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Driving dietary shifts: the role of LOHAS consumption tendency in integrating mycoproteins into low red meat diets

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Abstract

This study explores how a Lifestyle of Health and Sustainability (LOHAS) consumption tendency, an external stimulus emerging from broader socio-environmental and cultural contexts that promote health, ecological awareness, and social responsibility, affects consumers' intentions to incorporate mycoproteins into low red meat diets. The central hypothesis is that LOHAS consumption patterns act as a key driver in modulating psycho-attitudinal factors that either facilitate or inhibit the adoption of mycoproteins as a sustainable alternative to red meat. Data were collected through a cross-sectional survey administered to a randomly selected sample of 951 Italian consumers of red meat and mushrooms. To explore the factors affecting consumers' decision-making process to consume mycoproteins the Stimulus-Organism-Response (SOR) was used as the main theoretical framework. The survey explored participants' consumption habits related to mushrooms and red meat, the influence of LOHAS, perceptions of nutritional content, environmental sustainability, and barriers to adopting mycoproteins. The data were analysed employing Partial Least Squares Structural Equation Modelling (PLS-SEM) to examine the relationships between constructs. Findings reveal that LOHAS consumption tendency serves as stimulus that positively influences consumer perceptions of mycoproteins' nutritional value and environmental benefits, while barriers related to meat dependency and perceived value significantly hinder adoption. This study contributes by framing the LOHAS as an external socio-cultural stimulus within the S-O-R framework. By linking societal sustainability values with individual psychological processes, the research offers a novel perspective on the drivers of alternative proteins adoption. The findings provide theoretical insights into the interaction between value orientations and behavioural intentions, while offering practical guidance for policies and communication strategies aimed at promoting sustainable dietary transitions.

Keywords: Plant-based meat alternative, Sustainable diet, SOR theory, Mushrooms, Consumers' acceptance, *Fusarium Venenatum*

Introduction

The continued growth of the global population, coupled with rising food demand, presents urgent challenges for the sustainability of the global food system (United Nations 2022; WHO, 2019). Meeting these challenges requires a fundamental transformation of dietary patterns, particularly through a reduction in red meat consumption, which is associated with disproportionately high environmental and resource impacts (Jafari et al. 2024). Beyond environmental concerns, a growing body of research links excessive red meat intake to elevated risks of cardiovascular diseases, type 2 diabetes, and certain cancers, placing additional burdens on public health systems (Domingo and Nadal 2017). This concern is reinforced by the World Health Organization's 2015 communication which classifies red meat as “probably carcinogenic to humans” and processed meat as a Group 1 carcinogen, highlighting the public health risks associated with high meat consumption (WHO, 2015). Despite this communication, meat intake remains persistently high in Western countries (Statista 2024). Research indicates that red meat consumption is shaped by a complex interplay of taste preferences, cultural norms, habitual behaviours, and perceived health risks (Milford et al. 2019; Godfray et al. 2018). Even when consumers are aware of the environmental and health consequences, emotional attachment to meat, social identity, and convenience considerations often maintain elevated consumption levels (Cheah et al. 2020). In response to these challenges, alternative protein sources have gained increasing attention as a means of diversifying diets, reducing reliance on conventional meat, and mitigating the environmental consequences of food production (Gomez-Zavaglia et al. 2020; Rubio et al. 2020). Among these alternatives, mycoproteins (fungal-derived proteins produced from *Fusarium venenatum*) stand out for their low ecological footprint compared to conventional livestock and several other protein sources, and for their favourable nutritional profile (Gnaim et al., 2025; Pasutto et al. 2025; Okechukwu et al. 2024). Their production requires significantly fewer natural resources such as land, water, and energy than traditional livestock farming, and their high-quality protein content includes all essential amino acids (Rubio et al. 2020; Hashempour-Baltork et al. 2020; Khan et al. 2024). In addition to their sustainability credentials, mycoproteins have demonstrated potential health benefits, including positive effects on cholesterol, blood glucose, insulin regulation, and gut microbiota composition (Farsi et al. 2023).

While mycoproteins offer clear environmental and nutritional benefits—including lower land use, high-quality protein, and positive health effects—they have some limitations. They contain lower levels of certain micronutrients (e.g., vitamin B12, heme iron) than meat, and their production can entail higher energy use or GHG emissions compared to some plant-based alternatives (Rubio et al., 2024). Sensory differences in taste and texture may also affect consumer acceptance, though these were not directly surveyed in our study; previous research indicates that sensory attributes strongly influence willingness to adopt mycoproteins (De Cianni et al. 2023). Consumer behaviour toward alternative proteins is shaped by health and environmental perceptions, cultural norms, habits, and emotional attachment to meat (Testa et al. 2025; De Cianni et al. 2024), highlighting the relevance of positioning mycoproteins within broader dietary transitions to promote sustainable and healthful eating patterns. In this context, broader lifestyle trends play a pivotal role in shaping food choices. One particularly

influential orientation is the Lifestyle of Health and Sustainability (LOHAS), a global consumer mindset reflecting growing societal attention to ecological responsibility, ethical consumption, and personal well-being (Korhonen 2012). Importantly, LOHAS should not be viewed solely as an individual-level trait, but also as a cultural and normative framework that influences perceptions and decision-making environments. In this sense, LOHAS functions as an external stimulus, signaling evolving societal values around health and sustainability and shaping the food-related behaviors of both LOHAS-identified consumers and those exposed to these norms (Korhonen 2012; Mohr 2011). LOHAS-oriented values therefore act as environmental cues or social referents, activating personal norms, shaping attitudes, and influencing behavioral intentions toward sustainable food choices—including the adoption of alternative proteins such as mycoproteins. By framing food choices within this lifestyle perspective, it becomes possible to understand how societal values and personal orientations interact to facilitate dietary transitions toward more sustainable and health-conscious patterns.

LOHAS consumers are often early adopters of innovative, health-conscious, and environmentally friendly products (Pícha and Navrátil 2019), and their behaviours may exert a broader influence through social modelling, normative pressure, or market shifts (Mohr 2011; Emerich 2011). Their presence in the consumer landscape can thus contribute to a contextual environment that facilitates or encourages the adoption of alternative proteins. Integrating LOHAS into the analysis as an external driver allows for a more comprehensive understanding of the sociocultural conditions that support sustainable dietary transitions.

