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Assessing Space Tourism Propensity: A New Questionnaire for Future Space Tourists

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Abstract: (1) Background: Space tourism (ST) is an emerging frontier in tourism, attracting considerable stakeholders in the era of the New Space Economy. Thus, understanding the intentions and the characteristics of future space travelers is crucial. (2) Methods: Here, we validated the brief 11-item Space Tourism Propensity Questionnaire (STP-Q) and administered it, along with sociodemographic and psychological questionnaires, to 333 undergraduates in order to explore ST propensity and predictive factors. (3) Results: Linear regression analysis revealed that STP-Q scores are influenced by personality traits, particularly sensation seeking, social distance, and conscientiousness. Sensation seeking predicts the intention to engage in future space travel, while trait anxiety negatively impacts it. Surprisingly, neither sociodemographic features nor pro-environmental behaviors predict ST propensity, as expected. (4) Conclusions: The STP-Q is a cost-effective self-report for assessing ST propensity and can contribute to the evolving field of space tourism when used in combination with other questionnaires.

Keywords: space tourism; new space economy; aerospace psychology; space travel; space tourism propensity; pro-environmental behavior; sensation seeking; psychological distance

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1. Introduction

The years after 2020 marked the beginning of space tourism (ST), where paying customers travel to space for leisure, adventure, or commercial purposes [1]. In July 2021, Richard Branson, the British tycoon, became one of the first private astronauts to participate in a suborbital flight reaching about 85 km above the New Mexico desert. His company, Virgin Galactic, was established to sell spaceflight seats for the commercial market, and he competed with Bezos from Blue Origin and Elon Musk from SpaceX in the emerging ST industry. ST is a specialized segment of the aviation industry, offering tourists the chance the experience to travel in space for recreational, leisure, or business purposes [1].

However, the concept of ST is notably unique, as its definition is confined to the purposes of the journey and does not establish a minimum duration of stay in space. Designating participants of such a flight as "tourists", according to traditional definitions, could pose challenges, particularly in suborbital flights where travelers do not spend the night in orbit. Simultaneously, labeling them as "day visitors" may present difficulties, as the genuine transition from day to night does not occur in space during their stay. Space tourism thus emerges as a distinctive experience that raises numerous definitional issues, as science loses its reference point concerning the natural laws applicable on Earth.

Despite the future of ST being partly uncertain [2], it is currently expensive, and the market is expected to expand [3]. The first space traveler in the history was the American billionaire Dennis Tito when, in 2001, he paid $20 million to visit the International Space

Station [4]. Indeed, most of the people with annual incomes of more than $250,000 are interested in ST [5]. The suborbital ST is in its early stage and will probably become more feasible in next decades, due to the development of new spacecraft and cost decreasing [6]. While ST has been primarily studied by the hard sciences, and habitability issues have been the most considered, research on psychological variables of future space tourists and their behavioral intentions is in its early stages [7] but steadily growing [8], as well as the research on affective health in long-duration space missions [9].

What characteristics can future space tourists possess? What are the predominant motivations behind a journey to space? What are the potential effects of a space journey? For instance, ST may promote sustainable behaviors through the perception of the Earth effect, that is, the increased awareness and worry for humans and Earth conditions when witnessing the Earth in its entirety.

2. Theoretical Rationale and Main Hypotheses

The propensity for ST may have behavioral antecedents, as conceptualized in a recent theoretical model developed by Mehran and colleagues [10]. Their four-level hierarchical model suggests that subjective aspects influence the inclination toward ST.

In line with them, this study had two aims. First, we wanted to create and validate a questionnaire to assess the subjective propensity for space tourism, the STQ-P. Subsequently, we explored the influence of sociodemographic, personality, and behavioral variables on scores obtained from the STP-Q. Following the same procedure, we then investigated the willingness to participate in space tourism (STW), i.e., the intention to undertake a space journey in one's lifetime—a construct partially overlapping with, and one of the elements of, STQ-P. The study sample consisted of 333 undergraduates.

In the investigation of this work, we included some psychological constructs already known in the current literature on ST, such as sensation seeking and personality traits according to the Big Five model [3,10]. Additionally, we introduced and explored aspects not yet thoroughly examined, such as psychological distance and temporal perspective. Therefore, we explored them here. Below is the list of constructs included in our survey, along with the specifically developed and validated questionnaire, the STP-Q:

