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Passenger Insight on Sustainable Flight: Exploring the Relationships Between Attitudes and Risk Propensity on Willingness to Fly

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ABSTRACT

Passengers were generally accepting of sustainable aircraft, but compared to jet fuel, higher general risk propensity (GRiP) was more predictive of willingness to fly (WF) in sustainable aircraft. Sustainable attitudes strongly related to WF in sustainable aviation fuels (SAF) but had a weaker relationship on WF in electric and hydrogen aircraft, compared to jet fuel.

BACKGROUND

- The aviation industry aims to achieve net zero carbon emissions by 2050 through SAFs and alternative energy sources like biofuels, batteries, and hydrogen-based fuels (FAA, 2021).
- The industry's growth has raised concerns about safety, security, and environmental impact, affecting individuals' WF. Understanding consumer attitudes, characteristics, and behaviors is crucial for successful adoption of new technologies.
- Gender, age, and cultural perspectives influence attitudes toward sustainable aviation (Korba et al., 2023; Winter et al., 2020).
- The role of risk propensity in this context remains unexplored. Risk propensity, shaped by individual experiences and attitudes, may impact attitudes and behaviors related to air travel safety and sustainable aviation technology.

PURPOSE

The purpose of this study was to investigate the relationship between passengers' attitudes toward sustainability (Zwickle & Jones, 2018), general risk propensity (Zhang et al., 2019), and their willingness to fly (Rice et al., 2020) in four flight scenarios: traditional jet fuel (control), SAF, electric, and hydrogen.

METHODS

An exemption was approved by Florida Tech's Institutional Review Board. Participants were recruited via Amazon MTurk to complete a 50-question questionnaire on Qualtrics, consisting of the WF Scale (Rice et al., 2020), Sustainability Attitudes Scale (SAS; Zwickle & Jones, 2018), and General Risk Propensity Scale (Zhang et al., 2019). The WF scale was repeated for each flight scenario: traditional jet fuel, SAF, electric batteries, and hydrogen. Descriptive and inferential statistical analyses were conducted with R Studio Version 4.3.2. Inferential statistics included a moderation analysis of SAS and GRiPS as independent variables of each WF scenario, correlational analyses, and linear regressions between SAS on WF scores and GRiPS on WF scores. SPSS Version 29.0 was used to generate a one-way ANOVA with a pairwise comparison to test differences of WF by propulsion type.

RESULTS

- Passengers (n = 274) had the highest average WF for Jet Fuel (Table 1), and WF in hydrogen-powered aircraft was significantly lower compared to jet fuel (p = .015) and SAF (p = .026).
- Most of the participants show positive sustainability attitudes (M = 3.97, SD = 0.61) and high general risk propensity (M = 3.93, SD = 0.72), with men (n = 193) having slightly higher average scores and more variability compared to women (n = 81).
- Cronbach's alpha values demonstrated acceptable to good internal reliability for the six self-report scales.

Table 1: Descriptive Statistics for Willingness to Fly, Sustainability Attitudes, and GRiPS

Measurement Scales	Mean	Median	Range	Max	Min	Standard Deviation	Cronbach's Alpha
WF Jet Fuel	4.00	4.00	2.85	5.00	2.14	0.61	.79
WF SAF	3.98	4.00	3.00	5.00	2.00	0.59	.76
WF Electric	3.94	4.00	4.00	5.00	1.00	0.65	.81
WF Hydrogen	3.91	4.00	4.00	5.00	1.00	0.72	.84
SAS	3.97	4.05	3.27	5.00	1.73	0.61	.86
GRiPS	3.93	4.06	4.00	5.00	1.00	0.72	.86

- All IVs had significant, positive, linear models with the DVs.
- Linear regression models revealed SAS and WF with SAF had the strongest predictive relationship (R^2 = 0.72, p < .001) and GRiPS had the weakest predictive ability on WF with jet fuel (R^2 = 0.39, p < .001), followed by SAF (R^2 = 0.44, p < .001).

