

Develop a Sustainable Behavior Scale for Middle School Students and to Verify Its Psychometric Properties

Fatima Abdullah Al-Shahrani^{1*}, Nawal Al-Ghamdi¹, Muhammad Aslam²

¹Department of Psychology, Faculty of Education, King Abdulaziz University, Jeddah, Saudi Arabia

²Department of Statistics, Faculty of Science, King Abdulaziz University, Jeddah, Saudi Arabia

Email: *student.advisor33@gmail.com, nwal96@hotmail.com, aslam-ravian@hotmail.com

How to cite this paper: Al-Shahrani, F. A., Al-Ghamdi, N., & Aslam, M. (2024). Develop a Sustainable Behavior Scale for Middle School Students and to Verify Its Psychometric Properties. *Open Journal of Social Sciences*, 12, 590-606.

<https://doi.org/10.4236/jss.2024.124039>

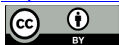
Received: March 1, 2024

Accepted: April 25, 2024

Published: April 28, 2024

Copyright © 2024 by author(s) and Scientific Research Publishing Inc. This work is licensed under the Creative Commons Attribution International License (CC BY 4.0).

<http://creativecommons.org/licenses/by/4.0/>



Open Access

Abstract

The aim of this study was to develop a Sustainable Behavior Scale for middle school students and to verify its psychometric properties. The study followed an analytical descriptive approach, by reviewing previous studies and reports, in addition to analyzing the electronic questionnaire distributed to a number of middle school students, totaling 175 students, whose ages ranged from approximately 12 to 15 years old. The sample participants were randomly selected from middle schools in Tabuk. To assess the psychometric properties of the scale, validity and reliability were examined. To verify the validity of the scale, both face validity, convergent validity, and discriminant validity of the items were used, along with confirmatory factor analysis. Additionally, the reliability of the scale was examined through McDonald's Omega and split-half reliability. The results of the current study confirmed the quality of the psychometric properties of the Sustainable Behavior Scale and its suitability for use with a sample of middle school students in the Saudi community. It is anticipated that the scale will facilitate research in this field.

Keywords

Psychometric Properties, Sustainable Behavior

1. Introduction

Psychology has been concerned with the dynamic view of the relationship between humans and their environment, which emphasizes the mutual interaction between them, and the role of psychological processes that mediate this interaction. Environmental behavior is part of an individual's overall behavior acquired

through various entities such as family, school, and various societal institutions (Abdel-Messiah & Faraj, 2002).

It can be said that sustainable behavior is “an equation linked to repairing conscience and enhancing ethical values in the component of human behavior in its comprehensive dimension. It is a shared responsibility of social, political, religious, and environmental thought leaders, and without the availability of this effort, talking about sustainable behavior is a figment of the imagination” (Al-Wadae, 2022).

Sustainable development and achieving sustainable behavior are based on the policy of lifelong learning. In an era characterized by rapid development, students cannot thrive with a limited set of skills and knowledge. Therefore, it is imperative to equip students with skills that facilitate lifelong continuous growth (Al-Anzi, 2021). Education contributes to promoting sustainability goals in cognitive, social, emotional, and behavioral domains. This necessitates providing appropriate objectives for integrating education for sustainability across all formal and informal educational environments, ensuring their consistency to bring about the desired change in human behavior (UNESCO, 2021: p. 2).

Theories of environmental psychology, a branch of general psychology concerned with the reciprocal relationships between individuals and their environment, have emphasized that our thoughts and behaviors are influenced by our natural or artificial surroundings and, in turn, affect them. Therefore, this field has focused on researching the best behavioral practices that involve improving our relationship with the surrounding environment (Al-Shafei & Al-Omari, 2021).

An individual’s behavior, personality, formation, growth, conduct, inclinations, and thoughts are all products of their environment and their interaction with it. Any erroneous behavioral patterns towards one’s environment constitute unsustainable and unhealthy behavior. These negative behaviors represent an assault on the environment and may be caused by various factors, including psychological factors, physiological disturbances such as conflict, frustration, negative experiences, patterned responses to stress, intrusion on personal and spatial boundaries, lack of environmental knowledge, and the social environment in which the individual resides (Daher, 2014).

Many psychological studies have investigated the psychological impact of adopting sustainable behaviors by individuals. For example, studies by Brown & Kasser (2005) revealed that individuals who exhibit sustainable behaviors tend to experience greater happiness compared to those with unsustainable behaviors. These studies found that this happiness stems from satisfaction, enjoyment, a positive sense of well-being, and a feeling that life has meaning and value (Tapia-Fonllem et al., 2013).

Research and studies in environmental psychology aim to provide assistance in understanding the motivations behind individuals’ unsustainable behaviors and identifying barriers to sustainable behavior. Therefore, it can be said that psychology focuses on the factors influencing individual behavior, as individuals

are part of a collective. Individual sustainability is a means to achieve broad societal change, and as the number of individuals adopting sustainable behavior increases, society becomes accustomed to these practices, and they become characteristic of its members (Al-Tayton, 2018).

