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Reevaluating Propensity to Support Sustainability

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Abstract: In a world faced with ever-growing crises of climate change, economic inequality, and social injustice, sustainability has become a catch-all term to address these challenges and more. However, efforts to measure the social, environmental, and economic factors of sustainability are undermined by inconsistent understandings of the term. This research seeks to address this gap in sustainability research by constructing a wide-reaching propensity instrument that incorporates the different constructs of sustainability. A literature review informed propensity instrument construction. The first version of the instrument included 269 items, which were narrowed to 100 after an iterative process of merging, refinement, and elimination. The 100 scale items were deployed through an online survey, where 162 responses were collected to inform data analysis. Principal component analysis revealed two primary factors of Sustainable Behavior and Sustainability Attitude. After further refinement based on items' factor-loading scores and communalities, 13 items remained that described sustainability as environmentally and socially conscious behaviors and attitudes. The third construct of sustainability, economics, was not present after such refinements, suggesting that purely economic behaviors and attitudes are disparate from individuals' sustainability propensity. This new propensity instrument informs the understanding of sustainability and provides a tool for measuring sustainability with more breadth.

Keywords: sustainability; propensity; sustainable development

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1. Introduction

Sustainability is a term that can describe a variety of systems, lifestyles, or principles of behavior. It is used to inform important policy decisions, consumption choices, and more, but how can such a flexible term be defined? There are over 300 working definitions of sustainability [1], but some are more popular than others. One of the most recognized definitions of sustainability is that of sustainable development. Sustainable development was popularized by the 1987 Brundtland Report, which describes it as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" [2]. This definition highlights a major theme of sustainability, persistence over time, but it does so in a way that emphasizes growth and development. However, how might sustainable development differ from all-around sustainability? What about sustainable consumption practices? Over time, the scientific community has grown to accept sustainability as incorporating three cores of social, economic, and environmental sustainability, but what are the different measures of sustainability in these cores [3]? The ever-increasing usage of the term "sustainability" requires a greater understanding of what it actually means.

Even though the definitions of sustainability vary across disciplines (e.g., biology, economics, sociology, urban planning, environmental ethics), efforts are still being made to measure it, each with different conceptions of its meaning [4]. Studies evaluate entities' sustainability propensity through surveys and scales with the goal of understanding sustainability intention, which can lead to those entities acting in sustainability behaviors [5]. However, a murky understanding of sustainability can undermine these measurement efforts, as different scales measure different constructs of sustainability. These scales become even more complex when the scales evaluate different entities such as nations, communities, companies, and individuals.

Recognizing the growing importance of sustainability in the global context, we identified a need for a clearer framework to measure sustainability and its diverse interpretations. This study aims to enhance transparency regarding what sustainability propensity scales measure, the entities they are designed to evaluate, and how their questions target distinct constructs of sustainability. Our objective is to develop and validate a refined sustainability propensity scale instrument through an iterative process that integrates existing constructs and utilizes Principal Component Analysis (PCA) for its construction. This approach aims to enable future researchers to select question categories tailored to the specific aspects of sustainability they wish to measure, building on insights from widely used existing scales.

2. Literature Review

Sustainability has various definitions that span across different fields of study. However, the three-pillar concept of sustainability (social, economic, environmental) has been widely recognized in sustainability literature [3]. Figure 1 illustrates the overlapping social, economic, and environmental constructs that form sustainability. After the Brundtland Commission report popularized the definition of sustainable development, the three-pillar concept merged as a way to balance the trade-offs between goals of environmental health, economic growth, and societal equity [3]. After all, economic development, when left unchecked, may be a causing factor in declines of environmental health and social equity [3]. Sustainable development's definition differs from other definitions proposed for overall sustainability, but all include themes of preserving a "system's capacity to endure" and maintenance over time [6].

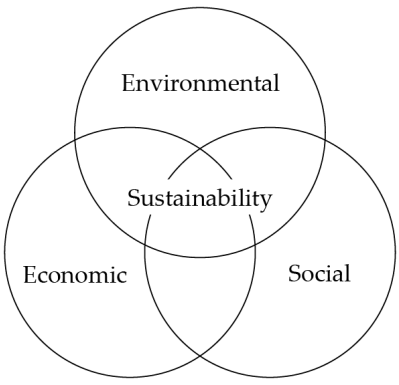

Figure 1. Overlapping social, economic, and environmental constructs combine to influence sustainability. Sustainability policies and initiatives may focus on any particular one of these constructs, but they are interrelated and influence one another.

With a general consensus on the overlapping social, economic, and environmental aspects of sustainability, efforts have still been made to offer more specific descriptions of sustainability constructs. Definitions are desirable within fields of study because they allow for more finite measures of sustainability efforts. For example, ref. [7] defined

sustainability for the healthcare industry as "after a defined period of time, a program, clinical intervention, and/or implementation strategies continue to be delivered and/or individual behavior change is maintained; the program and individual behavior change may evolve or adapt while continuing to produce benefits for individuals/systems". The definition allows for a benchmark where after a period of time, medical practitioners could decide whether an intervention is sustainable. Even though this definition is specific to one industry, sustainability's essence of being delivered over time and maintenance of desired outcomes are applicable to other fields of study. This example points towards the possibility for an all-encompassing definition of sustainability that could be applied to a variety of industries, while aspects of sustainability for specific systems might be measured through their unique inputs and outputs [6].