- Psychological distance, which is the subjective experience of distance/proximity between oneself and an event or object, in terms of its temporal, spatial, social, and/or hypothetical aspects in the present moment [11]. We focused on social distance (SD), in terms of concern for different social groups' wellbeing. Psychological distance and, specifically, social distance, indeed, can influence decision making [12].
- Sensation seeking is a personality trait related to the need for novelty and involvement in thrill-seeking activities [13]. It has already been addressed in relation to ST attractiveness [3,10].
- Risky behaviors, such as substance abuse or unprotected sexual activity, are considered potential threats to health or even life, and their actuation is linked to impulsivity [14]. We assessed risky behaviors' frequency to determine if impulsivity plays a role in predicting the propensity for ST, considering its effect on decision making [15].
- Personality traits from the Big Five model [16–18], in line with Mehran's framework [10]. Specifically, we focused on "Conscientiousness" and "Openness to Experience" subscales because they were the most interesting aspects for our research purposes. Conscientiousness is characterized by a disposition to be disciplined, responsible, and reliable [19]. Openness to experience is linked to the readiness to explore and interact with diverse and unfamiliar environmental stimuli, such as new ideas, individuals, cultures, and sensations [20].
- Trait anxiety is a stable characteristic of perceiving external or internal stimuli as threatening and experiencing mostly negative emotions (fear and anxiety) in most situations [21,22]. We assessed trait anxiety because highly anxious individuals exhibit reduced sensitivity to novelty [23], so anxiety might negatively predict ST propensity.

- Temporal perspective (TP), that is, the way we divide the flow of our social and personal experiences into distinct temporal categories, i.e., past, present, and future [24,25]. TP can be considered a personality trait affecting the human functioning, including actions, judgments, and emotions [26,27]. Considering the role of TP styles in travel research and travel choice [28], we wanted to explore whether the propensity for ST could be predicted by TP, and in particular by an index that calculates the distance from an ideal, balanced time profile, i.e., the DBTP [26,29,30].
- Pro-environmental behaviors (PEBs) are those actions taken by people to protect the environment [31], such as purchasing sustainable products (e.g., local food), conserving water and energy, and changing habits [32]. As climate change has become an urgent issue, PEBs are defined as any behaviors that individuals can adopt to mitigate the hazardous impacts of climate change, resulting in dual benefits of its mitigation and sustainability [33]. Sustainability is a crucial aspect of the ST field [34], if we consider that the expansion of ST is predicted to increase emissions of black carbon into the stratosphere.

In line with the still limited research on the subjective aspects involved in ST [3,9,10,34–36], the initial hypotheses of this study were as follows:

(a) Sociodemographic variables could predict propensity for ST; specifically, younger and single men may be more inclined toward ST [3].
(b) Social distance may affect the propensity toward ST, as it does with decision-making processes [37]. Our purpose in this case was exploratory, as we hypothesized that the direction of the effect relied on participants' ethical and social evaluations of ST. Practically, SD might predict the propensity for ST either positively or negatively, depending on how individuals perceive its impact (as beneficial or detrimental to humanity).
(c) We expected higher levels of sensation seeking to positively predict ST propensity, in line with the literature [3,10]. Space tourism, like any new and exciting experience, may particularly appeal to individuals who are more adventurous. Similarly, higher frequency of risky behaviors, denoting impulsivity, could predict it too.
(d) In general, "openness to experience" (OE) is positively associated with curiosity for novelty [38] and sensation seeking [39], while "conscientiousness" (CO) is negatively associated with risk-taking inclinations [40]. Recently, a study by Joseph and Zhang [41] found that OE directly predicts recreational risk taking, while CO inversely predicts it. Based on the literature, we hypothesized that OE positively predicts propensity for engaging in risky recreational events, such as space tourism (ST), while CO is expected to have a negative prediction.
(e) We posited that trait anxiety may negatively predict the propensity for space tourism, as individuals with higher levels of anxiety are typically more apprehensive about engaging in new and potentially risky experiences [42], such as space travel.
(f) We suggested that an imbalanced temporal perspective, as measured by the DBTP index, would positively predict ST propensity. Specifically, individuals who exhibit a disproportionate focus on hedonistic aspects of the present, compared to other temporal perspectives, are likely to demonstrate a greater interest in risk taking across various domains [43].
(g) We postulated that individuals with higher PEB-Q scores would exhibit heightened environmental concerns, which, in turn, might negatively predict ST propensity, particularly if participants are aware of the environmental impact associated with ST [44].
(h) We believed that gender differences may exist among the predictors of the STP-Q and STW, considering gender differences in risk perception [45]. Our purpose in this case was exploratory.

3. Methods

3.1. Participants

N = 430 undergraduates in psychology at the "D'Annunzio" University of Chieti-Pescara were recruited to attend our study. The survey was administered and distributed online via Qualtrics software [46] from mid-May 2021 to March 2022. Students provided written informed consent and received additional academic credits as an incentive for their participation. This study adhered to the ethical guidelines outlined in the Declaration of Helsinki [47]. The research protocol was approved by the Institutional Review Board for Psychology (IRBP) within the Department of Psychological, Health, and Territorial Sciences.

Inclusion criteria were defined as follows: (i) enrollment as an undergraduate student at "D'Annunzio" University and (ii) proficiency in the Italian language. Participants who did not complete the survey were excluded from the analysis.