Using psychological scales and applying them in environments other than those for which they were developed poses a problem that should be taken into consideration. These scales are influenced by the cultural factors of the study sample, thereby affecting the results obtained from these scales.

Based on this premise and in the absence of locally appropriate measurement tools for sustainable behaviour suitable for middle school students in the Arab environment in general, and the Saudi environment in particular—within the researcher’s scope—there arose a need to construct a scale for sustainable behaviour. This scale aims to verify its psychometric properties and its suitability for the Saudi and Arab environments.

From this point of view, we can identify the problem of the study in three questions:

- What are the indicators of the construct validity of the Sustainable Behaviour Scale among a sample of middle school students?
- What are the indicators of the reliability of the Sustainable Behaviour Scale among a sample of middle school students?

2. Objectives

The current study aims to: develop a sustainable behaviour scale, and identify the scale’s psychometric properties in terms of honesty and stability.

The Importance of the Current Study Lies in Two Aspects

Theoretical Significance: Enriching the Arab Library with theoretical and cognitive information about the sustainable behaviour variable.

In addition to the scarcity of research on the sustainable behaviour variable—within the limits of the researcher’s access to Arab databases—which is a vital subject within the framework of national policies for sustainable development and which serve as guides for individual and community behaviour. As may contribute to providing a measure that may contribute to an individual’s reform to achieve sustainability.

Its Practical Significance: Providing a new scale for sustainable behaviour among middle school students, as—to the best of the researcher’s knowledge—there is no Arabic scale measuring sustainable behaviour. And the scale can benefit researchers, specialists, and educators in designing appropriate preventive and therapeutic plans to reduce unsustainable behaviours that harm the environment and society.

3. Study Terminology

The researcher focuses on the main term in the current study, which is “sus-

tainable behaviour.”

3.1. Sustainable Behaviour

The conduct is defined linguistically as: a total response by the organism to a situation it faces. *Bonnes & Bonaiuto (2002)* is defined as: a set of vital activities with impacts that contribute to the preservation of an individual’s physical and social environment. *Najera (2010)* considers that it is intentional behaviour that represents a set of effective actions that respond to society’s and individual’s requirements to protect the environment and promote quality of life.

It can also be defined as: a lifestyle based on the best use of services and products that respond to basic needs, and achieve a better quality of life, so that it does not threaten the needs of future generations (*Norwegian Ministry of the Environment, 1994*). From what the researcher defines as procedurally sustainable behaviour: Self-conscious and deliberate behaviour by the student in order to reduce the negative effects of human behaviours in the world, manifested through pro-environmental behaviour, equity, rationalization and altruistic behaviour. These behaviours are measured by the student’s level of performance in the grades prepared by the researcher for this purpose.

3.2. Study Terminology

The psychometric properties refer to the characteristics of the scale used in the study, which have been verified for its validity and reliability (*Hijazi & Sherif, 2017*).

4. Dimensions of Sustainable Behaviour

Achieving sustainable development has become a major indicator of human-kind’s sustainability. The environment plays an important role in determining the behaviour of the individual. Its features, tendencies, trends, preparedness and capabilities, and every individual’s behaviour affects the environment, Environmental psychology is an emerging science and is closely related to our daily lives in different locations. and was heightened by environmental degradation and urban violence, The decrease in natural resources and the impact of environmental pollution on health, and one of the direct causes of environmental degradation, Is the exploitation by man of the environment and its resources for his well-being without attention to it environmental psychology examines the impact of the environment on human experience, behaviour and well-being, as well as the impact of individuals on the environment, i.e. factors affecting environmental behaviour, and ways to promote sustainable behaviour (*Pol, 2006*).

The various dimensions of sustainable development have also become one of the most important priorities on the agenda of most of the world’s countries working to develop their societies. The dimensions are interdependent and complementary, resulting from their intersection and overlap in sustainable be-

behaviour for societies (Kafi, 2017). We review the sustainable dimensions of behaviour with some brevity.

4.1. Social Dimension

The social dimension of development means the right of individuals to live in a clean environment to engage in their activities normally while providing them with services and guaranteeing their right to acquire and invest their share of natural wealth while serving their needs without affecting the right of future generations of natural resources. This dimension focuses on the individual being the core of the development process and its main objective, Sustainable development seeks to achieve people's health, education and practical care with high transparency and integrity to ensure access to a sustainable society (Tantawi, 2021).

Since behaviour is influenced by social values, customs and traditions in a society, it is through these values that behaviour is judged by acceptance or rejection (Daher, 2014).

4.2. Economic Dimension

Economic development gives importance to the human person; Its prominent role in increasing production and advancing economic, social and other development.

It must be noted that stimulating sustainable economic environmental growth to improve people's standard of living equitable distribution of resources among all individuals, Within one society and equal access to them, education and programmes aimed at rationalizing natural resources, energy and vocational training contribute significantly to increasing individuals' access to a profession, trade or project management as an attempt to raise the standard of living (Alrejal, 2016).

The economic dimension of sustainable behaviour can be summarized as the use of economically available environmental conservation tools and products, raising awareness to change production and consumption patterns and make them more sustainable, encouraging investments that take into account environmental impacts, and equitable distribution of resources and products to improve living standards (Kafi, 2017).