Beyond acknowledging that sustainability incorporates environmental, social, and economic considerations, how is it generally discussed? Efforts have been made to describe the different constructs of sustainability. The term has been used in varying degrees to describe "a set of social-ecological criteria that guide human action", "a vision of humankind that is realized through the convergence of the social and ecological objectives of a particular reference system", "an object, thing or phenomenon that happens in certain social-ecological systems", or "an approach that entails the incorporation of social and ecological variables into the study of an activity, process or human product" [8]. These descriptions imply the importance of social and ecological aspects of sustainability, while others might emphasize economic growth or development. They also vary in specificity, ranging from being an "object, thing, or phenomenon" to an actively followed approach or set of criteria [8]. Common archetypes of sustainability are the "ontology of nature", "substitution for natural capital", "economic growth", "population growth", "the role of technology", "social equity", and "stakeholder population" [9]. Descriptions often examine environmental problems with social and economic lenses [9]. More recently, the term has adopted more targeted definitions towards climate change and addressing risks from its adverse effects on society and economic well-being [10].

Given the varying definitions of sustainability found in popular literature, it can be tempting to attempt to create one, all-encompassing definition. The ability to definitively classify something as sustainable or not would be useful as a benchmark across industries. However, several researchers have argued against committing to one definition, as sustainability is an evolving concept that means different things in various fields, and determining one definition brings challenges of "paralysis by analysis" when examining all of the existing definitions [2]. After all, it is believed that there are more than 300 working definitions of sustainability [1]. Definitions can restrict how sustainability can be applied to various fields, so researchers argue that there should be more of a focus on understanding sustainability as a process, rather than specific requirements needed to define something as sustainable [1]. For example, one may view sustainability as a framework for maintaining system vitality, or it might be used to emphasize consideration of futurity, equity, and biodiversity [4]. Studying these types of examples of sustainability and examining how it is used in various fields provides a better working understanding of the concept than any working definition could offer [1]. Additionally, several existing scales have been developed to measure sustainability—for example, the New Ecological Paradigm (NEP) Scale has predominantly focused on environmental factors [11]. While these scales have contributed valuable insights, they may not fully capture the multifaceted nature of sustainability or provide a consistent framework for measurement. Our work seeks to address these limitations by developing a more integrated and standardized instrument that encompasses the diverse dimensions of sustainability in a comprehensive way. The fol-

lowing subsections provide an overview of the literature on the constructs of sustainability across social, economic, and environmental dimensions.

2.1. Social Construct of Sustainability

The social aspect of sustainability focuses on systems involving people and how individuals' actions impact others. It builds off the Brundtland Report's definition of sustainable development but with an emphasis on meeting basic human needs before addressing issues of biophysical growth [12]. Though narrower than sustainability as a concept, the definition of social sustainability incorporates several different constructs as well. Through "bridge social sustainability", there is a focus on nurturing the relationships between people and the environment to cultivate social conditions that allow for more ecological care [12]. "Maintenance social sustainability" emphasizes consideration of what cultural and social systems people want to keep or improve during times of development [12]. Both of these types of social sustainability consider human needs before ecology or economics, by fostering healthy social conditions and considering why people may resist sustainable development [12]. By factoring in human needs, a degree of safety is also achieved for communities, whereby security is guaranteed against increasing vulnerabilities caused by climate change [10].

As sustainability is context-specific and dynamic, it is important to consider how it can be implemented at a community scale, where local conditions may vary [13]. Communities might implement designs for sustainable transport, density, passive solar, or the reclamation of abandoned sites [10]. However, these designs must be accomplished through the redistribution of resources, education, inclusion through participation, and recognition of marginalized groups to achieve equity [10,14].

Past efforts to measure social sustainability have done so by correlating social behavior or intentions with the three cores of sustainability [15], examining benefits of a pro-social education [16], comparing national cultural values to individual action [13], and measuring altruistic behavior [17]. Questions evaluating social sustainability typically target altruistic intentions, collective behavior, and equity. Though these themes are the focus of social sustainability, Table 1 provides examples of social sustainability propensity scale items that still incorporate the environmental and economic cores, as environmental and economic topics persist in the items and their constructs.

Table 1. Examples of items designed to measure social sustainability propensity and their constructs. Constructs are listed from each item's original source(s).

Scale Item	Construct(s)
I talk with friends about environmental problems.	Social behaviors toward conservation [18]; Pro-ecological behavior [17]; Pro-environmental behavior [16]
I care about the needs of my local community and society.	Collectivism [13]
I help people who have fallen or gotten hurt.	Altruism [17]
I do volunteer work for a charity.	Pro-social behavior [16]
When purchasing a product, I consider whether workers' human rights were to adhered to in production.	Social consciousness for consumption [19]

2.2. Economic Construct of Sustainability

Out of the three cores of sustainability, economic sustainability is perhaps the most distinct. Compared to the other-oriented nature of social and environmental sustainability, economic sustainability is typically more individualistic [20] and focuses more on logical decision-making. At its simplest, it could mean balancing costs, profits, and economic

growth to keep a business or community financially stable over time. When examining economic sustainability in a broader sense, sustainability action can occur in businesses through entrepreneurial or corporate action, or through consumption practices by consumers.