Despite their potential influence, the role of LOHAS consumers in driving dietary transitions remains underexplored in the context of alternative proteins. Existing research on mycoprotein acceptance is still in its early stages and presents mixed findings (De Cianni et al. 2023). Some studies highlight consumer openness based on perceived health and environmental benefits (De Cianni et al. 2024), while others point to barriers such as taste preferences or strong emotional attachments to conventional meat (Chezan et al. 2022). These inconsistencies suggest that current investigations often treat influencing factors such as health consciousness, environmental concern, or lifestyle orientation, in isolation, overlooking the interactions between them and the broader behavioural context.

To advance understanding in this area, a more holistic approach is needed, one that accounts for the synergistic effects of values, attitudes, and motivations on behavioural intentions. Examining how LOHAS tendencies interact with consumers' psychological and behavioural variables could offer valuable insights into the drivers of sustainable food adoption. To date, no study has systematically integrated these elements into a unified theoretical framework focused on mycoprotein consumption as a substitute of red meat.

The present study aims to address this research gap by examining the behavioural drivers underlying consumers' intentions to incorporate mycoproteins as a sustainable dietary alternative. The analysis is based on a statistically representative sample of 951 Italian consumers who regularly consume both mushrooms and red meat. The Stimulus–Organism–Response (S–O–R) model (Mehrabian and Russell 1974) is employed as the guiding theoretical framework. Within this framework, LOHAS is

conceptualized as an external stimulus that activates internal organismic states—such as attitudes, perceived barriers, and nutritional and ecological evaluations—which in turn shape consumers' behavioural responses, namely their intention to adopt mycoproteins. By framing LOHAS as a contextual driver, this approach links broader societal values around health and sustainability to individual decision-making processes, allowing for a nuanced understanding of how cultural and lifestyle-oriented cues influence the adoption of alternative proteins. By integrating principles from behavioural economics and consumer psychology, the model enables an exploration of how LOHAS-related values interact with internal psychological constructs such as attitudes, psychological barriers, and concerns to shape consumers' intentions. This integrative approach aims to deepen our understanding of the complex decision-making processes underpinning the acceptance of alternative proteins and to inform more effective strategies for fostering sustainable dietary transitions.

Theoretical model and hypotheses development

The SOR theory offers a valuable framework for understanding consumer behaviour by emphasizing the internal psychological processes that mediate between external stimuli and behavioural responses. Compared to other theoretical approaches, the SOR framework offers distinct advantages for understanding consumer behaviour in complex, value-laden contexts such as sustainable food consumption. Whereas the Theory of Planned Behaviour (TPB- Ajzen 1991), focuses primarily on cognitive predictors of intention such as attitudes, subjective norms, and perceived behavioural control, SOR explicitly links external stimuli (e.g., social norms, ecological cues, lifestyle orientations like LOHAS) to internal organismic processes (e.g. affective and cognitive responses) that drive behaviour. Similarly, unlike the Stimulus–Response model, which assumes a direct link between stimulus and behaviour (Tandon et al. 2021), or Cognitive Dissonance Theory which addresses psychological discomfort arising from conflicting cognitions (Cooper 2012), SOR provides a more holistic and multidimensional perspective, capturing the mechanisms through which external influences interact with internal states to shape behavioural outcomes. This integrative capacity makes SOR particularly suitable for examining how LOHAS-oriented values influence consumer perceptions, attitudes, and intentions toward adopting mycoproteins as a sustainable dietary (Sultan et al. 2021). It highlights the complexity of consumer decision-making by integrating external influences, internal affective and cognitive states, and resulting behavioural outcomes.

At the heart of the SOR framework lies the notion that stimuli (S) do not merely trigger automatic responses, but instead affect an individual's internal state, the organism (O), which in turn determines the behavioural response (R) (Tandon et al. 2021). Stimuli may originate from socio-psychological or environmental contexts, such as social norms, ecological cues, or lifestyle orientations like LOHAS (Lavuri et al. 2022), or they may stem from product-specific attributes such as labelling, pricing, or branding (Testa et al. 2024; Sultan et al. 2021).

The organism (O) represents the internal processing unit of the consumer, encompassing both emotional and cognitive domains. Emotional responses may include affective reactions such as trust, fear, or enthusiasm, while cognitive processes

involve more deliberate evaluations such as perceived value, risk assessment, or ethical considerations (Sultan et al. 2021). To further conceptualize the internal dynamics within the organism, the Dual Factor Theory (DFT) has been integrated into the framework. DFT posits that consumer decisions are influenced by competing internal forces, facilitators that support, and inhibitors that impede, the adoption of a product. These opposing forces are central to the deliberation process and critically shape whether a consumer moves toward or away from a purchase decision (Herzberg et al. 1996).

Finally, the response (R) reflects the outcome of this decision-making process. It represents the consumer's final behavioural expression, be it acceptance, rejection, or indecision, resulting from the interplay between external stimuli, internal organismic states, and contextual influences. As such, the SOR model offers a comprehensive lens through which to examine consumer behaviour, particularly in complex and value-laden domains such as sustainable food choices (Sultan et al. 2021).

2.1. Stimuli influence Organisms

According to the literature, the LOHAS consumption tendency significantly influences internal cognitive and affective processes related to food choice (Pícha & Navrátil 2019). Specifically, LOHAS functions as a contextual external stimulus that shapes key behavioural facilitators, such as heightened attention to the nutritional quality of food products and awareness of environmental impacts (Kim et al. 2013). By promoting values centred on health consciousness, environmental responsibility, and personal well-being, a LOHAS orientation enhances consumers' internal evaluations of health and sustainability attributes, emotional responses such as ethical satisfaction, and motivation to adopt value-consistent behaviours. Rather than directly determining food choices, LOHAS influences the underlying cognitive and motivational pathways, thereby mediating decision-making processes regarding novel or alternative protein sources.

Mycoproteins, recognized for their high nutritional profile, including complete proteins, essential amino acids, and potential metabolic benefits (Khan et al. 2024; Hashempour-Baltork et al. 2020), are therefore likely to be positively evaluated by individuals with LOHAS-oriented values. These consumers may be more inclined to perceive mycoproteins as a nutritionally sound and health-supportive alternative to conventional meat. In this way, LOHAS shapes the evaluative criteria applied to food choices, reinforcing facilitators such as nutritional awareness and health motivation, both of which are instrumental in promoting the adoption of sustainable protein sources.

Beyond nutritional considerations, LOHAS also fosters ecological awareness by encouraging consumers to account for the environmental impact of their consumption patterns (Höfer, 2009). As a value-driven lifestyle rooted in sustainability and environmental stewardship, LOHAS promotes the internalization of ecological concerns into everyday decision-making. This influence increases the salience of sustainability-related product attributes during food evaluations.