4.3. Environmental Dimension

Sustainable development in its environmental dimension is based on: a balance between increasing economic growth and conserving natural resources that have become depleted; Because of its extensive and irrational use, it contributes to the creation of alternatives to these resources and strives to rebuild them, preserving the remainder of them for future generations. It is threatened by the risk of destruction and extinction as a result of pollution, waste abundance and gas emission. It also contributes to finding appropriate environmental solutions to reduce and confine these hazards (Fateh, 2018).

4.4. Technological Dimension

The technological dimension of sustainable behaviors is meant to use and exploit technology in our daily lives to conserve natural resources for the benefit of present generations without harming the interests of future generations. Sustainable technology uses the least energy and resources and produces clean waste, in the sense that it does not produce gases or pollutants that raise temperatures on the Earth's surface (Tantawi, 2021).

4.5. Human Dimension

Human behaviour is based on an active force that moves and directs this behaviour through an accurate and orderly nervous system. This active mental process contributes to a deeper understanding of the complex relationships between human beings and their environment and interprets information in a selective manner and thus creates an individual's phenomenal behaviour. This behaviour can be controlled and made sustainable by understanding how the individual perceives the reality and the world in which he lives, to achieve adaptation and the sustainable development goals (Daher, 2014).

5. Previous Studies

Several studies have examined sustainable behaviour and its relationship with other variables, including:

Corral-Verdugo et al. (2011) aimed to investigate whether there is a correlation between psychological well-being and sustainable behaviour: altruistic behaviour and pro-environmental behaviour, for example. The results of the survey research conducted on 120 individuals showed an improvement in the psychological well-being of participants engaged in sustainable activities. This suggests that individuals supportive of the environment and sustainable behaviour are likely to experience positive psychological benefits such as happiness, enhanced satisfaction, contributing to personal well-being.

In the study by Tapia-Fonllem et al. (2013), which involved constructing a scale for sustainable behaviour and verifying its validity and reliability in measuring pro-sustainability behaviours, the researchers adopted a descriptive-analytical methodology. They administered a questionnaire to a random sample of students and professors from four universities in Mexico, totaling 807 individuals, with 52% females and 47% males, aged between 18 and 44 years old. The results of the study indicated a correlation between the four factors of the scale (pro-environmental behaviour, altruism, economy, and fairness). The scale demonstrated good reliability with a Cronbach's alpha value of 0.79, and construct validity between 0.39 and 0.85 at a significance level of 0.01, indicating acceptable reliability and validity coefficients.

The study by Jesse & Eric (2015) aimed to determine the effectiveness of an interactive website providing multi-source feedback on motivating students to change their behaviours towards sustainability or their values, or aligning be-

tween them. Based on the principle that creating “cognitive dissonance” between individuals’ values and behaviours tends to encourage them to reconcile daily behaviours with declared values, the platform works to increase students’ awareness of individual sustainability. This study utilized a unique multi-source feedback platform developed by three teaching bodies at James Madison University, and a sustainable personality survey platform. Continuous research indicated that when conducted effectively, the feedback process could lead to changes in students’ awareness, behaviours, and values after the study. However, few students indicated a greater alignment between their values and behaviours. The study recommended the provision of multi-source platforms and applications in academic environments, government organizations, non-profit organizations, and other organizations that measure growth and success for social change, which starts with individual change.

The study by [Barrera-Hernández et al. \(2020\)](#) contributed to elucidating the impact of environmental connectedness on sustainable behaviours and happiness among children. To analyze the relationship between various variables in children (environmentally supportive behaviour, economy, altruism, fairness, and happiness), a structural equation model was utilized. The results revealed a significant relationship between environmental connectedness and sustainable behaviours, which in turn influence happiness. This indicates that children who perceive themselves as more connected to the environment tend to engage in more sustainable behaviours. Furthermore, the more supportive children are of the environment, economy, altruism, and fairness, the higher their perceived happiness. The study recommended discussing the implications for studying and promoting sustainable behaviours within the framework of positive psychology.

A General Comment on Previous Studies

By reviewing some of the previous studies that addressed sustainable behaviour, the researcher benefited from these studies in constructing and delineating the dimensions of the scale based on the literature, tools, and measures used in previous studies, standardizing them on the sample in the current study, formulating the scale items, and selecting the most suitable methods to verify the validity and reliability of the scale, such as the study by [Tapia-Fonllem et al. \(2013\)](#). Additionally, it helped in identifying the appropriate research methodology for conducting this type of study, according to the circumstances and nature of the current study.

6. Methodology

6.1. Study Methodology

A descriptive-analytical approach was adopted, considering the adaptation of this approach to the specific conditions and requirements imposed by the psychometric study of psychological measurement tools.

6.2. Study Population

The study population consists of middle school students in both government and private schools in Tabuk city, Saudi Arabia.

6.3. Study Sample

A random sample of middle school students from both government and private schools in Tabuk city was selected, totaling 175 individuals, with 62% females and 48% males. Their ages ranged between 12 and 15 years old.