Corporate responsibility can require companies to consider sustainability by balancing the social, environmental, and financial outcomes of their products or services. Operating sustainability could be the result of a genuine desire to incorporate sustainability, or it might be used as a business practice to get into greener markets [21]. Koe et al. found that businesses and their workers that have a propensity to support sustainability initiatives, feel social pressures to act sustainably or perceive sustainability as desirable or feasible are more likely to engage in sustainable entrepreneurship [5]. Additionally, there are greater benefits to companies for encouraging social and environmental responsibility over purely economic motivations, as individuals with comparatively large economic values were found to be more likely to engage in financially detrimental activities to a company [20].

At a consumer level, individuals make decisions over which they have control. When environmental and social consequences of products are disconnected from their purchases, it is less likely that individuals consume sustainably [22]. When sustainable consumption does occur, it often happens out of a sense of altruism rather than self-interest [22]. Altruistic and pro-environmental intentions of consumers result in a higher willingness to pay for products [23] and greater attention to production and eco-labels [24]. Individuals look for labels and indicators such as recycling, packaging, resource/energy use, and local production [19]. Opposing motivations of altruism, individuals also consume based on self-benefit and frugality. Visser et al. discuss how when these different motivations combine, sustainability becomes more popular for consumers [25], similar to how Tapia-Fonllem et al. found that sustainable behavior emerges through a combination of pro-ecological, frugal, altruistic, and equitable behaviors [17].

Measuring economic sustainability in the past has focused on frugality [17], purchasing behavior [18], collaborative consumption [19], and a desirability of sustainable business practices [5]. Table 2 provides examples of economic sustainability propensity scale items. Some items are purely economic and deal with only finances or weighing costs and benefits, such as "I only purchase products I absolutely require", while others incorporate aspects of environmental sustainability.

Table 2. Examples of items designed to measure economic sustainability propensity and their constructs. Constructs are listed from each item's original source(s).

Scale Item	Construct(s)
When purchasing a product, I consider if it was produced domestically.	Consumerism [18]; Participation through energy-related behaviors [21]; Consciousness for sustainable purchase behavior [26]
I only purchase products I absolutely require.	Consciousness for economically sound consumption [19]
I value individuals who identify the need for sustainability products/services.	Perceived feasibility of sustainable, entrepreneurial behavior [5]
I would not purchase a new vehicle if my old/current vehicle still functions.	Frugality [17]
I would give part of my income if I was certain that the money would be used to prevent environmental pollution.	Support towards sustainability initiatives [27]

2.3. Environmental Construct of Sustainability

The environmental aspect of sustainability is often the most presumed core of sustainability to be included in sustainable systems. It involves care for natural ecosystems for their intrinsic value and the worth of their resources. Environmental sustainability has typically described environmental conservation, which can be measured through specific actions such as recycling [18]. However, Kaiser & Wilson argue for a better understanding of environmental sustainability by seeing it through a lens of general behavior [18]. As with social and economic sustainability, understanding environmental sustainability more generally helps explain its interconnectedness to the other cores of sustainability. Of course, values such as environmentalism and diversity speak to environmental sustainability, but so do frugality, altruism, and equality [17]. While environmentalism can be measured through the costs and benefits of environmental risk [28], it can also be taught through prosocial education [16]. In this way, the three cores of sustainability can be understood together.

Questions regarding environmental sustainability target energy conservation [18,19], transportation [18], waste avoidance [18,19], and affinity towards diversity [17]. As evidenced by the examples in Table 3, environmental sustainability propensity scale questions include themes of social and economic sustainability through actions such as volunteering or consumption practices.

Table 3. Examples of items designed to measure environmental sustainability propensity and their constructs. Constructs are listed from each item's original source(s).

Scale Item	Construct(s)
I try to reduce energy use for heating and cooling.	Participation through energy-related behaviors [21]; Pro-environmental behavior [16]
I volunteer in environmental conservation.	Intention to act toward pro-environmental behavior [17]
I purchase products in reusable packages.	Waste avoidance [18]; Pro-ecological behavior [17]; Pro-environmental behavior [16]
I ride a bicycle instead of taking a car.	Mobility & Transportation [18]; Participation through energy-related behaviors [21]; Pro-environmental behavior [16]
When purchasing an item, I consider whether it is made from recycled materials.	Consciousness for environmentally friendly consumption [19]

3. Materials and Methods

3.1. Literature Selection

Compiling a comprehensive sustainability instrument first required a review of sustainability propensity literature. The review allowed for an understanding of how sustainability has historically been framed by varying constructs and concepts. Through creating a repository of these scales, one encompassing instrument could be made that incorporates sustainability's most common constructs and allows for a more holistic way to measure the term. There were no limitations on the origins of the literature included in the review because considering sustainability from a diverse set of fields and perspectives is necessary for a greater understanding of the term, though we focused on papers published in venues listed in the Web of Science's Master Journal List. The following search terms were combined and iterated upon in Google Scholar to collect literature: sustainability, sustainable, green, propensity, social, altruistic, environmental, ecological, economic, and business. Pieces of literature that directly provided their scale items were given priority, but all relevant (i.e., discussing sustainability propensity) studies informed this study. 43 academic papers were identified in total, with 40 being included in the Web of Science's Master Journal List. The three papers outside of this repository were included to capture perspectives published at other research venues, and they each had over 100 citations.

