involve domain relevance and important of individual test item content. Effective and good item have higher mean scores and low standard deviations, indicating higher agreement among raters for each item. So, calculated mean and SD distribution has served the criterions for item selection. 15 out of 33 items met the both the criterions such as 8 from Energy Conservation and 7 from Green Transport Use.

The domain of interests has been defined clearly at the start of the test construction process. The domain definition serves for item specifications in line with domain definition. The presence of domain operational definition served experts to provide higher ratings to the items which were matching with definition. The assumption here is, words contained within each item which expert raters found synonymous and like operational definition might have served for higher ratings. Specific items such as "I change my daily habits to save energy", "I reduce energy use by closely following electricity bills", "I use energy saving light bulbs", "I spend time learning on energy conservation" contained words such as save energy, energy conservation, energy efficient, sustainable transport received high mean ratings. Other reasons for higher ratings for specific items can be good domain representativeness, relevance and if the raters might have found the items to be complementing the operational definition.

Out of 33, almost 31 items received higher ratings than average, only two items received lower ratings than average of 3. Reason behind getting lower mean ratings on these specific items such as "I do not use electric vehicles" and "I usually forget to remove cellphone chargers from socket" (Mean 2.95 and 2.82 respectively)

can be understood by looking at the way items formed. Both the items were reverse coded/negatively coded. The expert raters might have confused or ambiguous about these items to be measuring opposite of the domain's operational definition and hence, rated these items lower in terms of measuring specific construct. Although 31 items received more than average ratings from the within group variability and were fulfilling mean criterion for selection of items. Standard deviation is used as a measure to see how dispersed rating data in relation to mean. Low SD means all the rater scores are clustered together and they rated item similarly. Some items such Item 2, Item 3, Item 7, Item 8, Item 10, Item 11, Item 13, Item 16, Item 17, Item 19, Item 20, Item 21, Item 23, Item 24, Item 26 and item 31 received higher within group variability from expert ratings due to which those items were not considered in final test. Out of 31 items, only 15 items were considered for the final test blueprint.

It can be considered that items with higher mean ratings and lower within group variability established good face validity. Also, items which contained words from operations definition and found highly relevant to operational definitions of the domains within the test, showed high face validity due to appropriate phrasing.

Chapter VI

Implications and Directions for Future Research

The key implications from the current research study suggests

• Items that are relevant to operational definition were selected more and have received higher ratings from expert raters.

• Items which received higher mean ratings and lower standard deviations considered to have higher face validity.

• The way items have been constructed or keyed i.e., nature and phrasing of items such as reverse keyed or negatively keyed has great influence on expert ratings, expert preference, and selection.

Direction of future research

The test items which are not selected can be modified or revised. Revised items can be used in further standardization process. The findings of current study can be used to construct the comprehensive pro-environmental behavior questionnaire using more domains and can be administered further to large enough sample to build reliability.

Chapter VII

Conclusion

The present study explored and validated the two dimension of pro-environmental behavior domains: energy conservation and green transport use. Items matched with operational definition of study domains showed high face validity indicating good internal structure of the test. Findings of this study can be used to construct Pro-environmental Behavior Questionnaire using more specific domains. Also, it can be used further to establish reliability, validity, and exploratory analysis. Researchers should strive to develop tools of assessment based on psychometric property evaluations. The current study is an attempt to contribute to a cumulative research culture that will improve accurate measurement and understanding of Pro-Environmental Behavior in long run.

Chapter VII

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Appendices

Appendix 1

Table 2

Expert rater's score on the Nature Relatedness Scale depicting their level of pro-environmental orientation

Expert Rater	Raw Total Score	Raw Average Score
1	96	4.57
2	65	3.10
3	78	3.71
4	102	4.86
5	87	4.14
6	84	4.00
7	97	4.62
8	82	3.90
9	88	4.19
10	82	3.90
11	86	4.10
12	79	3.76
13	78	3.71
14	82	3.90
15	93	4.43
16	83	3.95
17	67	3.19
18	75	3.57
19	89	4.24

20	100	4.76
21	95	4.52
22	78	3.71
23	84	4.00
24	67	3.19
25	93	4.43
26	84	4.00
27	105	5.00
28	91	4.33
29	66	3.14
30	94	4.48
31	99	4.71
32	98	4.67
33	104	4.95
34	87	4.14
35	78	3.71
36	90	4.29
37	88	4.19
38	85	4.05
39	80	3.81
40	96	4.57
41	83	3.95
42	88	4.19

The score of an individual is computed by summing up the values assigned to the individual responses when the items are related to each other and the total score.

Appendix 2

Consent Form

Hi, I am Umesh Shinde, completed master's in applied psychology (Clinical Psychology). Currently I am working on a research project under the supervision of Dr. Debdulal Dutta Roy, Head of the Psychology Research Unit of the Indian Statistical Institute (ISI), Kolkata.

The current research is on "Determining Internal Consistency of Questionnaire measuring Energy Conservation behavior and Green Transport Use" that contains number of statements asking you about your Pro-Environmental behaviors. You are hereby requested to give your voluntary consent to participate in this study. Any information collected from you during the process would be kept confidential and will be used strictly for research purposes only. You are free to withdraw from the study at any point of time without any prejudice.