7. Building the Study Scale Steps

The researcher developed a scale to measure sustainable behaviour among middle school students due to the lack of a suitable scale within the scope of the researcher's expertise in the Arab environment. The researcher took the following steps in preparing the scale:

- 1) Setting the target of the scale: In the current study, the measure aims to measure the sustainable behaviour of middle school students.
- 2) Knowledge of theoretical literature and models related to the concept of sustainable behaviour, as reported in:

Collect available metrics aimed at measuring the sustainable behavior of other samples (Tapia-Fonllem et al., 2013). The researcher reported on the identification of the dimensions of sustainable behaviour, four dimensions: pro-environmentally based behaviour—fair and equitable behaviour—consumer rationalization behaviour—altruistic behaviour. The researcher also benefited from the vocabulary of the scale after translating it into Arabic, adopting those that are commensurate with the study's objectives and the type and age of the sample.

The researcher also benefited from a measure of altruistic behaviour in the study of the bibliography (AL Dabaiba, 2009). In the development of vocabulary for altruistic behaviour, and after rationalization, the researcher benefited from some of the proposed vocabulary in the identification of sustainable consumption prepared by Naseeb and Murdawi (2020), the researcher also used the measure of environmental behaviour to prepare (Ali & Amer, 2020), a measure of social values and environmental behaviour by Saleh Osman (2012), where some vocabulary on pro-environmental and rational behaviours was quoted.

- 3) Target Population: This scale targets middle school students in the Kingdom of Saudi Arabia.

4) Formulating the Scale Items in its Initial Form: The questionnaire consisted of 24 positive statements divided into four dimensions: Environmental Supportive Behaviours, Conservation Behaviour, Altruism, and Justice and Fairness. The scale was initially administered to the sample, in addition to being presented to 15 experts, to assess the relevance of the items to sustainable behaviour, as well as to evaluate the clarity and accuracy of the statements in measuring the intended constructs.

- 5) Determining the Response Format: The response format for the scale was

determined using a five-point Likert scale, ranging from Strongly Disagree to Strongly Agree (1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree). The negative statements were reverse-coded accordingly.

6) Preparing Scale Instructions: The researcher prepared clear and concise instructions for the scale, ensuring they were easily understandable for the participants. Care was taken to make the instructions brief. Among the test instructions, participants were invited to engage by reading a set of statements representing various daily life situations and behaviours, accurately identifying their own positions based on their perspectives rather than societal expectations. It was emphasized that all provided data would be treated with utmost confidentiality and would only be used for research and study purposes.

7) The Scale Description:

The questionnaire consisted of 22 items divided into four dimensions:

a) Environmental Supportive Behaviours: These include recycling, waste management, water and energy conservation, reading environmentally friendly books and topics aligned with sustainable development goals. It consists of 6 items, including two negative items.

b) Conservation Behaviours: These constitute the cornerstone of sustainable lifestyle, encompassing individuals' daily consumption habits, purchasing practices, and waste disposal methods. Aligning our daily behaviours with our positive values leads to a sustainable community. It consists of 6 items, including two negative items.

c) Altruistic Behaviours: This entail prioritizing the collective benefits over individual gains. Altruistic behaviour serves as an indicator of sustainable behaviour due to its implications for preserving the social and natural context and the well-being of the community. It consists of 5 items, including one negative item.

d) Fairness and Justice Behaviours: One of the most important goals of sustainable development is justice within current generations and between current and future generations. This is achieved through sharing needs and balancing the benefits gained by the present generation and those for the future, in addition to meeting the current individual needs and balancing between human well-being and the safety of environmental and social systems (Tapia-Fonllem et al., 2013). It consists of 5 items, including one negative item.

And it can be illustrated in the following **Table 1**:

Table 1. Dimensions of the sustainable behaviour scale.

<i>Dimension</i>	<i>Paragraph Number</i>
Environmentally Supportive Behaviours	21-18-17-*10-*4-1
Conservation Behaviours	*23-15-11-*7-5-2
Altruistic Behaviours	24-*19-12-8-3
Justice and Fairness Behaviours	22-*20-16-14-9

*Indicates the inverse paragraph.

8. Results

8.1. Results of the First Research Question

What are the indicators of construct validity for the Sustainable Behaviour Scale among a sample of middle school students?

To answer the first research question, three methods were employed to verify the scale's validity: face validity, internal consistency reliability, and confirmatory factor analysis using structural equation modelling.

8.1.1. Face Validity (Expert Validity)

To verify the validity of the items and their suitability for measuring the intended constructs, as well as their appropriateness for the Saudi environment, the scale was presented to a group of experts with experience and expertise in the fields of measurement, education, and psychology. The panel consisted of 15 expert judges. The researcher benefited from the feedback of the judges, who recommended removing three items that were unanimously deemed irrelevant to the construct being measured. After linguistic revisions based on the judges' suggestions, the scale consisted of 24 items in its initial form, which was then applied to the study sample to assess its psychometric properties.

8.1.2. Internal Consistency Reliability

The reliability of the scale was assessed using internal consistency reliability by calculating Pearson correlation coefficients between each item and the total score of the scale. The results are presented in **Table 2**.