3.2. Items/Construct Refinement

The comprehensive propensity instrument was built by combining existing scales used in the identified literature. Out of the 43 academic papers that were reviewed for their content on propensity methods and social, economic, or environmental sustainability, 11 sources provided documentation on their scales, and their items were merged into the comprehensive instrument. When all items were included from the selected literature, there were 269 in total. The 269 items were grouped into constructs based on how they were categorized in their original literature (See Table 4). In the process of in-depth review, the items were iterated upon and reduced through combining identical, merging similar, eliminating redundant items, and splitting individual items into more distinct questions. For example, the item "I prefer to live lightly" was eliminated because of its potential to be interpreted in different ways, and "Workers should not be discriminated against" was merged with "Workers' human rights should be adhered to" because of the items' similarity. After this refinement, 100 scale items remained that were again grouped into refined constructs that categorized items based on what they were designed to measure (See Table 5). The final, deployable instrument incorporated items from the 11 sources' scales, which represented the fields of environmentalism, sustainability, sociology and behavioral sciences, culture, consumption, and entrepreneurship.

Table 4. Constructs and the number of items from all selected literature.

Constructs	Number of Items
Environmental Awareness	20
Environmental Action	38
Sustainable Consumption	32
Transportation	14
Reuse/Recycling	12
Uncertainty Avoidance	2
Frugality	18
Performance Orientation	16
Future Orientation	8
Power Distance	17
Collectivism/Altruism	5
Social Action	32
Masculinity-Femininity	39
Happiness	10
Sustainable Business	6
Total	269

Table 5. Refined constructs and the number of items.

Constructs	Number of Items
Societal/Environmental Perception	17
Individual Action	18
Resource Use	19
Sustainable Consumption/Purchasing	25
Collective Action	2
Sustainable Business Practice	19
Total	100

3.3. Deployment & Analysis

The items were used to create a survey on the Qualtrics survey platform. In addition to the 100 scale items, survey participants were asked for their basic demographic information. The first page of the Qualtrics survey detailed informed consent for survey participants, allowing participants to leave the survey at any time. Approval from the researchers' Institutional Review Board (IRB) was granted for the deployment of the instrument and data collection before it was administered. The instrument was deployed on Amazon's Mechanical Turk platform, where 162 participants who received the Master Worker certification completed responses to inform the analysis of the comprehensive scale. 165 responses to the instrument were advertised and received, but three were rejected for being incomplete, resulting in 162 total. We did not consider specific socioeconomic and environmental factors such as location, type of residence, employment, or lifestyle when distributing the survey to participants. PCA was performed to reduce the dimensionality of datasets. Reliability tests, correlation analysis, and linear regression were used to measure internal consistency of variables and their relations.

4. Results

Figure 2 illustrates the iterative process that resulted in the constructs of the final set of sustainability propensity scale items (See Table 6). The original instrument (see Supplemental Materials [5,13,16–19,21,24,26,27,29]) had 100 items that measured constructs previously established by existing research, such as "consumer consciousness for environmentally friendly consumption", "consumerism", "equity", "social norm", and "perceived feasibility of sustainable, entrepreneurial behavior". Table 7 describes the demographics of the participants that answered the original scale items.

Table 6. Finalized constructs and the number of items.

Constructs	Number of Items
Sustainability Attitude	7
Sustainable Behavior	6
Total	13

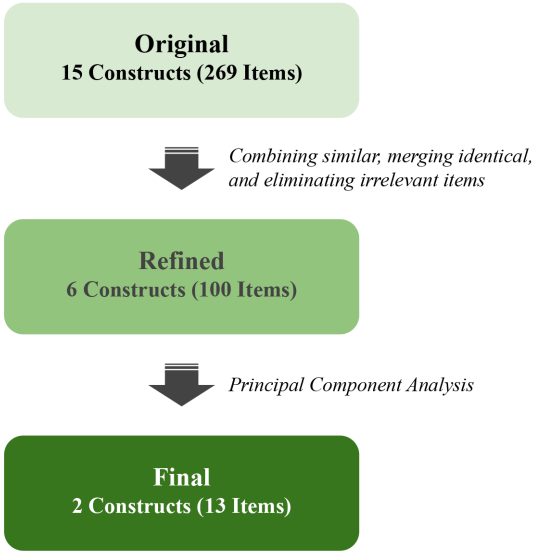

Figure 2. Through a process of refinement and principal component analysis, the original instrument was narrowed to 13 items that describe sustainability as environmentally and socially conscious attitudes and behaviors. Attitudes are feelings or ways of thinking, and behaviors are defined by actions (e.g., volunteering, donating, consumption practices).

Table 7. Demographics of the 162 participants that completed the original, 100-item sustainability propensity scale.

Age (Mean, SD)		44 (10.1)
Sex	Male	97 (59.9%)
	Female	64 (39.5%)
	Prefer not to disclose	1 (0.6%)
Race/Ethnicity (multi-select)	American Indian or Alaskan Native	3 (1.9%)
	African American	4 (2.5%)
	Arab or Middle Eastern	1 (0.6%)
	Asian	46 (28.4%)
	Black	8 (4.9%)
	Latino or Hispanic	7 (4.3%)
	Native Hawaiian and other Pacific Islander	1 (0.6%)
	White	98 (60.5%)
	Other	3 (1.9%)
Highest Education Level	Grades 9 to 12, no diploma	1 (0.6%)
	high school graduate or equivalent (GED)	17 (10.5%)
	some college	25 (15.4%)
	Associate degree	16 (9.9%)
	Bachelor's degree	78 (48.1%)
	Graduate degree	21 (13%)
	Professional degree	4 (2.5%)
Monthly Income	$0–$1000	36 (22.2%)
	$1001–$2000	31 (19.1%)
	$2001–$3000	26 (16%)
	$3001–$4000	22 (13.6%)
	$4001–$5000	21 (13%)
	More than $5001	16 (16%)
Employment Status (multi-select)	working full-time	118 (72.8%)
	working part-time	18 (11.1%)
	part-time student	1 (0.6%)
	unemployed	11 (6.8%)
	retired	7 (4.3%)
	disabled	1 (0.6%)
	Other: gig-worker	2 (1.2%)
	Other: self-employed	5 (3.1%)