For further information,

Contact: +91 8850067547

Email: ur.shinde0105@gmail.com

I have understood the purpose of this research and I am voluntarily giving my consent to participate in this study.

- Agree

- Disagree

Appendix 3

<div align="center">

Personal Demographic Information

</div>

Instructions: Kindly provide your personal details. All fields of information are mandatory.

Name:

Contact Number:

Age (in years):

Sex:

Address:

State:

Educational Status:

Area of specialization:

Designation:

Your past-time/hobby:

Appendix 4

Nature Relatedness Scale

Instructions: For each of the following, please rate the extent to which you agree with each statement, using the scale from 1 to 5 as shown below. Please respond as you really feel, rather than how you think "most people" feel.

1	2	3	4	5
Disagree strongly	Disagree a little	Neither Agree or disagree	Agree a little	Agree strongly

1. I enjoy being outdoors, even in unpleasant weather.

2. Some species are just meant to die out or become extinct.

3. Humans have the right to use natural resources any way we want.

4. My ideal vacation spot would be a remote, wilderness area.

5. I always think about how my actions affect the environment.

6. I enjoy digging in the earth and getting dirt on my hands.

7. My connection to nature and the environment is a part of my spirituality.

8. I am very aware of environmental issues.

9. I take notice of wildlife wherever I am.

10. I don't often go out in nature.

11. Nothing I do will change problems in other places on the planet.

12. I am not separate from nature, but a part of nature.

13. The thought of being deep in the woods, away from civilization, is frightening.

14. My feelings about nature do not affect how I live my life.

15. Animals, birds, and plants should have fewer rights than humans.

16. Even in the middle of the city, I notice nature around me.

17.   My relationship to nature is an important part of who I am.

18.   Conservation is unnecessary because nature is strong enough to recover from any human impact.

19.   The state of non-human species is an indicator of the future for humans.

20.   I think a lot about the suffering of animals.

21.   I feel very connected to all living things and the earth.

Appendix 5

<h2 align="center">Pro-environmental Behaviour Questionnaire</h2>

Instructions: In this section, you will be given statements which you will have to classify as representative to either of these domains viz.

Energy Conservation (EC): Energy conservation behaviors refers to behaviors associated with reducing demand, protecting, and replenishing supplies, developing, and using alternative energy sources and cleaning of the damage from the prior energy processes.

Green Transport Use (GTU): Green transport use refers to behaviors associated with convenient, safe, efficient, low pollution humanized and diversified urban transportation system.

Then you need indicate the extent to which the given statement matches the domain you selected. Please note that all questions are mandatory.

1	2	3	4	5
Very Low	Low	Moderate	High	Very High

Energy Conservation -

1. I adjust heating and cooling systems as per season.

2. I replace the old appliances with energy-efficient ones.

3. I use low voltage lamps.

4. I change my daily habits to save energy.

5. I keep electric appliances clean and in good condition to achieve greater efficiency.

6. I reduce energy use by closely following electricity bills.

7. I use bicycles as eco-friendliest means of transport.

8. I check on my current vehicle emission levels.

9. I check refrigerator doors to make sure it is completely closed after use.

10. I use clothesline for soaking cloths.

11.   I keep windows and doors closed when heating or cooling systems are on.

Green Transport Use -

1.   My travels are as ecologically as possible.

2.   I travel by train instead of air.

3.   I use public transport.

4.   I do not use electric vehicles*.

5.   I experiment on developing and using alternative energy sources.

6.   I follow sustainable transport policies.

7.   I consciously search for sustainable ways to travel for vacations.

8.   I use carpool to reduce emissions.

9.   I use daylight as much as possible.

10.   I believe recycling reduces waste production.

11.   I use energy saving light bulbs.

12.   I invest in renewable energy resources.

13.   I drive less and use other forms of transportation.

14.   I switch off personal electronics when not in use.

15.   I use solar power source as a convenient alternative.

16.   I walk or pedal conveniently to cover short distances.

17.   I usually forget to remove cellphone chargers from socket. *

18.   I recommend green transport use among my friends and family.

19.   I spend time learning on energy conservation.

20.   I change electronic appliances if they adversely affect energy consumption.

21.   I adjust my travels to reduce emissions.

22.   I use other ways to make my travels less pollutant.

Appendix 6

R-Script

#Data input

> PEB<-read.table(file="clipboard",header=T,sep="\t")

> NRS<-read.table(file="clipboard",header=T,sep="\t")

#Mean

> apply(PEB,2,mean)

> PEBMEAN=apply(PEB,2,mean)

#SD

> PEBSD=apply(PEB,2,sd)

#Data Presentation

> PEBMEANSD=data.frame(PEBMEAN,PEBSD)

#Mean value less than 3

> table(PEBMEAN<3)

#SD less than 1

> table(PEBSD>1.00)

#Boxplot

> boxplot(PEBMEAN,main="Box-Whiskerplot for the of mean distribution of items", ylab="Mean score of Items", col = 3)

> boxplot(PEBSD,main="Box-Whiskerplot for the of Standard Deviation of items", ylab=" Score on SD of Items", col = 2)