The table reveals that all Pearson correlation coefficients for the scale ranged between 0.42 and 0.79, indicating the acceptability of the construct validity of the scale items, except for items 6 and 13. The correlation coefficients for these items with the total score of the scale were 0.01 and -0.21 , respectively, which are statistically non-significant values. Therefore, these two items will be removed.

The internal consistency reliability between the scale items and their corresponding dimensions was calculated, and the results are as follows in **Table 3**.

The table reveals that all Pearson correlation coefficients resulting from examining the relationship between the items of the scale and their respective dimensions were statistically significant at the 0.01 and 0.05 levels, ranging from 0.32 to 0.83.

Additionally, the internal consistency reliability of the dimensions and the total score of the scale was verified. This is evident from the following table (**Table 4**).

From **Table 4**, it is evident that all correlation coefficients between the dimensions of sustainable behaviour orientation and the total score of the scale are statistically significant at the 0.01 level. This indicates the internal consistency reliability of the scale. The correlation coefficients ranged between 0.79 and 0.87, suggesting that the scale achieved a good level of internal consistency reliability and is suitable for use with a sample of middle school students.

Table 2. Pearson correlation coefficients between each item and the total score of the sustainable behaviour scale (n = 175).

<i>Paragraph</i>	1	2	3	4	5	6	7	8
Correlation	**0.68	**0.74	**0.79	**0.53	**0.79	NS0.01	**0.68	**0.74
Paragraph	9	10	11	12	13	14	15	16
Correlation	**0.76	**0.49	**0.63	**0.67	NS0.21	*0.43	**0.76	**0.62
Paragraph	17	18	19	20	21	22	23	24
Correlation	**0.77	**0.78	**0.42	**0.67	**0.68	**0.77	**0.57	**0.73

**Statistical function coefficients at significance level 0.01. *Statistical function coefficients at significance level 0.05.

Table 3. Pearson correlation coefficients between each item of the sustainable behaviour scale and its respective dimension (n = 175).

<i>Environmentally supportive behaviors (6 phrases)</i>		<i>Conservation behaviors</i>		<i>Environmentally supportive behaviors (6 phrases)</i>		<i>Conservation behaviors</i>	
<i>Poverty</i>	<i>Correlation</i>	<i>Poverty</i>	<i>Correlation</i>	<i>Poverty</i>	<i>Correlation</i>	<i>Poverty</i>	<i>Correlation</i>
1	*0.68	2	**0.71	3	**0.76	9	**0.73
4	**0.50	5	**0.77	8	**0.77	14	**0.74
10	**0.69	7	**0.66	12	**0.73	16	**0.73
17	**0.70	11	**0.75	19	**0.70	20	**0.32
18	**0.43	15	**0.81	24	**0.74	22	**0.61
21	**0.83	23	**0.75				

**Statistical function coefficients at significance level 0.01. *Statistical function coefficients at significance level 0.05.

Table 4. Pearson correlation coefficients between dimensions of the sustainable behaviour scale and the total score (n = 175).

<i>The dimensions</i>	<i>Correlation coefficient value</i>
1. Environmental Supportive Behaviours	**0.85
2. Conservation behaviours	**0.79
3. Thrift behaviours	**0.87
4. Fairness and justice behaviours	**0.76

**Function at the 0.01 level, *Function coefficients at the 0.05 level.

8.1.3. Confirmatory Factor Analysis (CFA)

CFA was employed to evaluate the model after each analysis, aiming to understand how variables are related to the questionnaire items illustrated in **Figure 1**.

The following goodness of fit indices were used: Chi-square ratio to degrees of freedom (χ^2/df), Goodness of Fit Index (GFI), Comparative Fit Index (CFI), and Root Mean Square Error of Approximation (RMSEA). The results are as follows:

The results in **Table 5** show that the goodness of fit indices for the study model ($\chi^2/df = 2.571$, GFI = 0.900, CFI = 0.901, TLI = 0.900, RMSEA = 0.07) meets the acceptance criteria. Therefore, the results confirm that the model fits the current study data perfectly.