Though four factors were identified by the initial analysis, only two were significant and included enough items to cluster together. Factor 1, which is being termed "Sustainable Behavior", included items about consumption, charitable acts, altruistic behavior, and environmentally conscious behavior such as recycling or conserving energy. It had 48 items total, four of which loaded well onto multiple factors. Factor 2, henceforth known as "Sustainability Attitude", included 25 items in total, two of which loaded well onto multiple factors. They targeted feelings about pollution, sustainable production, frugality, and equality. Factor 3 only had eleven items, with one item loading onto multiple factors and with none belonging to a particular, unifying construct. Factor 4 had three items that did not have any common themes. Lastly, 13 questions did not load well onto any of the factors. By eliminating any items that had factor loading scores or communality less than 0.6, or that loaded onto one factor alone, the final instrument was reduced to 12 questions. Five items are Sustainable Behavior, and seven are Sustainability Attitude. Table 8 shows the finalized items and PCA results.

Cronbach's alpha was measured to understand the internal consistency of variables. Table 9 shows the Cronbach's alpha values for each variable, which are above the pre-established thresholds [30]. The Cronbach's alpha of Sustainable Behavior was 0.848, which indicates a good internal consistency of the variable; of Sustainability Attitude was 0.918, indicating an excellent internal consistency.

Table 8. Finalized Items & PCA Results.

Variable	Item	Factor 1	Factor 2	Communality
Sustainable Behavior	When purchasing a product, I consider if it is packaged in an environmentally friendly manner.	0.785		0.625
	I contribute financially to environmental organizations.	0.776		0.670
	I purchase products in reusable packages.	0.661		0.630
	I purchase organic products.	0.658		0.678
	I provide money to the homeless.	0.600		0.660
Sustainability Attitude	Pollution is deteriorating natural resources.		0.761	0.730
	I support legislation that improves the environment.		0.732	0.664
	I value companies that address sustainability issues.		0.730	0.738
	I value individuals who identify the need for sustainability products/services.		0.718	0.677
	Inequities within communities and among employees should not be tolerated.		0.704	0.764
	I value supervisors that train employees for sustainability.		0.643	0.601
	I oppose legislation that harms the environment.		0.640	0.611

Table 9. Reliability analysis results.

Variable	Cronbach's α	The Number of Items
Sustainable Behavior	0.848	5
Sustainability Attitude	0.918	7

Pearson correlation coefficient was 0.490 ($p < 0.001$), meaning a moderate correlation between Sustainable Behavior and Sustainability Attitude exists. In regression analysis, Sustainability Attitude could elucidate the R^2 value of 0.240 of Sustainability Behavior, which means it had the capability of explanation of 24%. The p-value (0.000) showed its significance, and a positive t-value indicates that Sustainability Attitude is significantly and proportionately affecting Sustainability Behavior (See Table 10). Figure 3 shows this relationship between two variables.

Table 10. Regression analysis results indicate a moderate correlation between Sustainable Behavior and Sustainability Attitude, with an R^2 of 24%.

Dependent Variable	Independent Variable	B	β	t	p-Value
Sustainable Behavior	(Constant)	0.774			
	Sustainability Attitude	0.534	0.490	7.145	0.000

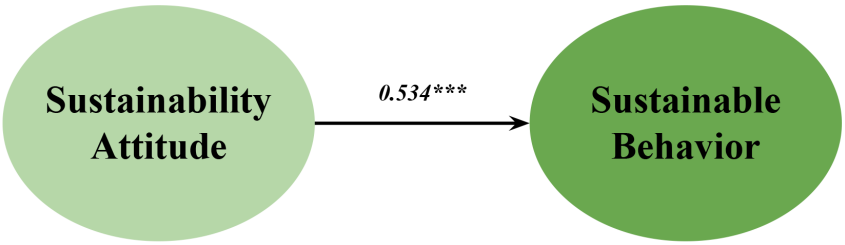

Figure 3. The relationship between Sustainability Attitude and Sustainability Behavior. *** indicates p-value < 0.001.

5. Discussion

The finalized factors—Sustainability Attitude and Sustainability Behavior—and their relationships within our comprehensive instrument are consistent with theoretical models from the literature on attitudes and behaviors, including the Theory of Reasoned Action [31], the Theory of Planned Behavior [32], and the Technology Acceptance Model, which builds upon the Theory of Reasoned Action [33]. Specifically, Sustainability Attitude reflects an individual's beliefs and values concerning sustainability, aligning with the Attitudes and Subjective Norms components of the Theory of Planned Behavior. Similarly, Sustainability Behavior corresponds to the Behavior component in the Theory of Planned Behavior. This alignment with theoretical models underscores that our instrument is not only theoretically grounded but also capable of effectively capturing the mechanisms of attitudes and behaviors as outlined in the existing literature.