Given that the fungi used in mycoprotein production, primarily mushrooms, can be cultivated with substantially lower environmental impact compared to conventional animal-based protein sources (González et al. 2020; Stoffel et al. 2019), consumers guided by LOHAS values are more likely to view mycoproteins as an ecologically responsible option (Moser 2016). Thus, LOHAS strengthens evaluative dimensions

associated with environmental welfare and reinforces a sense of ethical responsibility in consumption.

Furthermore, because LOHAS encompasses both health and environmental concerns as integral elements of a broader lifestyle commitment (Veljović & Krstić, 2020), it fosters a holistic framework through which consumers interpret food products. This orientation may lead individuals to regard mycoproteins not only as a healthy and sustainable alternative but also as a reflection of their broader ethical and lifestyle values. As a result, LOHAS-driven consumers are more likely to integrate mycoproteins into their diets as part of a balanced, responsible, and value-consistent approach to sustainable living. In light of these considerations, the following hypotheses are proposed:

H1 LOHAS consumption tendency positively influence consumers' perception of the nutritional content of mycoproteins.

H2 LOHAS consumption tendency positively influence consumers' perception of the ecological welfare associated with mycoproteins

H3 LOHAS consumption tendency positively influence consumers' attitudes towards mycoproteins.

Regarding potential inhibitors, LOHAS-oriented values may help mitigate several barriers that hinder consumer adoption of mycoproteins. Individuals who embrace LOHAS principles often adopt dietary patterns that align with their ethical, health, and environmental values (Köse and Kırçova 2021). This alignment may reduce their susceptibility to psychological inhibitors such as food neophobia, i.e., the reluctance or fear of trying unfamiliar foods (Korhonen 2012). For example, whereas an average consumer may perceive mycoproteins as strange or unfamiliar, a LOHAS consumer may be more likely to interpret novelty as an opportunity to experiment with healthier and more sustainable options. This is particularly relevant in the case of mycoproteins, which remain relatively unknown to many consumers due to their recent introduction into mainstream markets (De Cianni et al. 2023).

In this context, the greater awareness and openness fostered by LOHAS values may help familiarize consumers with novel products like mycoproteins, transforming uncertainty into curiosity, thereby positively influencing their perceptions and reducing uncertainty (Matharu et al. 2021). By shaping more receptive attitudes toward food innovation, LOHAS can play a key role in lowering psychological resistance and facilitating trial and acceptance. Consequently, LOHAS-oriented consumers may be more willing to incorporate mycoproteins into their diets as part of a broader commitment to balanced, sustainable, and health-conscious eating practices (Palmieri et al. 2023).

Furthermore, the LOHAS consumption orientation, which prioritizes both nutritional quality and environmental sustainability, may enhance the perceived value-cost ratio of mycoproteins (Choi and Feinberg 2021). While price is often cited as a barrier, consumers aligned with LOHAS principles are typically less

price-sensitive and more responsive to the ethical and ecological attributes of products (Pícha and Navrátil 2019). Supporting this, Chen (2011) found that LOHAS consumers are generally willing to pay a premium for products that promote both personal health and environmental sustainability.

A major barrier to the adoption of alternative proteins, however, remains consumers' dependence on conventional meat products, a barrier well-documented in the literature (Rizzo et al. 2023; Testa et al. 2025). LOHAS-oriented consumers, due to their heightened health and environmental awareness, may help overcome this resistance by perceiving mycoproteins as a compelling alternative to meat. Indeed, their stronger health and ecological awareness can reframe meat reduction not as a loss, but as a gain in terms of personal well-being and environmental responsibility. Their greater sensitivity to the health and ecological implications of dietary choices (Rizzo et al. 2023) may contribute to reducing attachment to meat and increasing openness to incorporating mycoproteins into daily consumption patterns. In doing so, LOHAS values may support broader dietary transitions toward reduced meat consumption and the integration of more sustainable protein sources. Based on this reasoning, it can be assumed that:

H4 LOHAS consumption tendency reduces consumers' risk barriers, such as food neophobia regarding mycoproteins.

H5 LOHAS consumption tendency reduces consumers' price barriers of mycoproteins.

H6 LOHAS consumption tendency reduces consumers' dependence on meat

2.2. Organisms influence Response

In the SOR framework, the organism component captures the internal psychological mechanisms, often conceptualized as the consumer's "black box", that mediate the effect of external stimuli on behavioural responses. In the context of sustainable food choices, these internal processes are crucial in shaping consumers' intention to replace conventional meat with mycoprotein-based alternatives.

Within this organism stage, perceived nutritional value functions as a key psychological mediator. Consumers who prioritize health and well-being are more likely to recognize the nutritional benefits of mycoproteins, including high protein content, positive effects on metabolic health, and compatibility with balanced diets (Aida et al. 2009). These perceptions may foster greater openness to integrating mycoproteins into their daily consumption routines. By reinforcing the belief that mycoproteins are a suitable and beneficial substitute, these perceptions reduce uncertainty and strengthen willingness to adopt them (Tables 1 and 2).

In parallel, concern for ecological welfare serves as another important driver. As consumers increasingly value environmental sustainability, their food choices tend to align with low-impact alternatives. Mycoprotein production, requiring fewer natural resources and generating a smaller environmental footprint compared to conventional animal agriculture, meets these sustainability criteria (Gomez-Zavaglia

Table 1 Socio-demographic characteristics of the sample

Variables	Description	Sample (N = 951)	Population*
Sex at birth	Female	723 (76.03%)	
	Male	228 (23.97%)	
Age	Mean \pm S.D	46.11 \pm 11.10	46.8
Education	Graduate or higher	374 (39.33%)	
	Not graduated	577 (60.67%)	
Monthly income	Very low	348 (36.59%)	
	Low	99 (10.41%)	
	Medium	398 (41.85%)	
	High	106 (11.15%)	
Geographical region	North-West	240 (25.2%)	26.7%
	North-East	185 (19.5%)	19.3%
	Centre	190 (20.0%)	19.8%
	South	220 (23.1%)	23.2%
	Islands	116 (12.2%)	11.0%

* Italian population data; sources: ISTAT macro-distribution Northwest, Northeast, Central, South, Islands

Table 2 Hypotheses test results

Hypothesis	Path	Supported
H1	L \rightarrow NC	YES
H2	L \rightarrow EW	YES
H3	L \rightarrow ATM	YES
H4	L \rightarrow RB	YES
H5	L \rightarrow PP	NO
H6	L \rightarrow MD	YES
H7	NC \rightarrow I	YES
H8	EW \rightarrow I	NO
H9	ATM \rightarrow I	YES
H10	RB \rightarrow I	YES
H11	PP \rightarrow I	NO
H12	MD \rightarrow I	YES
H13	L \rightarrow I	YES

et al. 2020; Rubio et al. 2020). Thus, individuals with strong ecological values are more likely to view mycoproteins as an environmentally responsible substitute for meat.