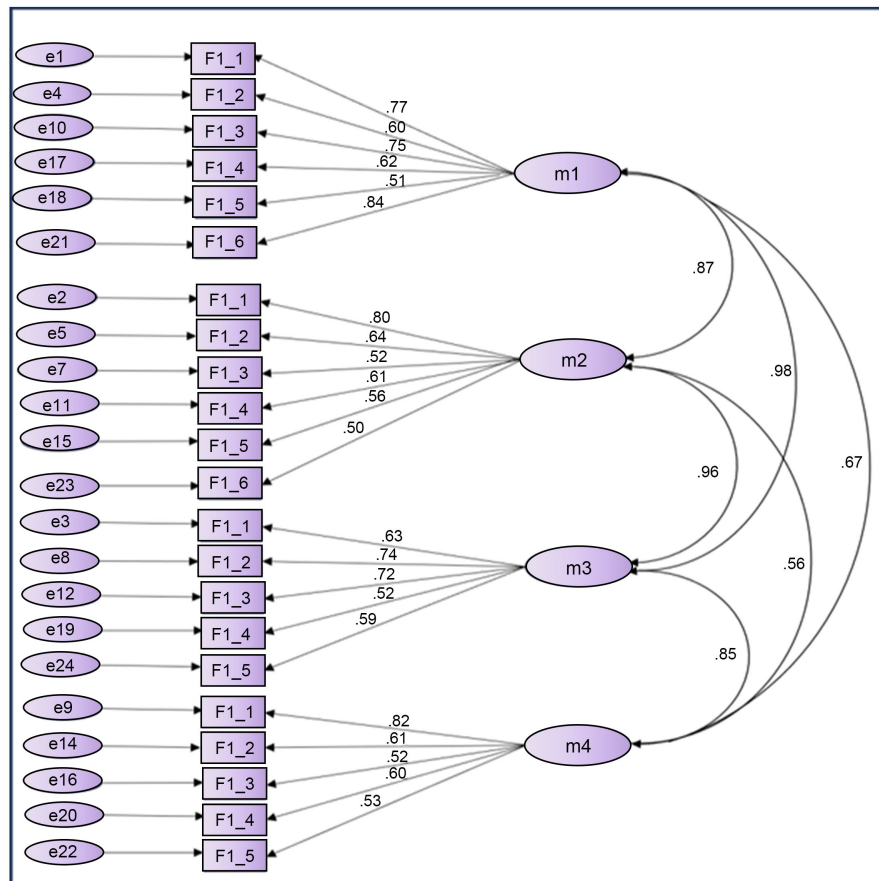


Figure 1. Confirmatory Factor Analysis (CFA).

Table 5. Goodness of fit indices.

<i>Indicators of model fit quality</i>	<i>The acceptable value for fit. (Hair et al., 2019)</i>
$\chi^2/df = 2.571$	$\chi^2/df < 3$
GFI = 0.900	GFI > 0.90
CFI = 0.906	CFI > 0.90
TLI = 0.900	TLI > 0.90
RMSEA = 0.07	RMSEA = 0.07

8.1.4. Convergent Validity

Means converting the level of agreement and correspondence between items (or measurement items) into a degree of consistency. This process is achieved using the following indicators:

- Factor loading.

Measuring factor loading is an indicator of the accuracy of the inverse structures of latent variables, where it is preferable for the factor loading to have a high variance ratio, and for the external loads of all variables to be statistically significant. According to Hair et al. (2019), measurement items with factor loadings greater than 0.5 are considered acceptable. The results in Table 6 indi-

cate that the factor loading for all items is greater than 0.5 at a statistically significant level ($p < 0.05$).

- Composite reliability

Composite reliability measures the reliability of the latent variable structure from multiple external variables. The closer the value is to one, the higher the reliability level. According to Hair et al. (2019), an acceptable value for composite reliability should be greater than 0.70. The results in Table 6 show that the composite reliability (CR) values for all items range from 0.845 to 0.700, which is greater than the acceptable value of 0.70. Therefore, the composite reliability of all variables can be accepted.

- Average Variance Extracted (AVE)

This criterion is used to verify the convergence validity of latent variables. According to Hair et al. (2019), the acceptable value for the average variance extracted (AVE) should be at least 0.50. The results in Table 6 reveal that the AVE values for all items range from 0.526 to 0.50, which is greater than the acceptable value of 0.50. Therefore, the extracted average variance for all variables can be accepted.

Table 6. Convergent validity indicators.

Variable	Measurement items	Loading factor	Composite reliability	Average variance extracted	Level of significance
Environmentally supportive behaviours	Item 1	0.774	0.845	0.526	0.000
	Item 2	0.603			0.000
	Item 3	0.753			0.000
	Item 4	0.624			0.000
	Item 5	0.514			0.000
	Item 6	0.843			0.000
Conservation behaviours	Item 1	0.797	0.710	0.501	0.000
	Item 2	0.643			0.000
	Item 3	0.52			0.000
	Item 4	0.611			0.000
	Item 5	0.563			0.000
	Item 6	0.507			0.000
Altruistic behaviours	Item 1	0.632	0.742	0.50	0.000
	Item 2	0.745			0.000
	Item 3	0.719			0.000
	Item 4	0.521			0.000
	Item 5	0.594			0.000
Fairness and justice behaviours	Item 1	0.817	0.700	0.50	0.000
	Item 2	0.608			0.000
	Item 3	0.524			0.000
	Item 4	0.609			0.000
	Item 5	0.533			0.000

8.1.5. Discriminant Validity

Which indicates the extent of differentiation among latent variables or verifies that each latent variable is distinct from the other latent variables in the model. To measure discriminant validity, the method proposed by Fornell & Larcker (1981) was used. This method suggests supporting discriminant validity if the square root of the extracted average variance (AVE) for the latent variable is greater than the correlations between all latent variables. Table 7 shows that the square root of the AVE values for all latent variables exceeds the inter-construct correlations for each latent variable, thus confirming the discriminant validity of all latent variables.

8.2. Results of Research Question 2

What are the indicators of the sustainability behaviour scale stability among a sample of middle school students?