Of the 430 students who had started the survey, only 333 completed it, so we considered only the latter for the purposes of this study. The final sample exhibited a mean age of 20.95 years (SD = 2.58; Mdn = 20), with a minimum age of 18 years and a maximum of 35 years. The sample was well-balanced in terms of gender, with 190 female participants (57.1%). Education levels varied, with 305 participants (91.6%) holding a high school diploma and 28 participants (8.4%) possessing a bachelor's degree. Approximately half of the participants were single (n = 184; 55.3%), and a majority reported having no income (72.4%). Given the homogeneity of our sample, we opted to include only specific sociodemographic variables (gender, age, and marital status) in our analyses, while disregarding others (education, income, and children), despite their relevance in prior related research [3].

3.2. Procedure

The survey required approximately 15 min to complete and was composed of the ad hoc questionnaire on ST and standardized measures described in the *Materials* section.

The survey began by collecting sociodemographic information (age, gender, income, education level, and marital status). Participants read a brief description of ST, ensuring that even those previously unaware of this phenomenon could gain some understanding, and then completed the ad hoc questionnaire for space tourism (Table S1, Supplementary Materials) and the psychological and behavioral questionnaires (refer to the *Materials* section for details). The brief description of ST they read was the following:

"Until now, only astronauts have had the opportunity to venture into space. However, this may soon change as space tourism becomes available to the public. Suborbital flights that launch into space and immediately return to Earth will allow ordinary individuals to travel to the edge of space at approximately 100 km. Passengers will be able to experience weightlessness, witness the curvature of Earth, observe the darkness of space and the brightness of stars, just as astronauts do. The space industry is making great strides and some companies have predicted selling 11,000 seats in the next 10 years, with approximately 1000 seats already booked. Currently, the cost of a suborbital space journey, involving reaching the edge of space and then returning to Earth, with a total duration of approximately 2–3 h, ranges between $250,000 and $500,000. On the other hand, an orbital trip, which entails staying in orbit—continuously circling the planet at extremely high speeds to avoid falling back to Earth—and typically lasting several days, comes at a price exceeding $50 million per seat. The growth of the space tourism market is very promising and will play a significant role in future economic growth and supporting scientific research. In the distant future, spacecraft could potentially be utilized as high-speed transportation to connect different cities through suborbital travel, enabling travel from Europe to Australia in just two hours, for instance."

4. Materials

4.1. The ad hoc Questionnaire for Space Tourism

We have adopted and partially modified the questionnaire for ST developed by Sankovic [48] to evaluate knowledge, perceived importance, attraction, motivations, and lifetime disposition for ST. Participants provided responses utilizing various scales, including dichotomous (yes/no), 9-point (e.g., ranging from 0 "absolutely no" to 9 "absolutely yes"), multiple choice, and open-ended responses. The list of items and response scales are presented in the Supplementary file (Table S1). As discussed in the *Data Analysis* section, Principal Component Analysis (PCA) was used to confirm that selected items were loaded into a single latent factor [49]. These were then used in the following analyses and referred to as the 'Space Tourism Propensity Questionnaire' (STP-Q).

4.2. Social Distance (SD) Scale

To measure the level of SD we created five ad hoc items, in which we asked participants how concerned they were about the conditions of different groups of people from the nearest to the farthest (ranging from 'family' to 'humanity'; see the Supplementary Materials) on a Likert scale ranging from 1 ("Not at all") to 9 ("Extremely"). All items were reversed, and we obtained an overall mean score (range: 1–9), with higher scores indicating a greater degree of social distance. Internal consistency of the SD scale was tested with Cronbach's alpha and showed excellent values ($\alpha = 0.814$).

4.3. Brief Sensation Seeking Scale (BSSS-8)

We measured sensation seeking (SS) levels with the 'Brief Sensation Seeking Scale' (BSSS) [50], a brief self-report questionnaire. It is a shortened version of the Sensation Seeking Scale Form V (SSS-V) [51], and consists of eight items that evaluate four facets of SS: thrill and adventure seeking, experience seeking, disinhibition, and boredom susceptibility. Participants rated each item on a 5-point Likert-type scale, from 1 ("Totally disagree") to 5 ("Totally agree"). The total score can range from 8 to 40, with higher scores indicating a higher level of SS. The BSSS has been found to have good internal consistency and test–retest reliability [52] and is commonly used in research on personality, health-related behaviors, and other areas where SS may play a role [53].

4.4. Risk Behavior Scale (RBS)

Risk behaviors were detected with the 'Risk Behavior Scale' (RBS) [54], a self-report consisting of 14 questions about bad habits or dangerous behaviors, e.g., smoking, using drugs or alcohol, getting drunk, going on drastic diets, and having sex without protection. Participants had to indicate the frequency they engaged in each risky behavior on a 4-point scale, from 1 ("never") to 4 ("more than five times so far"). The total score is obtained by summing the 14 items, ranging from 14 to 56.

4.5. The Big Five Inventory (BFI)

The Big Five Inventory (BFI) [17,55] is a self-assessment tool designed to measure the five main dimensions of personality. For our research purposes, we used the Italian version [56] and only included the conscientiousness (9 items) and openness to experience (10 items) subscales. Items consist of brief descriptions of characteristics and behaviors to which the examinee must express their degree of agreement/disagreement on a 5-point scale, from 1 ("Strongly Disagree") to 5 ("Strongly Agree"). A medium score (range: 1–5) was then calculated for each subscale, with higher scores indicating a greater level of that personality dimension.