The key contribution of our work lies in its ability to address a gap in the literature—specifically, the limited availability of comprehensive scales that incorporate diverse sustainability dimensions. While existing scales, such as the NEP Scale, have predominantly focused on environmental factors [11], our instrument uniquely integrates individual decisions and actions, offering a more holistic view of sustainability. This distinction underscores our work's contribution to the ongoing challenge of effectively measuring attitudes toward sustainability. While previous literature has made important strides in this area, there remains room for further development in constructing scales that fully capture the complexity of sustainability attitudes. Our instrument represents a meaningful step forward by integrating multiple dimensions of sustainability within a single, cohesive framework. By grounding our work in established theories and addressing existing gaps, we aim to contribute to the broader conversation on how to more effectively measure and understand sustainability attitudes and behaviors. In this section, we provide detailed definitions of each final factor and discuss the implications of our instrument.

5.1. Factor 1—Sustainable Behavior

Ref. [17] define sustainable behaviors as "the set of actions aimed at protecting the socio-physical resources of this planet", and our results confirm the emphasis of sustainable behavior on environmentally or socially conscious action. By caring for people and the planet, this factor includes two cores of sustainability, as a person may act with the intention to conserve environmental resources, or one may support fellow humans through different altruistic actions. Varying levels of participation in sustainability behavior include acting through charitable acts and donations, mindful consumption practices (e.g., purchasing products in reusable packages), and engaging in general environmental or social activism.

Sustainable behavior indirectly incorporates economic sustainability, but it does so through consumers' purchasing decisions. Frugality and debt-free consumption are typically included in sustainability behavior and consumption by existing literature [17,19]. However, our results indicate that the propensity to act sustainably is not related to purely economic decision-making, as only scale items that incorporated social or environmental sustainability were well-supported by the principal component analysis, even though economic-facing scale items were present in the 100 item instrument. When individuals engage in sustainable consumption, it can be attributed to a legitimate desire to be environmentally or socially responsible. Solely frugal consumption is disconnected from sustainability, as individuals' economic responsibility outweighs any intention to be sustainable [18]. This is why all resulting scale items incorporate social or environmental consciousness, as making economically sound decisions is disconnected from social and/or environmental support [19], and acting sustainably requires a genuine desire to pursue sustainability [34].

5.2. Factor 2—Sustainability Attitude

Sustainability Attitude describes how individuals value or feel about socially or environmentally responsible behaviors, regardless of whether they participate in such behaviors. The emergence of behavior and attitude from the all-encompassing instrument aligns with established research about behavior and attitude, as propensity is a measured intention that can lead to behavior [5], and models of attitude and behavior show that underlying values and attitudes influence behavior [20,35]. This model is further supported by the results of our regression analysis and the positive correlation between our factors of Sustainable Behavior and Sustainability Attitude. The scale items within this factor measure individuals' values, ranging from equity to supporting sustainable entrepreneurship. Similar to Sustainability Behavior, social and environmental attitudes emerged. Social values are "altruistic or other-oriented in nature", focusing on people individually and collectively [20]. Environmental values emphasize the "integrity of the earth's biophysical systems upon which life depends" [20]. Economic values were present in the form of scale items that targeted support for sustainable entrepreneurship, but again, no purely economic attitudes were supported by instrument results. Previous research shows that strong economic values are negatively correlated with social and environmental values [15], and business experience negatively impacts the connection between sustainability propensity and sustainable entrepreneurship [36]. This further supports the disconnect between the cores of economic sustainability against social and environmental sustainability.

5.3. Implications

Our results provide several implications for future sustainability research and practical applications. First of all, the results support understanding sustainability as a model of general attitudes and behaviors. The generality of the term is significant, as this model emerged from synthesizing several varying constructs of sustainability defined by existing literature, and it is supported by models of attitudes influencing behavior [20,35]. It is imperative to discuss sustainability in a context-dependent manner, as businesses, individuals, governments, and other entities have different responsibilities relating to sustainability. As suggested by Basiago, the term can serve as an organizing principle that points towards common goals such as futurity, equity, and biodiversity [4], but it should ultimately be understood through how it is used as an organizing framework in practice [1].

Our results also show that economic sustainability is distinct from environmental and social sustainability, at least at an individual level. When individuals use this comprehensive instrument to measure their sustainability propensity, their responses tend to define sustainability in terms of human development. Previous research has shown that economic constraints and backgrounds can vary significantly, leading to diverse impacts and barriers to sustainable attitudes and behaviors across different life domains [19,37–39]. As a result, perceiving economic sustainability may be challenging due to the complex nature of individual economic circumstances and their interrelated effects [40]. However, when considering sustainability from a broader perspective, it remains possible to conceptualize it in ways that promote sustainable economic growth [2].

Our developed instrument has the potential to contribute not only to academic discourse by providing a valid tool for measuring an individual's sustainability disposition across diverse contexts (e.g., different demographic groups and the effectiveness of interventions) but also to practical applications in various domains such as policymaking, businesses, and educational programs. Since Sustainability Attitude can predict behavioral intention, this predictive power can be instrumental in enhancing the effectiveness of policy interventions aimed at promoting sustainability, thus broadening the practical applications of our instrument. Policymakers, for example, can utilize this instrument to promote

sustainability at local, national, and global levels. It can aid in assessing the sustainability attitudes and behaviors of different communities, thereby enabling the development of policies that are better aligned with the characteristics and needs of these populations. Furthermore, the instrument can be used to monitor the effectiveness of sustainability policies or programs over time, facilitating evidence-based improvements. In education, the instrument offers a valid metric for assessing students' sustainability dispositions, supporting the design and enhancement of curricula aimed at fostering sustainability practices.