Stability refers to the consistency and coherence of the scale, indicating that it yields the same results with the same likelihood if applied again to the same population. To ensure the stability of the scale used, the Cronbach's alpha coefficient was employed to assess the accuracy of the responses from the study population.

The results in Table 8 indicate that the Cronbach's Alpha coefficient value for the total questionnaire items is 0.903. Furthermore, the results show that the Cronbach's Alpha coefficient value for the first dimension, Environmental Supportive Behaviours, is 0.830, for the second dimension, Conservation Behaviours, is 0.708, for the third dimension, Altruistic Behaviours, is 0.734, and for the fourth dimension, Fairness and Justice Behaviours, is 0.719. According to Hair et al. (2019), the acceptable value for Cronbach's Alpha coefficient should be greater than 0.70. The results in Table 8 reveal that all Cronbach's Alpha coefficient values are greater than 0.70, indicating that all these coefficients are acceptable. This value is indicative of the validity of the study tool (the questionnaire) to achieve its objectives, suggesting the possibility of stability in the results that can be obtained upon its application

Table 7. Discriminant validity.

<i>The variables</i>	<i>Environmentally supportive behaviors</i>	<i>Conservation behaviours</i>	<i>Altruistic behaviours</i>	<i>Fairness and justice behaviors</i>
Environmentally supportive behaviours	0.725			
Conservation behaviours	0.659	0.714		
Altruistic behaviours	0.502	0.692	0.707	
Fairness and justice behaviours	0.688	0.373	0.577	0.707

The bold values represent the square root of the Average Variance Extracted (AVE).

Table 8. Cronbach's alpha coefficient values for the dimensions of the sustainability behavior orientation scale and the total scale score (n = 175) acknowledgements.

<i>Cronbach's alpha coefficient value</i>	<i>Number of items</i>	<i>The dimensions.</i>
0.830	6	<i>Environmentally supportive behaviours.</i>
0.708	6	<i>Conservation behaviours</i>
0.734	5	<i>Altruistic behaviours</i>
0.719	5	<i>Fairness and justice behaviours</i>
0.903	22	<i>Total score</i>

9. Conclusion

The preceding findings indicate that the Sustainable Behaviour Scale for middle school students exhibits high levels of reliability and validity. This makes it suitable for use in future research within the Saudi Arabian context.

The study concluded:

- All Pearson coefficients' values resulting from the examination of the relationship between the metric paragraphs and their dimension are statistically relevant at 0.01 and 0.05.
- All coefficients' values for the dimensions of the orientation towards sustainable behaviour and the overall score of the scale are at the level of 0.01, where the coefficients' values ranged between the values (0.79) and (0.87), indicating that the scale achieved a good degree of internal honesty.
- Quality indicators conforming to the study model ($\chi^2/df = 2.571$, GFI = 0.900, CFI = 0.901, TLI = 0.900, RMSEA = 0.07) meet the admission rule. That is, the model is well suited to the study's current data.
- The loading factor for all items is greater than 0.5 at a statistical indicative level ($p < 0.05$).
- The value (CR) of all items ranges from 0.845 - 0.700 and is greater than the acceptable value of 0.70. Therefore, the composite reliability of all variables can be accepted.
- The value (AVE) of all items ranges from 0.526 - 0.50 and is greater than the accepted value of 0.50. Therefore, the value of the average variance extracted for all variables can be accepted.
- The square root of AVE values for all underlying variables is greater than the interconnections for each underlying variable and therefore discriminatory honesty for all underlying variables can be accepted.
- All Alpha Cronbach coefficient values are greater than 0.70 which means that all of these transactions are of acceptable value, and this value is an indicator of the validity of the study tool for the purpose of achieving its objectives.

10. Recommendations of the Study

Based on the study's findings regarding the validity of the scale for application, the researcher recommends the following:

- Utilize the scale in psychological studies exploring sustainable behaviour and its relationship with other variables.
- Benefit from the scale in planning and designing counselling programs related to sustainable behaviour.

11. The Proposals

- Conduct further studies to verify the construct validity of the scale.
- Conduct studies to investigate the factorial structure variability of the scale across different samples or cultural contexts.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