Moreover, attitude toward mycoproteins acts as a broader evaluative disposition that consolidates these underlying motivations. Consumers who are both health- and sustainability-oriented are more likely to form favorable attitudes toward mycoproteins, perceiving them as congruent with ethical, balanced, and eco-conscious lifestyles (Banovic et al. 2022). Positive attitudes, in turn, enhance not only acceptance but also the likelihood of sustained behavioral change, supporting the larger transition toward more sustainable food systems (De Cianni et al. 2024). Furthermore, positive attitudes function as a proximal predictor of behaviour: they not only increase initial acceptance but also sustain long-term substitution of meat with mycoproteins. Accordingly, the following hypotheses are proposed:

H7 Perceived nutritional content positively influences consumers' intention to consume mycoproteins.

H8 Perceived ecological welfare of mushrooms positively influences consumers' intention to consume mycoproteins.

H9 Attitude toward mushrooms positively influences consumers' intention to consume mycoproteins.

In contrast to the previously discussed facilitators, a number of psychological inhibitors within the organism stage may hinder consumers' intention to adopt mycoprotein-based products as part of their regular diet. These inhibitors can shape consumers' internal evaluations and perceptions, ultimately reducing the likelihood of behavioural engagement with sustainable food alternatives.

A primary barrier is food neophobia, defined as the reluctance or fear of trying unfamiliar foods (Palmieri et al. 2023). Consumers unfamiliar with mycoproteins may experience discomfort or aversion toward incorporating such novel products into their diets (De Cianni et al. 2023). This reaction may persist even when nutritional or environmental benefits are known. Although individuals with a lifestyle of health and sustainability (LOHAS) may have higher exposure to food innovations, food neophobia can still exert a limiting influence, particularly among more traditional or conservative consumer segments (Sogari et al. 2022).

A second barrier relates to perceived monetary value. Mycoprotein-based products are often considered more expensive than conventional meat or other plant-based alternatives (Sogari et al. 2022). This perception of high cost may reduce purchase intent, particularly among price-sensitive consumers or those who view mycoproteins as a niche or premium food category (De Cianni et al. 2023). Even among LOHAS consumers, who may recognize nutritional advantages, price considerations can remain a deterrent to regular consumption.

Third, dependence on meat poses a cultural and habitual challenge. For many consumers, meat functions not only as a key nutritional source of protein but also as a symbolically and emotionally salient food, strongly embedded in culinary practices and social identity (Piazza et al. 2015). The sensory and experiential gap between meat and mycoproteins, such as differences in taste, texture, and satiety, may further reduce the perceived adequacy of mycoproteins as a viable replacement (De Cianni et al. 2023). As a result, strong meat attachment can inhibit openness to dietary substitution, regardless of sustainability motives.

Based on these considerations, the following hypotheses are proposed:

H10 Consumers' food neophobia (risk barriers) negatively influences their intention to consume mycoproteins.

H11 Perceived price barriers negatively influence consumers' intention to consume mycoproteins.

H12 Consumers' dependence on meat negatively influences their intention to consume mycoproteins.

2.3. Direct effect of LOHAS on intention

Finally, the LOHAS orientation may exert influence not only indirectly through the organism component, by shaping internal psychological processes that mediate consumer intentions, but also directly affect consumers' intention to purchase mycoproteins. Specifically, consumers who strongly identify with LOHAS values tend to prioritize health, environmental responsibility, and ethical considerations when making food choices (Kaur et al. 2023). This alignment of deeply held personal values with sustainable and health-oriented products, such as mycoproteins, can foster a more immediate and value-driven intention to purchase, independently of other internal perceptions or evaluations (Korhonen 2012). In other words, LOHAS consumers may engage in a proactive approach toward adopting alternative proteins because these products resonate with their broader lifestyle commitments and ethical principles. Thus, LOHAS orientation functions as a direct motivational factor, encouraging sustainable consumption behaviours beyond the indirect effects mediated by organism-level perceptions.

Therefore, the following hypothesis is proposed:

H13 LOHAS principles directly influence consumers' intention to consume mycoproteins.

3. Material and method

Data collection methods

In 2023, a cross-sectional survey was carried out by a professional research agency targeting a representative sample of 951 Italian consumers. The survey targeted participants who were responsible for purchasing food for the household and who consumed red meat and mushrooms, with a minimum age of 18 years. Including mushroom consumers ensure familiarity with fungal-based foods, allowing participants to provide informed evaluations of mycoproteins' taste, texture, and acceptability. At the same time, including meat consumers is essential to investigate the substitution of red meat with mycoproteins.

Demographic stratification was implemented to guarantee that the sample accurately reflected the Italian population in terms of key variables such as age and geographical region. The sample was weighted to reflect the distribution of these factors in the national population, ensuring that results could be generalized to a broader Italian context. The survey was distributed via the agency's CAWI platform. All data were collected anonymously and stored securely in compliance with data protection standards. The research protocol was approved by the Bioethics Committee of the University of Palermo. Prior to participation in the online survey, all respondents provided informed consent.

3.2 Variables investigated

The questionnaire started with two initial screening questions assessing the frequency of red meat and mushroom consumption, from which mycoproteins can be derived. Participants who reported consuming neither of these foods were excluded from the survey. Following the screening, participants completed a series of psychosocial scales designed to investigate the variables included in the SOR theoretical model. The first scale administered was the LOHAS (L) measure (Pícha and Navrátil 2019). Participants were then asked about their perceptions of the nutritional content of mycoproteins (NC) (Escobar-López et al. 2017). Additionally, the questionnaire evaluated how participants valued the protection and preservation of the natural environment to promote the long-term health of both human society and terrestrial ecosystems, an idea known as ‘ecological well-being (EW) (Tandon et al. 2021).

To further contextualize the survey, a scale measuring participants’ attitudes toward mushrooms (ATM) was included (Sogari et al. 2022). Investigating these attitudes is crucial, as they can offer valuable insights into participants’ openness to adopting dietary alternatives such as meat substitutes.