4.6. Trait Anxiety Inventory (STAI-Y)

The STAI-Y [57] is a self-report questionnaire consisting of 2 subscales with 20-items each, aimed at measuring state and trait anxiety (S-Anxiety and T-Anxiety, respectively). For our study, we include only the T-anxiety subscale for trait anxiety. The T-anxiety

subscale evaluates the subjective, more stable predisposition to perceive stressful situations as dangerous or threatening. Participants rated their degree of agreement/disagreement with statements on a 4-point Likert scale, from 1 ("almost never") to 4 ("almost always"). The total score can range from 20 to 80, with higher values indicating greater anxiety levels.

4.7. Short Version of the Zimbardo Time Perspective Inventory (ZTPI) and the DBTP Index

The 'Zimbardo Time Perspective Inventory' (ZTPI) [58] is a self-report measuring the individual tendency (positive and negative) toward different time perspectives (past, present, future). ZTPI counts six subscales: past negative (PN), past positive (PP), present fatalistic (PF), present hedonistic (PH), future negative (FN), and future positive (FP). For example, high scores on the PN subscale reflect a negative or aversive attitude toward the past, while high scores on the PP subscale indicate a warm, sentimental, and nostalgic attitude toward one's past. We used the short version of the ZTPI [59] composed of 18 items, 3 for each scale. Participants must rate their degree of agreement/disagreement with statements on a 5-point Likert scale, from 1 ("Definitely false") to 4 ("Definitely true"). Based on the scores obtained, we calculated the Deviation from a Balanced Time Perspective index (DBTP) [29,60,61], which we primarily used in our analyses (see *Data Analysis* section). The DBTP is an index given by the sum of deviations between the ratings provided and the ideally balanced TP ratings, as proposed by Zimbardo and Boyd [30]. Specifically, the DBTP is given by the aggregate sum of the deviations of the ZTPI scales, according to the following formula:

$$\sqrt{(\mathrm{oPN}-\mathrm{ePN})^2+(\mathrm{oPP}-\mathrm{ePP})^2+(\mathrm{oPF}-\mathrm{ePF})^2+(\mathrm{oPH}-\mathrm{ePH})^2+(\mathrm{oF}-\mathrm{eF})^2+(\mathrm{oFN}-\mathrm{eFN})^2}$$

where "o" is "observed score"; "e" is "expected score"; ePN = 1.95; ePP = 4.60; ePF = 1.50; ePH = 3.90; eF = 4.00; and eFN = 1.80. This index has been successfully used on the Italian population [62].

4.8. Questionnaire for Pro-Environmental Behaviors (PEB-Q)

PEB-Q is a 26-item self-report [33] that assesses attitudes toward climate change and the subsequent adoption of pro-environmental behaviors. These are the set of actions that the individual can affect to minimize the negative effects of pollution on the natural world and/or provide sustainable benefits for the environment and society [63]. PEB-Q is based on the Theory of Planned Behavior [64], which has been widely used in the research on attitudes and behaviors and is an extension of the Theory of Reasoned Action [65].

PEB-Q consists of five subscales: attitudes toward climate change (ATCC, 4 items), subjective norms (SN, 5 items), perceived behavioral control (PBC, 5 items), behavioral intention to adapt to climate change (BI, 6 items), and pro-environmental behavior (PB, 6 items). As it has been created for the Malaysian context, we translated it faithfully from English into Italian and adapted it to the Italian context (following the four-step methodology of [66]), e.g., we replaced "Malaysia" with "Italy" in all items where it was present (1, 3, 6, 7, 8, 10, 11). Participants had to rate their agreement/disagreement with statements on a 5-point Likert scale, from 1 ("Disagree strongly") to 5 ("Agree strongly"). For the aims of this work, we only considered the global score, ranging from 26 to 130, with higher values indicating greater levels of PEB and pro-environmental attitudes.

5. Data Analysis

First, we performed descriptive analyses to present the sociodemographic characteristics of the sample. Then, we ran chi-squared tests to investigate the relationship between sociodemographic characteristics of interest (gender, age, marital status) and two dichotomous dependent variables: knowledge of space tourism (STK) and willingness to engage in space tourism (STW). The STK variable corresponds to item 1 of the ad hoc questionnaire (Table S1, Supplementary Materials). STW, which corresponds to item 13 ("In your lifetime, how many trips to space would you like to take?"), was initially measured using four

response options (1 = "none"; 2 = "one"; 3 = "a few"; 4 = "as many as possible"). To simplify the analysis, we re-coded the item into a dichotomous variable called "willingness to engage in space tourism" (STW). The sample responses were grouped into two options: "none" (0) and "at least one" (1).