6. Conclusions

In this research, we developed and validated an enhanced sustainability propensity scale through an iterative process that integrates existing constructs. Our instrument could allow future researchers to select question categories tailored to the specific aspects of sustainability they wish to measure, building upon insights from widely used existing scales. Given the frequent usage of the term "sustainability", this research sought to explore the various meanings of sustainability to provide future researchers with a more comprehensive understanding of and an instrument for measuring individuals' sustainability propensity. Existing literature agrees on the three-pronged definition of sustainability as incorporating social, environmental, and economic sustainability, and the Brundtland Commission largely informed the world with its definition of sustainable development [3]. Given all the attempts to define sustainability however, many advocate for understanding it through practice, leaving it to be understood given varying contexts and rejecting any single definition [1–4].

While our research contributes to the field of sustainability by developing and validating a sustainability propensity instrument through survey analysis, several limitations should be noted. First, the instrument has not yet undergone expert evaluation, which could ensure its suitability and reliability. Future research should consider conducting such an evaluation to enhance the instrument's robustness. Additionally, our sample may not be representative of the general population, particularly in terms of income distribution. Although we included a broad range of income levels, with over 40% of participants reporting a monthly income of less than $2000, this distribution may not fully capture the diversity of the general population. This limitation is common in many previous studies, where income data is often underreported or derived from samples with similarly broad or limited ranges. Socio-economic and cultural factors, such as income and country of residence, can significantly influence perceptions and behaviors related to sustainability. Therefore, future research would benefit from a more balanced and representative sample across diverse socio-economic and cultural contexts to enhance the generalizability of the findings.

This research supports the understanding of sustainability as a term that can be used in practice or as a guiding principle, which does not belong to a single definition. The comprehensive instrument provided by this study will help future researchers measure sustainability according to their own needs, as it is labeled according to each question's original constructs in addition to our finalized, twelve scale items. As climate change and social injustices continue to impact the world, we encourage the further pursuit of understanding sustainability and using it to guide healthy, equitable systems across the globe.

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References

1. Ramsey, J.L. On not defining sustainability. *J. Agric. Environ. Ethics* **2015**, *28*, 1075–1087. [CrossRef]
2. Fien, J.; Tilbury, D. The Global Challenge of Sustainability. Education and Sustainability: Responding to the Global Challenge. 2002. Available online: https://books.google.com/books?id=q18nBgAAQBAJ (accessed on 15 January 2025).
3. Purvis, B.; Mao, Y.; Robinson, D. Three pillars of sustainability: In search of conceptual origins. *Sustain. Sci.* **2019**, *14*, 681–695. [CrossRef]
4. Basiago, A.D. Methods of defining 'sustainability'. *Sustain. Dev.* **1995**, *3*, 109–119. [CrossRef]
5. Koe, W.L.; Omar, R.; Majid, I.A. Factors associated with propensity for sustainable entrepreneurship. *Procedia-Soc. Behav. Sci.* **2014**, *130*, 65–74. [CrossRef]
6. Fath, B.D. Quantifying economic and ecological sustainability. *Ocean Coast. Manag.* **2015**, *108*, 13–19. [CrossRef]
7. Moore, J.E.; Mascarenhas, A.; Bain, J.; Straus, S.E. Developing a comprehensive definition of sustainability. *Implement. Sci.* **2017**, *12*, 110. [CrossRef]
8. Salas-Zapata, W.A.; Ortiz-Muñoz, S.M. Analysis of meanings of the concept of sustainability. *Sustain. Dev.* **2019**, *27*, 153–161. [CrossRef]
9. Vos, R.O. Defining sustainability: A conceptual orientation. *J. Chem. Technol. Biotechnol. Int. Res. Process. Environ. Clean Technol.* **2007**, *82*, 334–339. [CrossRef]
10. Eizenberg, E.; Jabareen, Y. Social sustainability: A new conceptual framework. *Sustainability* **2017**, *9*, 68. [CrossRef]
11. Dunlap, R.E.; Van Liere, K.D.; Mertig, A.G.; Jones, R.E. New trends in measuring environmental attitudes: Measuring endorsement of the new ecological paradigm: A revised NEP scale. *J. Soc. Issues* **2000**, *56*, 425–442. [CrossRef]
12. Vallance, S.; Perkins, H.C.; Dixon, J.E. What is social sustainability? A clarification of concepts. *Geoforum* **2011**, *42*, 342–348. [CrossRef]
13. Tata, J.; Prasad, S. National cultural values, sustainability beliefs, and organizational initiatives. *Cross Cult. Manag.* **2015**, *22*, 278–296. [CrossRef]
14. Dempsey, N.; Bramley, G.; Power, S.; Brown, C. The social dimension of sustainable development: Defining urban social sustainability. *Sustain. Dev.* **2011**, *19*, 289–300. [CrossRef]
15. Marcus, J. Human values and corporate actions propensity: Examining the behavioural roots of societal sustainability. *Bus. Soc.* **2012**, *51*, 677–689. [CrossRef]
16. Neaman, A.; Otto, S.; Vinokur, E. Toward an integrated approach to environmental and prosocial education. *Sustainability* **2018**, *10*, 583. [CrossRef]
17. Tapia-Fonllem, C.; Corral-Verdugo, V.; Fraijo-Sing, B.; Durón-Ramos, M.F. Assessing sustainable behavior and its correlates: A measure of pro-ecological, frugal, altruistic and equitable actions. *Sustainability* **2013**, *5*, 711–723. [CrossRef]
18. Kaiser, F.G.; Wilson, M. Goal-directed conservation behavior: The specific composition of a general performance. *Personal. Individ. Differ.* **2004**, *36*, 1531–1544. [CrossRef]