Subsequently, potential barriers to the adoption of mycoproteins-based products were explored, focusing on concerns related to price (PB), dependence on meat (MD), and perceived risks barriers (RB) associated with novel foods, the latter derived from the Food Neophobia Scale (Banovic et al. 2022; Tandon et al. 2021; Pliner and Hobden 1992). Understanding these barriers is essential for identifying strategies to promote positive changes in dietary habits (Fig. 1).

Finally, participants’ intentions (I) to consume mycoproteins, along with their socio-demographic characteristics, were collected. Following the formats validated in the literature, we used 5-point Likert scales for all constructs except the Risk and Price Barrier scales, which used 7-point Likert scale. Table 3 in the Appendix provides a summary of all variables included in the study.

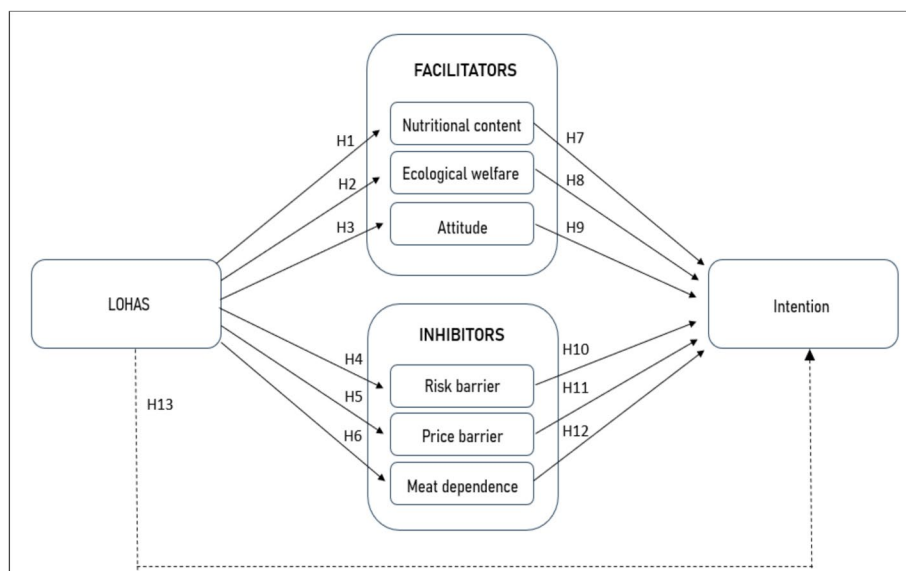


Fig. 1 Application of SOR Theory

Table 3 Variables description

Variables	Item description	References
LOHAS (L)	<p>I am willing to pay an additional price for eco-friendly products</p> <p>I am willing to pay an additional price for products with eco-friendly packaging</p> <p>I am willing to pay an additional price for food or beverages without added artificial colorings and preservatives</p> <p>I make an effort to eat healthily and ensure a healthy diet for my family</p> <p>I prefer a healthy lifestyle</p> <p>Nutrition plays an important role for me</p> <p>I prefer to use renewable energy sources when possible</p> <p>I prefer eco-friendly products</p> <p>I use easily recyclable products</p> <p>I practice yoga, tai, etc</p> <p>I attend fitness centers</p> <p>I use wellness services (e.g., steam bath, sauna, massages, etc.)</p> <p>I am interested in new experiences with alternative medicine such as acupuncture and homeopathy</p> <p>I prefer and support alternative and preventive medicine</p> <p>I enjoy reading articles on how to maintain mental and physical well-being</p>	Pícha and Navrátil 2019
Nutritional Content (NC)	<p>Mycoproteins contain plenty of vitamins and minerals</p> <p>Mycoproteins keep me healthy</p> <p>Mycoproteins are nutritious</p> <p>Mycoproteins are rich in proteins</p>	Escobar-López et al., 2017
Ecological Welfare (EW)	<p>Among the protein sources available for human consumption, mycoproteins are produced in a way that does not disturb the balance of nature</p> <p>Mycoproteins are an environmentally sustainable protein source</p>	Tandon et al. 2021
Attitudes Towards Mycoproteins (ATM)	<p>Eating fresh and processed mycoproteins is extremely unpleasant</p> <p>Eating fresh and processed mycoproteins is extremely enjoyable</p> <p>Eating fresh and processed mycoproteins is extremely disgusting</p> <p>Eating fresh and processed mycoproteins is extremely delicious</p> <p>Eating fresh and processed mycoproteins is extremely foolish</p>	Sogari et al. 2022
Risk barriers (RB)	<p>I continuously taste new and different foods</p> <p>I don't trust new foods</p> <p>If I don't know what a food contains, I won't try it</p> <p>I like foods from different countries</p> <p>Ethnic food seems too strange to eat</p> <p>During meals, I try new foods</p> <p>I'm afraid to eat things I've never eaten before</p> <p>I am very picky about the foods I eat</p> <p>I eat almost everything</p> <p>I enjoy trying new ethnic restaurants</p>	Pliner and Hobden 1992
Price Barrier (PB)	<p>I find mycoproteins, both fresh and processed, to be expensive</p> <p>I find the price of mycoproteins, both fresh and processed, to be quite high</p>	Tandon et al. 2021

Table 3 (continued)

Variables	Item description	References
Meat Dependence (MD)	I can't imagine not eating red meat regularly If I couldn't eat red meat, I would feel weak I would feel fine with a diet without red meat If I were forced to stop eating red meat, I would feel sad Red meat is irreplaceable in my diet	Banovic et al. 2022
Intention of mycoproteins consumption (I)	Considering your current consumption, how likely do you think it is that you will replace some of the red meat you consume with a portion of mycoproteins-based burgers, meatballs, or other mushroom products in the next 6 months?	

3.3 Data analysis

The analyses were conducted using Stata 17 statistical software. To examine both the measurement model and the structural relationships within the conceptual framework, Partial Least Squares Structural Equation Modeling (PLS-SEM) was applied (Hair et al. 2019). PLS-SEM was selected because it is particularly suitable for prediction-oriented research, for complex models with multiple latent constructs, and for studies with relatively smaller or non-normally distributed samples (Hair et al. 2021). In this context, PLS-SEM provides greater flexibility than covariance-based SEM by allowing the simultaneous assessment of both measurement quality and structural relationships while minimizing distributional assumptions.