Next, we conducted a Principal Component Analysis (PCA) to evaluate the suitability of a unidimensional model for the ad hoc questionnaire. Our hypothesis was that the items identified by the asterisk in Table S1 (Supplementary Materials) would underlie the same latent variable, demonstrating a single-factor structure. Items with weak loading ($\leq$0.40) and/or loading on multiple factors ($\geq$0.35) were eliminated from the final battery. Based on the PCA results, the eleven items were reduced into a single factor, which we labeled as the "Space Tourism Propensity Questionnaire" (STP-Q) and used in subsequent analyses.

Then, a correlation analysis was conducted to examine the associations between the STP-Q and recorded variables (sociodemographic, psychological, and behavioral). Therefore, a linear regression analysis was conducted on the entire sample to identify which variables predicted the STP-Q. Only the factors exhibiting a significant correlation with the STP-Q in the correlation analysis were included as predictors. An additional regression analysis was conducted to examine the results for each gender separately.

Finally, we decided to explore individual differences in the probability of taking at least one trip to space in one's lifetime. To this end, we conducted a binary logistic regression analysis by including STW as the dependent variable. Among the predictors, we included only those variables found to be significantly associated with STW at a previous biserial point correlational analysis.

Sensitivity analyses were conducted with G*Power, version 3.9.1.6 [67,68], after data collection to calculate the minimum effect size that can be detected given alpha (0.05), power (0.80), and sample size (333). Results for correlation analysis indicated that we had enough power to detect $r \geq 0.107$. Results for multiple linear regression analysis (fixed model, R^2 deviation from zero) on the entire sample (n = 333) showed that we had enough power to detect $f^2 \geq 0.04$. Moreover, in the regression analysis on men (n = 143), we had enough power to detect $f^2 \geq 0.086$, and in the analysis on women, we had enough power to detect $f^2 \geq 0.051$. Regarding logistic regression analyses, our sample was sufficiently large (>200 subjects) to capture medium and large effect sizes [69] following Cohen's guidelines [49,70,71].

6. Results

6.1. Descriptive Analysis

Our results indicated that slightly more than half of the sample (n = 181, 54.4%) had prior awareness of space tourism (STK). Interestingly, a very high percentage of participants (n = 317, 95.2%) desired to have at least one space trip in their lifetime (STW).

Chi-squared tests were run to assess the relationship between dichotomous sociodemographic variables (gender and marital status) and STK and STW. Results showed that, in our sample, men had significantly higher knowledge about ST (STK) compared to women, while there were no gender differences in STW. On the contrary, marital status was not found to be associated with either STK or STW. Therefore, neither the knowledge of space tourism nor the current intention to travel to space is associated with being in a relationship vs. single (Table 1).

The ST questionnaire measured purely descriptive aspects (items 4, 14, 15, 16, 17, 18) that were not included in the PCA described below because they are not conceptually related to ST propensity. For example, with item 4, we asked for a cognitive estimate of when ST might become an available service for interested citizens, and with item 14, we asked for a subjective assessment of how much a space trip should cost. Descriptive analysis of items not included in the PCA are reported in the Supplementary Materials (Table S2).

Table 1. Chi-squared tests comparing gender and marital status with knowledge about ST (STK) and intention to make a space trip during a lifetime (STW).

				STK			STW		
		n	**%**	**Yes**	**No**	χ^2	**Yes**	**No**	χ^2
Gender	Female	190	57.1%	92 48.4%	98 51.6%	6.28 *	180 94.7%	10 5.3%	0.20
	Male	143	42.9%	89 62.2%	54 37.8%		137 95.8%	6 4.2%	
Marital status	Single	184	55.3%	96 52.2%	88 47.8%	0.79	177 96.2%	7 3.8%	0.90
	In a relationship	149	44.7%	85 57%	64 43%		140 93.9%	9 6.1%	

Note. * $p < 0.05$.

6.2. PCA and Reliability of the Space Tourism Propensity Questionnaire (STP-Q)

PCA was used to evaluate the factor structure of the STP-Q (see Table 2), since we had a sufficient sample size to perform the analysis [72]. The KMO value was 0.88, indicating that the relationships between variables were very strong and our data were suitable for factor analysis, and the Bartlett's test of sphericity was significant too, $\chi^2(55) = 1.295$, $p < 0.001$. The eleven items entered significantly loaded onto one factor, which explained 37.16% of variance ($p < 0.001$). The questionnaire demonstrates good internal consistency, with an optimal Cronbach's alpha ($\alpha = 0.809$) that did not increase when one or more items were excluded.

Table 2. PCA confirmed a one-factor structure for selected items (factor loading). Values indicate Cronbach's alpha.

Items	**Factor Loading**	**Alpha (If Removed)**
Item 2	0.554	0.799
Item 3	0.691	0.788
Item 5	0.523	0.799
Item 6	0.621	0.794
Item 7	0.615	0.789
Item 8	0.737	0.781
Item 9	0.652	0.786
Item 10	0.629	0.790
Item 11	0.530	0.804
Item 12	0.500	0.803
Item 13	0.608	0.803

A total score was computed summing individual items; therefore, the total STP-Q score ranged from 11 to 90. To facilitate data analysis, we decided to convert this score into a percentage score using the following formula, where 'minimum' corresponds to 11:

$$= (\text{value} - \text{minimum})/(\text{range}) \times 100$$

After standardizing the score, the mean value of the STP-Q was 72.24 (SD = 17.78).