Figure 1: Linear Regression of Willingness to Fly and Sustainable Attitudes

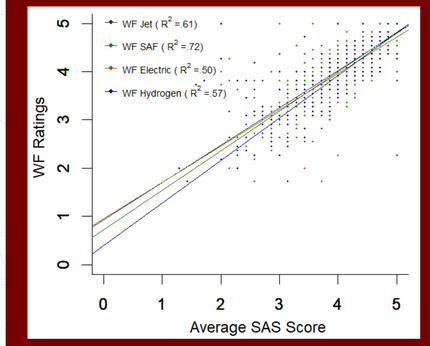

Figure 2: Linear Regression of Willingness to Fly and General Risk Propensity

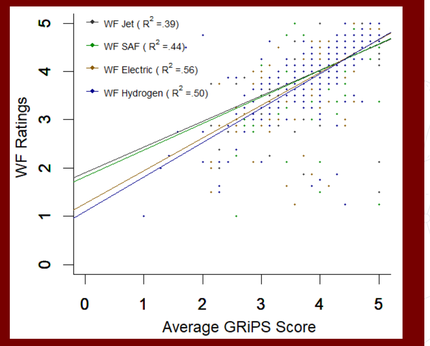

Table 2: Linear Regression and Correlations of WF Scenarios and Independent Variables

Sustainable Attitudes Scale (SAS) Linear Regression				
WF Scenario	Jet Fuel	SAF	Electric	Hydrogen
Estimated Slope (B)	0.77***	0.82***	0.75***	0.88***
R^2	.61***	.72***	.50***	.57***
Pearsons r	.78***	.85***	.71***	.75***
General Risk Propensity Scale (GRiPS) Linear Regression				
WF Scenario	Jet Fuel	SAF	Electric	Hydrogen
Estimated Slope (B)	0.53***	0.55***	0.68***	0.71***
R^2	.39***	.44***	.56***	.50***
Pearsons r	.63***	.66***	.75***	.71***

Note: ***p < .001 for all Table 2 Correlations

- A weak moderation effect was found (B = 0.09) between GRiPS and SAS on WF in electric aircraft (p = .03). No other moderation effects were detected.

DISCUSSION

A high positive correlation between sustainable attitudes and WF in SAF (r = 0.85, p<.001) was apparent, although a weaker relationship was found between sustainable attitudes and the other sustainable methods when compared to WF with jet fuel. Nonetheless, high overall WF scores are promising for industry stakeholders and the future of sustainable aviation.

GRiPS was not determined to be a strong predictor for WF, but significant positive relationships were demonstrated for all WF scenarios. Notably, GRiPS had a stronger relationship with acceptance towards sustainable fuel types compared to traditional jet fuel, indicating that passengers may perceive sustainable fuel types, electric (R^2 = .56), hydrogen (R^2 = .50), and SAF (R^2 = .44), as riskier, but are more willing to fly if they generally are inclined to take risks.

WF in electric aircraft had a stronger relationship with GRiPS (r = 0.75) than sustainable attitudes (r = 0.71) and was the only measured variable that may be predicted more accurately by GRiPS (R^2 = .56), than SAS (R^2 = .50). The weak moderation effect detected between SAS, GRiPS, and WF further exemplifies the complexities of passenger acceptance of electric aircraft, aligning with Winter et al. (2020) and Han et al. (2019), yet future research would be needed to reveal if perceptions of safety risk or environmental concerns influence passengers' intention to adopt.

FUTURE RESEARCH

Future research may involve a longitudinal study to measure how behavioral intention evolves as sustainable aviation technology becomes available in the commercial market. Similar studies can examine airline pilots' willingness to pilot (Rice et al., 2020) for the four scenarios. An experimental study may also be conducted to measure the influence of an educational intervention on WF in sustainable aircraft.

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