PLS-SEM consists of two main components: the measurement model (also referred to as the outer model) and the structural model (or inner model) (Gallagher et al. 2022; Tuncer 2021). The measurement model's validity and reliability were evaluated using several criteria. Indicator reliability was assessed through factor loadings, as loadings above 0.70 indicate that individual items strongly reflect their latent construct. Internal consistency was examined using both Cronbach's alpha and Rho_A coefficients, since the combination of the two provides a more robust assessment of scale reliability. Convergent validity was evaluated through the Average Variance Extracted (AVE), which verifies whether each construct explains a sufficient proportion of variance in its indicators (threshold ≥ 0.50). Discriminant validity was tested using the Fornell–Larcker criterion, ensuring that constructs are empirically distinct from each other. Following this, the structural model was tested through path coefficient estimation and significance testing (via bootstrapping procedures recommended for PLS-SEM). This approach allows for the evaluation of hypothesized relationships while accounting for sampling variability (Hair et al. 2021; 2019).

4. Results

4.1 Socio-demographic characteristics

Among the 951 respondents, women predominated, consistent with Italian household patterns in which women often manage food purchases. The participants' average age

is approximately 46 years, with a standard deviation of about 11 years. Approximately 40% of the sample possesses a bachelor's degree or higher, indicating a relatively high level of educational attainment. Additionally, the monthly income distribution shows that the majority of participants fall into the 'very low' or 'medium' income brackets, underscoring the socioeconomic diversity within the sample. For further insight, detailed data can be found in Table 1.

4.2 Verification of methodological bias and model evaluation

To evaluate potential common method bias, Harman's one-factor test was performed (Tuncer 2021). The results revealed that a single factor accounted for 42.35% of the total variance, which is below the recommended threshold of 50% (Sultan et al. 2021). Furthermore, an assessment of variance inflation factors (VIF) confirmed the absence of significant collinearity, with all values remaining under 2.9 (Gallagher et al. 2022; Tuncer 2021). Consequently, the dataset appears to be free from common method bias. The factor loadings were then examined to assess the relationships between the items and their respective constructs, with all factor loadings exceeding 0.6. Additionally, all Cronbach's alpha coefficients and rho A values demonstrated strong internal consistency reliability, surpassing the minimum acceptable threshold of 0.65 (Hair et al. 2021; Sultan et al. 2021). For further details, please refer to Table 4 in the Appendix. Finally, in terms of convergent validity, the average variance extracted (AVE) for all constructs exceeded the 0.5 threshold, indicating that they explain more than 50% of the variance in their respective items (Hair et al. 2021).

4.3 Structural model results

The results of the PLS-SEM (Fig. 2) show significant relationships between all the variables that influence consumers' intention to consume mycoproteins. Most of the hypotheses were supported (Table 2), confirming the important role of LOHAS principles in shaping consumer attitudes and behaviour toward sustainable food alternatives.

Hypotheses H1–H3 indicate that LOHAS consumption tendency significantly influences key facilitators of mycoprotein adoption. Specifically, LOHAS has a strong positive effect on the perception of nutritional benefits (H1, $\beta=0.358$, $p<0.01$), ecological welfare (H2, $\beta=0.234$, $p<0.05$), and general attitudes toward mycoproteins (H3, $\beta=0.197$, $p<0.01$), suggesting that consumers aligned with LOHAS values are more likely to appreciate the health and environmental advantages of mycoproteins.

Regarding the inhibitors, the model provides mixed results. LOHAS negatively influences the perception of risk barriers (H4, $\beta=-0.172$, $p<0.01$), and significantly reduces meat dependence (H6, $\beta=-0.164$, $p<0.01$), supporting the view that LOHAS-oriented individuals are less bound to traditional meat consumption and are more open to new food sources. However, the relationship between LOHAS and price barriers is not statistically significant (H5, $\beta=-0.027$, $p>0.10$), indicating that LOHAS consumers do not differ significantly from others in how they perceive the cost of mycoprotein products.

Looking at the direct influences on consumption intention, nutritional perception shows a strong and positive effect on intention (H7, $\beta=0.392$, $p<0.01$), as does

Table 4 Measurement model

Items/Constructs	L	NC	EW	ATM	RB	PB	MD	I
L1	0.622							
L2	0.604							
L3	0.633							
L4	0.644							
L5	0.673							
L6	0.700							
L7	0.675							
L8	0.744							
L9	0.705							
L10	0.628							
L11	0.674							
L12	0.653							
L13	0.734							
L14	0.720							
L15	0.724							
NC1		0.849						
NC2		0.899						
NC3		0.890						
NC4		0.889						
EW1			0.936					
EW2			0.933					
ATM1				0.849				
ATM2				0.798				
ATM3				0.854				
RB1					0.872			
RB2					0.933			
PB1						0.951		
PB2						0.949		
MD1							0.679	
MD2							0.843	
MD3							0.636	
MD4							0.681	
MD5							0.608	
I1								1.000
Cronbach	0.906	0.905	0.855	0.783	0.779	0.892	0.774	1.000
rho_A	0.907	0.910	0.846	0.798	0.832	0.894	0.871	1.000
AVE	0.562	0.758	0.872	0.667	0.803	0.900	0.635	1.000

attitude toward mycoproteins (H9, $\beta = 0.253$, $p < 0.05$). However, ecological welfare does not have a significant impact (H8, $\beta = 0.014$, $p > 0.10$), suggesting that while consumers may acknowledge environmental benefits, these alone may not be sufficient to drive intention. Among the inhibitors, only meat dependence shows a strong and significant negative influence on intention (H12, $\beta = -0.352$, $p < 0.01$), confirming its role as a critical barrier to adopting mycoproteins. Risk barriers have a marginal but significant negative effect (H10, $\beta = -0.026$, $p < 0.05$), while price barriers remain non-significant (H11, $\beta = 0.012$, $p > 0.10$).