6.3. Correlation and Regression Analyses for the STP-Q

The correlation analysis showed that the STP-Q significantly correlates with both sociodemographic and some personality measures, but not with the scores on the PEB questionnaire (Table 3).

Table 3. Correlation analysis (with confidence intervals) between STP-Q scores and recorded variables.

	STP-Q		
	Pearson's r	**95% CI**	
		Lower Limit	**Upper Limit**
Gender	**−0.108 ***	−0.21	−0.00
Age	−0.029	−0.14	0.08
Marital status	−0.036	−0.14	0.07
SD	**−0.137 ***	−0.24	−0.03
RBS	0.104	−0.00	0.21
BSSS	**0.353 ****	0.26	0.44
BFI CO	**0.114 ***	0.01	0.22
BFI OE	0.07	−0.04	0.18
STAI	−0.07	−0.18	0.04
DBTP	**−0.124 ***	−0.23	−0.02
PEB-Q	0.053	−0.06	0.16

Note. * = $p < 0.05$; ** = $p < 0.01$.

Then, we conducted a multiple linear regression to identify which variables independently predicted the STP-Q score, our dependent variable. Only the variables that were found to be significant in the correlational analysis were included in the linear regression. The results (Table 4) showed that our model was significant, F (5, 327) = 13.58, $p < 0.001$, and explained 17.2% of variance (R^2), showing a medium effect size of $f^2 = 0.21$. Significant predictors were SD, BSSS, and CO (BFI); thus, participants with higher social distance, sensation seeking, and conscientiousness had higher scores on the STP-Q.

Table 4. Linear regression analysis predicting STP-Q score (n = 333).

Predictors	***B***	**SE**	**β**	**t**	***p***	**95% CI**	
						Lower Limit	**Upper Limit**
Gender	−3.046	1.906	−0.085	−1.598	0.111	−6.80	0.70
SD	−1.994	0.668	−0.156	−2.984	**0.003**	−3.31	−0.68
BSSS	8.141	1.210	0.345	6.727	**<0.001**	5.76	10.52
BFI CO	3.226	1.516	0.115	2.128	**0.034**	0.24	6.21
DBTP	−1.003	1.081	−0.050	−0.927	0.354	−3.13	1.12

Although gender did not predict the STP-Q score, we investigated whether there were any gender differences in predictors of it by conducting separate linear regressions for men and women. To this end, we preliminary ran correlation analyses between STP-Q and recorded variables separately for men and women to identify the ones to include in the regression analysis.

Correlation analysis on men showed that the STP-Q scores correlated with SD (r = −0.198, $p = 0.018$); 95% CI [−0.35, −0.04]; BSSS (r = 0.232, $p = 0.005$); 95% CI [0.07, 0.38]; CO (BFI) (r = 0.190, $p = 0.023$); 95% CI [0.03, 0.34]; and DBTP (r = −0.169, $p = 0.044$)—95% CI [−0.32, −0.01]—with effect sizes being small but not trivial. Among women, instead, the STP-Q scores were correlated only with SD (r = −0.153, $p = 0.035$); 95% CI [−0.29, −0.01]; and BSSS (r = 0.421, $p < 0.001$)—95% CI [0.30, 0.53]—with the latter showing a medium effect size. Then, two separate linear regression analyses were run to identify predictors for the STP-Q in men vs. women. The regression analysis on women was significant, F (2, 187) = 21.65, $p < 0.001$ (medium effect size, $f^2 = 0.23$), and explained 18.8% of the variance (R^2). The only significant predictor in this model was BSSS (β = 0.409, $p < 0.001$), 95% CI [6.88, 13.38]. The regression analysis on men was significant too, F (4, 138) = 5.563, $p < 0.001$ (medium effect size, $f^2 = 0.16$), accounting for 13.9% of the variance (R^2). The sig-

nificant predictors were BSSS (β = 0.246, p = 0.002), 95% CI [1.97, 8.87], and SD (β = −0.192, p = 0.017)—95% CI [−4.08, −0.41].

6.4. Correlation and Logistic Regression Analyses for the STW Item

In addition, we wanted to explore which variables specifically predicted STW, that is, the willingness to achieve at least one travel to space in a lifetime, and whether they differed from those predicting the overall STP-Q score. This analysis aimed to identify which variables predicted membership in the group of participants who reported wanting to take at least one space trip (n = 317) versus none (n = 16). First, we performed a correlational analysis between STW and recorded variables (see Supplementary Materials, Table S3). The results showed that STW positively correlates with BSSS (r = 0.186, $p < 0.001$), 95% CI [0.08, 0.29], and negatively with STAI (r = −0.116, p = 0.035), 95% CI [−0.22, −0.01].