- Abdel-Messiah, S., & Faraj, M. (2002). Development of Environmental Risk Awareness among Some Categories of Society and Secondary School Students and the Extent to Which Science Books Address Those Risks. *Scientific Education Journal*, 3, 1-47.
- AL Dabaiba, S. K. (2009). *Altruistic Behaviour and Its Relationship with Family Parenting Patterns of Secondary School Students in Jordan*. Unpublished Master's Thesis, University of Oman.
- Al-Anzi, S. F. (2021). The Role of Educational Supervisors in Achieving the Sustainable Professional Development of Secondary Teachers in the Tabuk Education District from the Point of View of Educational Leaders. *The International Journal of Educational and Psychological Research*, 8, 136-196.
- Ali, N. S., & Amer, S. B. (2020). Modifying Environmental Behavior among a Sample of Street Children Using Visual Art—A Case Study. *Journal of Environmental Sciences Institute of Environmental Studies and Research—Ain Shams University*, 49, 103-146.
- Alrejal, H. (2016). The Role of Continuing Education and Its Management in Achieving the Requirements of Sustainable Development. In *14th Annual Conference: From Adult Education to Lifelong Learning for All for Sustainable Development* (pp. 1057-1078). Ain Shams University, Center for Adult Education, Arab Educational, Cultural and Scientific Organization and General Authority for Adult Education.
- Al-Shafei, B., & Al-Omari, W. (2021). The Contribution of Psychological Approach in Addressing Environmental Problems and Sustainable Development. *Journal of University of Psychological and Educational Sciences*, 1, 817-842.
- Al-Tayton, A. (2018). Sustainable Behaviour Psychology. *Al Arabi Online Magazine*, 714. <https://alarabi.nccal.gov.kw/home/article/17546>
- Al-Wadae, S. (2022). *Sustainable Behaviour: A Directional Responsibility*. Ecomena. <https://www.ecomena.org/sustainable-behavior-ar>
- Barrera-Hernández, L. F., Sotelo-Castillo, M. A., Echeverría-Castro, S. B., & Tapia-Fonllem, C. O. (2020). Connectedness to Nature: Its Impact on Sustainable Behaviors and Happiness in Children. *Frontiers in Psychology*, 11, Article 276. <https://doi.org/10.3389/fpsyg.2020.00276>
- Bonnes, M., & Bonaiuto, M. (2002). Environmental Psychology: From Spatial-Physical Environment to Sustainable Development. In R. B. Bechtel & A. Churchman (Eds.), *Handbook of Environmental Psychology* (pp. 28-54). John Wiley & Sons, Inc.

- Brown, K. W., & Kasser, T. (2005). Are Psychological and Ecological Well-Being Compatible? The Role of Values, Mindfulness, and Lifestyle. *Social Indicators Research*, 3, 49-68. <https://doi.org/10.1007/s11205-004-8207-8>
- Corral-Verdugo, V., Montiel-Carbajal, M. M., Sotomayor-Peterson, M., Frías-Armenta, M., Tapia-Fonllem, C., & Fraijo-Sing, B. (2011). Psychological Wellbeing as Correlate of Sustainable Behaviors. *International Journal of Hispanic Psychology*, 4, 31-44.
- Daher, H. A. (2014). *Environmental Behaviour in Adolescence and Its Relationship with Learned Helplessness and Future Career among a Sample of Students in Damascus Governorate*. Unpublished Master's Thesis, Faculty of Education, University of Damascus. <http://search.shamaa.org/fullrecord?id=243096>
- Fateh, B. (2018). Strategic Management's Contribution to the Achievement of Sustainable Development Goals. *Indicator Journal of Economic Studies*, 2, 5-19.
- Fornell, C., & Larcker, D. F. (1981). Evaluating Structural Equation Models with Unobservable Variables and Measurement Error. *Journal of Marketing Research*, 18, 39-50. <https://doi.org/10.1177/0022243781018001>
- Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2019). *Multivariate Data Analysis* (8th ed.). Cengage Learning, EMEA.
- Hijazi, T., & Sherif, N. (2017). The SEKO Metric Properties of Two Images Test in Mathematics for the Intermediate Stage "Comparison Study". *Journal of Educational and Psychological Studies—Sultan Qaboos University*, 11, 190-178. <https://doi.org/10.53543/jeps.vol11iss1pp178-190>
- Jesse, B. P., & Eric, C. P. (2015). The Sustainable Personality: Values and Behaviors in Individual Sustainability. *International Journal of Higher Education*, 4, 12-21. <https://doi.org/10.5430/ijhe.v4n1p12>
- Kafi, M. (2017). *Sustainable Development*. Academics Publishing and Distribution Company.
- Najera, M. J. (2010). *Sustainability in Higher Education. An Explorative Approach on Sustainable Behavior in Two Universities*. Doctoral Dissertation, Erasmus University.
- Naseeb, S., & Mardawi, K. (2020). Sustainable Consumption According to Sustainable Behavior Pillars: A Field Study of Gas Consumers in Constantine. *Journal of Humanities Sciences*, 31, 729-751.
- Norwegian Ministry of the Environment (1994). *Oslo Roundtable on Sustainable Production and Consumption*. <https://enb.iisd.org/consume/oslo004.html>
- Osman, S. S. (2012). *Some Social Values and Their Relationship with Environmental Behavior, a Field Study of a Sample of Benghazi University Students*. Unpublished Master's Thesis, Benghazi University.
- Pol, E. (2006). Environment. *Human Behavior*, 7, 95-113.
- Tantawi, R. (2021). General Education Curricula and Sustainable Development Requirements. *Journal of the Faculty of Education*, 1, 1-19.
- Tapia-Fonllem, C. O., Verdugo-Corral, V., Fraijo-Sing, B. F., & Durón-Ramos, M. F. (2013). Assessing Sustainable Behavior and Its Correlates: A Measure of Pro-Ecological, Frugal, Altruistic and Equitable Actions. *Sustainability*, 5, 711-723. <https://doi.org/10.3390/su5020711>
- UNESCO (2021). *Sustainable Development Goal 4*. <https://ar.unesco.org/gem-report/node/1346>