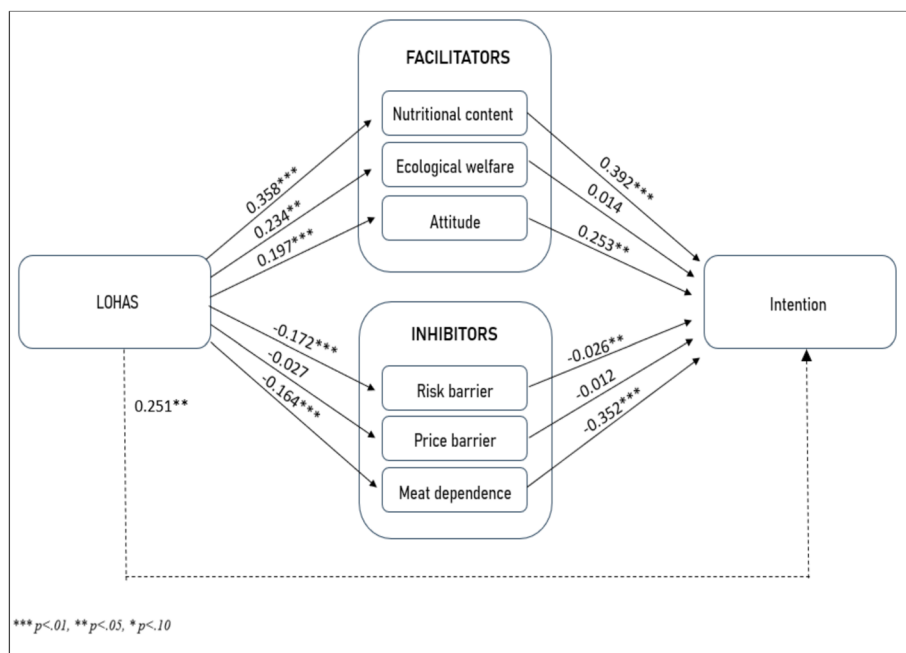


Fig. 2 PLS SEM results

Finally, LOHAS itself shows a direct and significant positive effect on consumers’ intention to consume mycoproteins (H13, $\beta=0.251$, $p<0.05$), reinforcing the idea that personal values tied to health, sustainability, and lifestyle are central to motivating behavioural change in food consumption.

Discussion

This study sought to provide a comprehensive understanding of the consumer decision-making process regarding the adoption of mycoproteins, focusing on how LOHAS orientation influences both facilitators and inhibitors within the SOR framework.

When comparing the findings to existing literature, both convergences and divergences emerge. First, the positive relationship between LOHAS orientation and perceived nutritional content corroborates prior studies (Kim et al. 2013; Köse & Kircova 2021), reinforcing the notion that individuals who adhere to LOHAS principles tend to prioritize health in their food choices. This suggests that the foundational tenets of the LOHAS lifestyle, emphasizing personal well-being, responsible consumption, and holistic health, play a central role in shaping how consumers assess food products from a nutritional perspective. In this context, mushrooms, from which mycoproteins are derived, are particularly compelling due to their rich composition of proteins, vitamins, and minerals (Khan et al. 2024; Hashempour-Baltork et al. 2020). These attributes enhance the appeal of mycoproteins among health-conscious consumers seeking foods that align with both wellness and sustainability.

Similarly, the positive influence of LOHAS orientation on perceptions of ecological welfare aligns with earlier findings (Zhang & Fares 2017; Höfer, 2009), which suggest that LOHAS-aligned consumers consistently evaluate products through an environmental lens. Mushrooms and mycoproteins, characterized by their low environmental footprint,

minimal land and water use, and efficient production methods (González et al. 2020; Stoffel et al. 2019), resonate with these ecological values. Thus, mycoproteins are perceived as both nutritionally beneficial and environmentally responsible, a dual appeal that is particularly attractive to LOHAS consumers (Nart & Öztürk, 2021). These findings support the broader view that sustainable food products like mycoproteins are well-positioned to satisfy the intersecting goals of personal and planetary health, particularly among ethically motivated consumers.

Moreover, the observed positive association between LOHAS values and consumer attitudes toward mycoproteins is consistent with theoretical and empirical work suggesting that value-based lifestyles influence affective and evaluative responses to food innovations (Veljović & Krstić, 2020; Kim et al. 2013). Consumers with strong LOHAS tendencies appear more inclined to form favorable attitudes toward novel food products that align with their ethical and sustainability priorities. Given their high protein content, low environmental impact, and perceived health benefits, mycoproteins are increasingly recognized as an integral part of a balanced and responsible diet. This value congruence likely underpins the formation of positive consumer attitudes and enhances the likelihood of acceptance and behavioural adoption.

Turning to the specific drivers of intention to consume mycoproteins, the positive effect of perceived nutritional content is in line with prior studies (Schweiggert-Weisz et al. 2020), which show that consumers' recognition of health benefits significantly increases willingness to adopt mycoproteins. However, the non-significant impact of perceived ecological welfare is somewhat unexpected. While previous research has demonstrated the importance of sustainability in shaping food behaviour (e.g., Moser 2016), this finding suggests that, at least for emerging protein sources like mycoproteins, ecological considerations may be secondary to more immediate and personal concerns related to health. Consumers may acknowledge environmental benefits without allowing them to significantly influence purchase intentions. This is in line with recent studies indicating that consumers often lack a comprehensive understanding of sustainability across its three dimensions, environmental, social, and economic, and tend to prioritize health-related concerns over ecological considerations when making food choices. For instance, research by Verain et al. (2021) highlights that while consumers express concern for sustainability, their motivations for food choices are predominantly driven by health and convenience rather than environmental factors. Similarly, a study by Ardebili and Rickertsen (2024) found that individuals with strong health motivations are more likely to adopt sustainable dietary patterns, suggesting that health considerations often take precedence over ecological concerns.

The positive effect of favourable attitudes toward mycoproteins reinforces the role of affective evaluations in consumer behaviour, supporting earlier findings that attitudes are a key determinant of novel food acceptance (Banovic et al. 2022).

In contrast, the negative relationship between LOHAS orientation and perceived risk barriers offers a more nuanced contribution. While some literature posits that LOHAS consumers may demonstrate heightened risk sensitivity due to their informed and deliberative decision-making style (Mohr 2011; Anshu et al. 2022), the present findings suggest the opposite: that LOHAS values may actually reduce perceived risks associated with novel foods. Trust in the healthfulness and sustainability of such products,

core principles within the LOHAS framework, may help alleviate concerns related to unfamiliarity, safety, or food technology.

The negative influence of LOHAS orientation on meat dependence is similarly aligned with previous research (Banovic et al. 2022; Mosier & Rimal 2020), highlighting LOHAS as a potential driver of dietary shifts away from animal-based proteins. This relationship underscores the transformative capacity of value-based consumption patterns in encouraging plant-based or alternative protein adoption. Mycoproteins, as a sustainable meat substitute, are well-aligned with LOHAS priorities, offering a viable pathway for individuals seeking to reduce meat intake for ethical, environmental, or health-related reasons.