Then, a binary logistic regression analysis was run to explore which of these two significant variables at the correlation analysis predicted STW. The model was significant, $\chi^2(1) = 19.81$, $p < 0.001$, and explained 15.2% of the variance (Nagelkerke $R^2 = 0.152$), indicating a moderate relationship between prediction and grouping. Prediction of engaging in at least one space travel in future was 95.2% overall, with sensation seeking explaining significant proportions of variance. Both predictors reached significant p-value level, but only BSSS had an appropriate effect size for our sample, as it was significant for OR = 3.47, $p < 0.001$, 95% CI [1.65, 7.29], which equates to a medium effect size, corresponding to Cohen's d = 0.05. The trait anxiety (STAI), despite being significant for OR = 0.931, p = 0.03, 95% CI [.87, 0.99], did not show an adequate effect size. As discussed in the next section, the results should be taken with caution because only a few participants (n = 17) stated that they would not want to take space travel in the future. While our model has demonstrated accuracy in predicting willingness to participate in space travel, its reliability in predicting those who have no interest in undertaking any space travel is limited.

7. Discussion and Conclusions

ST is now a reality, and its popularity is growing, making it increasingly attainable and affordable. The "New Space Economy" [73] refers to the economic chain related to the space sector, which now encompasses many activities, including launcher development, new materials, services offered by Earth observation satellites, and science missions. Space tourism will probably attract more and more people, and increasing public awareness is essential for its advancement [74]. However, there is still a paucity of empirical research on the behavioral intentions of space travelers as well as limited knowledge about risk perception and motivations involved in ST [36].

The aim of this study was to examine the construct validity of a questionnaire designed to investigate the propensity for space travel (STP-Q) from a psychological perspective. The results provided evidence of construct validity, suggesting that the STP-Q is a promising and reliable scale for assessing the propensity for commercial space travel. Furthermore, we explored which individual characteristic can predict the propensity for ST, addressing the recent call for research [3,35].

First, on a descriptive level, we found that most of our participants were already aware of space tourism even before receiving the description we presented to them. Nearly all of them expressed a desire to embark on at least one space trip during their lifetime. This strong inclination highlights a significant demand for the experience, indicating the potential for a highly lucrative space tourism market for investors. In examining gender differences in relation to space tourism, our findings indicate that while men exhibit greater knowledge about space tourism compared to women, there is no gender disparity in terms of the intention to embark on at least one space trip in the future. Conversely, marital status was found to have no significant influence on either knowledge of the phenomenon or the intention to engage in space tourism. It should be noted that due to the homogeneity of our sample (consisting primarily of students with no income), only a limited number of sociodemographic variables were considered. Consequently, variables such as income,

education, and the presence of children were excluded, despite their potential relevance. Further research involving a more diverse sample in terms of age and income could explore the association or predictive nature of these variables with the propensity for space travel.

Secondly, we examined the psychological factors that could contribute to the inclination toward space travel, encompassing both personality traits and behaviors. Our findings indicated that within our sample, the propensity for space tourism, as assessed by the STP-Q scale, was influenced by three factors: sensation seeking (measured by the BSSS), social distance (SD), and the conscientiousness subscale (CO) of the Big Five model.

Our study not only confirmed the significant role of sensation seeking in relation to space tourism, as previously observed by Reddy and colleagues [3], but also shed light on the contributions of two additional personality aspects to the propensity for space travel. Specifically, social distance demonstrated an inverse relationship with the STP-Q, indicating that individuals with lower scores on the SD scale (and a greater concern for social groups distant from their own household) exhibited a higher propensity for space tourism. On the other hand, conscientiousness, which encompasses various traits (such as industriousness, perfectionism, orderliness, and task planning) directly predicted STP-Q scores. While this finding may appear contradictory to the role of sensation seeking, it is important to note that sensation seeking and conscientiousness are not inherently opposed. While they generally exhibit an inverse relationship [75], sensation seeking only shares a portion of the variance with conscientiousness [76].

In practical terms, our findings suggest that undergraduate participants who displayed higher levels of sensation seeking were more conscientious, demonstrated a greater concern for the living conditions of other social groups, and were more inclined toward the phenomenon of space tourism. One potential explanation for these results is that our participants perceive space travel not only as an exciting personal experience (sensation seeking) but also as a progressive endeavor that can benefit all of humanity (social distance and conscientiousness).

Despite the non-significance of gender in predicting the STP-Q, we wanted to explore whether gender differences exist among variables predicting space tourism propensity, as has been observed for other psychological variables, such as risk perception, e.g., [77]. Thus, we conducted separate analyses by gender, which revealed that in women, the only significant predictor for the STP-Q was sensation seeking, while for men, the social distance was also a significant predictor.