19. Balderjahn, I.; Buerke, A.; Kirchgeorg, M.; Peyer, M.; Seegebarth, B.; Wiedmann, K.P. Consciousness for sustainable consumption: Scale development and new insights in the economic dimension of consumers' sustainability. *AMS Rev.* **2013**, *3*, 181–192. [CrossRef]
20. Marcus, J.; MacDonald, H.A.; Sulsky, L.M. Do personal values influence the propensity for sustainability actions? A policy-capturing study. *J. Bus. Ethics* **2015**, *127*, 459–478. [CrossRef]
21. Braun, P. Going green: Women entrepreneurs and the environment. *Int. J. Gend. Entrep.* **2010**, *2*, 245–259. [CrossRef]
22. Li, Y.; Lu, Y.; Zhang, X.; Liu, L.; Wang, M.; Jiang, X. Propensity of green consumption behaviors in representative cities in China. *J. Clean. Prod.* **2016**, *133*, 1328–1336. [CrossRef]
23. Powell, P.A.; Jones, C.R.; Consedine, N.S. It's not queasy being green: The role of disgust in willingness-to-pay for more sustainable product alternatives. *Food Qual. Prefer.* **2019**, *78*, 103737. [CrossRef]
24. Aprile, M.C.; Mariani, A. Young People's Propensity to use Sustainability Labels on Food Products: A Case Study in the South of Italy. *Qual.-Access Success* **2015**, *16*, 75.
25. Visser, M.; Gattol, V.; Van der Helm, R. Communicating sustainable shoes to mainstream consumers: The impact of advertisement design on buying intention. *Sustainability* **2015**, *7*, 8420–8436. [CrossRef]
26. Mohr, M.; Schlich, M. Socio-demographic basic factors of German customers as predictors for sustainable consumerism regarding foodstuffs and meat products. *Int. J. Consum. Stud.* **2016**, *40*, 158–167. [CrossRef]
27. Parboteeah, K.P.; Addae, H.M.; Cullen, J.B. Propensity to support sustainability initiatives: A cross-national model. *J. Bus. Ethics* **2012**, *105*, 403–413. [CrossRef]
28. Toma, L.; Mathijs, E. Environmental risk perception, environmental concern and propensity to participate in organic farming programmes. *J. Environ. Manag.* **2007**, *83*, 145–157. [CrossRef] [PubMed]
29. Inglehart, R.; Haerpfer, C.; Moreno, A.; Welzel, C.; Kizilova, K.; Diez-Medrano, J.; Lagos, M.; Norris, P.; Ponarin, E.; Puranen, B.; et al. *World Values Survey: Round Six-Country-Pooled Datafile Version*; JD Systems Institute: Madrid, Spain, 2014.
30. Nunnally, J.; Bernstein, I. *Psychometric Theory*; McGraw-Hill Inc: New York, NY, USA, 1967.
31. Ajzen, I. The Theory of planned behavior. *Organ. Behav. Hum. Decis. Process.* **1991**. [CrossRef]
32. Fishbein, M. Attitude and the Prediction of Behavior. In *Readings in Attitude Theory and Measurement*; John Wiley & Sons, Inc.: New York, NY, USA, 1967.
33. Davis, F.D.; Bagozzi, R.; Warshaw, P. Technology acceptance model. *J. Manag. Sci.* **1989**, *35*, 982–1003.
34. Dolan, P. The sustainability of "sustainable consumption". *J. Macromarketing* **2002**, *22*, 170–181. [CrossRef]
35. Yadav, R.; Balaji, M.; Jebarajakirthy, C. How psychological and contextual factors contribute to travelers' propensity to choose green hotels? *Int. J. Hosp. Manag.* **2019**, *77*, 385–395. [CrossRef]
36. Kuckertz, A.; Wagner, M. The influence of sustainability orientation on entrepreneurial intentions—Investigating the role of business experience. *J. Bus. Ventur.* **2010**, *25*, 524–539. [CrossRef]
37. Insights, D. Economic Uncertainty Puts Pressure on Sustainable Behavior Change. 2023. Available online: https://deloi.tt/4jpEyl2 (accessed on 5 January 2025).
38. Lin, Y.H.; Lee, T.H.; Wang, C.K. Influence analysis of sustainability perceptions on sense of community and support for sustainable community development in relocated communities. *Int. J. Environ. Res. Public Health* **2021**, *18*, 12223. [CrossRef] [PubMed]
39. Karraker, A. "Feeling poor" perceived economic position and environmental mastery among older Americans. *J. Aging Health* **2014**, *26*, 474–494. [CrossRef]
40. Garlock, T.M.; Asche, F.; Anderson, J.L.; Eggert, H.; Anderson, T.M.; Che, B.; Chávez, C.A.; Chu, J.; Chukwuone, N.; Dey, M.M.; et al. Environmental, economic, and social sustainability in aquaculture: The aquaculture performance indicators. *Nat. Commun.* **2024**, *15*, 5274. [CrossRef]