Likewise, the significant negative influence of perceived risk barriers aligns with research showing that uncertainty, whether related to food safety, taste, or unfamiliarity, can inhibit adoption of innovative food products (Sogari et al. 2022). The influence of perceived price barriers is not significant. This is in contrast with prior findings (Sogari et al. 2022), indicating that high price perceptions pose a persistent obstacle to mainstream adoption. These insights emphasize the multifaceted nature of consumer evaluation, where both benefits and barriers jointly shape behavioral intentions.

Finally, the finding that meat dependence negatively affects consumer intention confirms the enduring role of cultural, sensory, and emotional attachments to meat in shaping food decisions (Banovic et al. 2021; Testa et al. 2025; Rizzo et al. 2023). Deeply ingrained preferences, habits, and identity-related associations with meat continue to present a significant barrier to dietary transition, even when suitable alternatives are available. Therefore, strategies to encourage mycoprotein adoption should not only highlight health and sustainability benefits but also address the emotional and habitual dimensions of meat consumption.

Conclusions

The findings of this study offer meaningful contributions to both theory and practice in promoting the acceptance and broader diffusion of alternative protein sources, specifically, mycoproteins derived from mushrooms. From a theoretical perspective, this research expands the growing literature on consumer behaviour toward sustainable protein alternatives by being the first to apply the Stimulus–Organism–Response (SOR) framework to the case of mycoproteins. By incorporating both external stimuli and internal psychological mechanisms, such as attitudes, perceived barriers, and value orientations, this study provides a more comprehensive understanding of the factors that shape consumer intentions to adopt novel protein sources. The model proposed here contributes to the refinement of predictive frameworks for alternative protein adoption, particularly for products that remain underexplored in academic research. In practical terms, the findings yield actionable implications for marketers, product developers, and food system stakeholders. Marketing and communication strategies should emphasize the nutritional and environmental advantages of mycoproteins, particularly in ways that resonate with LOHAS-oriented consumers. Efforts to normalize their consumption can include the development and promotion of easy-to-prepare recipes that integrate mycoproteins into familiar dishes, thereby increasing familiarity and reducing food neophobia. Additionally, in-store strategies should enhance product visibility by

placing mushroom-based products in high-traffic sections, such as the meat or plant-based aisles, and encourage product trial through targeted discounts or sampling campaigns. From a policy standpoint, the findings of this study offer concrete guidance for institutions aiming to promote sustainable protein alternatives. The strong positive effects of LOHAS orientation on perceived nutritional benefits and attitudes toward mycoproteins indicate that educational initiatives and public campaigns should highlight both the health and sustainability attributes of these products. Programs could focus on their high protein content, complete amino acid profile, metabolic benefits, and resource-efficient production, thereby reinforcing both personal and environmental health messages. The significant negative influence of meat dependence on consumption intention underscores the need to address habitual dietary patterns. Institutional interventions, such as integrating mycoproteins into school meals, university canteens, and public cafeterias, alongside tasting sessions and recipe demonstrations, can facilitate gradual substitution of conventional meat.

Finally, the non-significant impact of perceived ecological welfare suggests that environmental messaging alone may be insufficient to drive adoption. Policies should therefore combine sustainability information with clear health and nutritional benefits, tailoring communication to resonate with health- and sustainability-oriented consumers in line with LOHAS principles.

By directly linking interventions to the key facilitators and inhibitors identified in this study—health perception, attitudes, meat dependence, and economic considerations—policy and institutional strategies can more effectively promote the adoption and normalization of mycoproteins, supporting both personal well-being and planetary sustainability. Despite its contributions, this study is not without limitations. First, while the S-O-R framework provides a valuable lens for examining value-driven motivations, this study did not capture several potentially influential factors, such as social pressure from peers or family members and broader cultural norms, which may also shape consumer responses. Future research could extend this work by integrating these social and contextual dimensions, potentially through frameworks such as the TPB, to provide a more comprehensive understanding of consumer behaviour. In particular, examining how LOHAS-oriented values interact with social norms and cultural contexts could clarify whether these values moderate or mediate the impact of external influences on sustainable food choices. Such an integrative approach would help disentangle the relative contributions of personal lifestyle values and social dynamics in shaping consumers' responses to sustainable innovations like mycoproteins. Second, this research was based on a statistically representative sample of Italian red meat consumers. While this design strengthens the internal validity and representativeness of the findings within the national context, the results may not be fully generalizable to consumers in other countries or cultural settings. Differences in dietary traditions, exposure to alternative proteins, and the prevalence or expression of LOHAS-oriented values may lead to distinct patterns of perception and acceptance. Future cross-cultural studies could therefore provide valuable insights into how cultural and lifestyle factors shape consumers' responses to sustainable protein innovations. Third, it is important to acknowledge that this study did not consider sensory aspects such as taste, texture, or aroma, which can significantly influence consumer acceptance of novel protein sources

like mycoproteins. These dimensions were not included because the research was conducted within a hypothetical setting aimed at exploring how external sustainability-related factors such as, LOHAS-oriented values interact with consumers' internal states. Future studies integrating sensory trials and real consumption experiences could provide a more comprehensive understanding of how LOHAS values and sensory perceptions jointly shape consumer acceptance. Finally, the cross-sectional design of this study limits the ability to establish causal relationships between the investigated variables. Future research could address this limitation by employing longitudinal or experimental designs to explore the temporal dynamics of sustainable food adoption. For instance, panel studies could track changes in consumers' attitudes and behaviours over time, while controlled experiments could test the causal impact of specific interventions—such as informational campaigns, labelling strategies, or sensory experiences—on the willingness to adopt sustainable protein alternatives. Such approaches would provide stronger evidence on the mechanisms driving behavioural change and the persistence of sustainability-oriented choices...

Appendix

See (Tables 3 and 4).

Author contribution

G.R. was responsible for: Conceptualization, Investigation, Data Curation, Formal Analysis, Writing Original draft. T.M. was responsible for: Conceptualization, Investigation, Visualization, Funding acquisition. G.M. was responsible for: Conceptualization, Investigation, Methodology, Validation, Writing-Review and editing, Supervision. R.D.C. was responsible for: Conceptualization, Investigation, Formal Analysis, Writing Original draft, Supervision.

Data availability

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Declarations

Conflict of interest

The authors declare no competing interests.

Ethical approval

The research protocol was approved by the Bioethics Committee of the University of Palermo. Prior to participation in the online survey, all respondents provided informed consent, in accordance with the ethical principles of the Declaration of Helsinki.

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