Finally, we examined which variables predicted the willingness to make at least one trip to space in a lifetime (STW). The STW item is thus a snapshot of participants' intention at the time of the questionnaire, which may change over time. Our purpose here was to investigate whether there were any differences in the predictors of STW from those found in the STP-Q. We identified two predictors for STW: sensation seeking and trait anxiety. Theoretically, participants with higher levels of sensation seeking expressed the willingness to take at least a travel in space during their lifetime, whereas those with higher trait anxiety indicated that they would not. However, the effect size of the trait anxiety predictor was too small for our sample size, which limited our analysis to only medium and large effects. Consequently, while we cannot regard trait anxiety as a significant negative predictor in lifetime space travel intention based on our findings, future studies with larger and more diverse samples should take it into account.

In conclusion, contrary to hypothesis a, we did not find that gender or marital status predicts STP-Q scores. However, gender made a difference in the actual knowledge of ST, and gender differences exist among the predictors of the STP-Q (hypothesis h). Some personality variables predicted scores on the STP-Q scale, specifically sensation seeking, social distance, and conscientiousness (hypotheses b, c, d). The DBTP index, contrary to hypothesis f, did not emerge as a significant predictor, suggesting that temporal orientation does not play a role in ST propensity. An alternative explanation is that the variance explained by the DBTP is overshadowed by that explained by sensation seeking. Indeed, individuals with higher levels of sensation seeking have a dominant hedonistic present

temporal perspective, prioritizing immediate pleasures [58]. However, further studies are required to affirm this. Regarding trait anxiety, hypothesis e was partially confirmed. Although the STAI score did not predict the STP-Q, it (negatively) predicted STW. A plausible explanation is that trait anxiety does not influence attitudes and inclinations toward ST as a phenomenon itself but rather affects the subjective decision-making process of whether to undertake space travel [78]. Finally, hypothesis g, which posits the role of pro-environmental behaviors in negatively predicting the STP-Q, was not supported by our data. This may be due to a lack of information in our sample about the actual environmental impact of ST [34].

7.1. Practical Implications

The STP-Q is a brief and cost-effective self-report measure, and it can serve as a preliminary tool for assessing individual propensity for approaching ST. This measure can be used for research purposes as it may be of help in answering some research questions about the type of tourists that might choose to participate in a spaceflight instead of going on a cruise. Consequently, and coupled with other instruments, it may help to identify people who are not able to cope and adapt to space travel. Moreover, our study offers several practical implications that can be implemented, as follows:

- Targeted marketing. Our findings provide a solid basis for implementing concrete strategies and actions in the ST sector, enabling a more targeted and effective approach to attracting and meeting the needs of potential space tourists. Knowing the factors that influence the propensity for ST can help the development of targeted marketing strategies. Companies in this industry can adopt differentiated approaches for men and women, using messages and communication channels specific to each target group.
- Development of tourism packages. The results of our study can guide the development of customized tourism packages to meet the different needs and preferences of potential space tourists. For example, if sensation seeking is a key factor, campaigns could emphasize the excitement, adventure, and unique experience offered by ST.
- Education and information. Given the assumption that participants may lack adequate information about ST, it is important to provide appropriate training and education on the participants. Travel agencies, space companies, and tourism organizations can play a key role in disseminating correct knowledge about ST, eliminating any information gaps.
- Partnerships and collaborations. Companies in the ST sector can consider strategic partnerships with other organizations or brands that share similar values or cater to the same target groups. These collaborations can expand the reach of marketing initiatives and increase the attractiveness of ST to target audiences.

7.2. Limitations and Future Directions

As anticipated, the main limitation of this study is the sample. Undergraduates do not represent the general population. As a result, we were unable to consider variables that are more relevant to space tourism literature, such as income [3]. For this reason, we want to limit the conclusions reached here to young students.

In the future, we plan to administer the STP-Q to a more diverse sample, encompassing individuals of different ages, from various economic and cultural backgrounds, to investigate whether some variables (such as income, education, pro-environmental behaviors) may emerge as significant predictors of the STP-Q.

An additional limitation is that in the initial version of this study was that the description of the space tourism phenomenon in the custom questionnaire contained a sentence that we subsequently excluded in the final version to avoid any potential influence on the participants' responses. The sentence was as follows: "Although the space industry is making great strides, people's perception of spacecraft reliability is low, and it may take decades for standard commercial travel modes to be established". Rather, we introduced a

sentence that was not present in the original version—the one reviewed by the participants during the compilation process—as follows: "Currently, the cost of a suborbital space journey, involving reaching the edge of space and then returning to Earth, with a total duration of approximately 2–3 h, ranges between $250,000 and $500,000. On the other hand, an orbital trip, which entails staying in orbit—continuously circling the planet at extremely high speeds to avoid falling back to Earth—and typically lasting several days, comes at a price exceeding $50 million per seat".

Finally, the STP-Q provides a single measure that may facilitate the assessment of spaceflight propensity, but a combination of measures would surely be more effective in describing this new phenomenon. Despite these limitations, the STP-Q is a brief and cost-effective instrument that allows to (1) monitor changes in propensity over the next few years and across generations, (2) collect information to develop marketing techniques and promote the space tourism market, and (3) have a solid reference point that will be beneficial for conducting future research in this field.

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