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Differences in Risk Perception Factors and Behaviours amongst and within Professionals and Trainees in the Aviation Engineering Domain

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Abstract: In the aviation sector, the variability in the appreciation of safety risk perception factors and responses to risk behaviours has not been sufficiently studied for engineers and technicians. Through a questionnaire survey, this study investigated differences amongst professionals and trainees across eleven risk perception factors and five indicative risk behaviour scenarios. The findings indicated significant differences between the two groups in four factors and three scenarios as well as within groups. Moreover, age, years of work and study and educational level were other factors accounting for such differences within each group of professionals and trainees. The results showing these significant differences are aligned with relevant research about pilots and indicate that the appreciation of risk perception factors by aviation engineers and the development of their risk behaviours deserves more attention. Our findings cannot be generalised due to the small sample and its distribution across the demographic variables. However, the results of this study suggest the need tailoring risk communication and training to address the different degrees to which influences of risk perception factors are comprehended, and risk behaviours emerge in aviation engineering trainees and professionals. Further research could focus on the development of a respective uniform framework and tool for the specific workforce group and could administer surveys to more extensive and more representative samples by including open-ended questions and broader social, organisational and systemic factors.

Keywords: risk perception factors; risk behaviours; aviation engineering; professionals; trainees

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1. Introduction

Risk is widely viewed as a product of exposure to hazard, the probability of hazard's manifestation and severity of its impact, and risk acceptance or rejection is linked to the respective anticipated benefits (e.g., [1]). According to Sjöberg et al. [2], risk perception is a subjective assessment of an action plan and encapsulates the probability of adverse outcomes and the awareness of the magnitude of their respective consequences. For example, there might be a case of an emergency aircraft turn-around under extreme heat to transport a patient. The exposure to extreme heat might lead to health implications and performance degradation of the technical team, but the duty to service the aircraft might be undertaken depending on the effects of a flight delay on the condition of the patient. Risk perception has been considered to mediate between locus of control and safety behaviours during operations [3]. Weber [4,5] suggested the psychological risk–return modelling which treats risk as diverse across individuals and a function of content and context: [Preference (X) = Expected Benefit(X) + Perceived Risk(X) + content/context)].

Risk perception is related to deviances from formal procedures when the latter are unclear or irrelevant to the context they target [6]. When formal policies fail to deliver the desired message or do not match the real-world conditions, employees will create agendas of their own. However, even under cases of disregarding established rules, risk perception still plays a role in the decision of workers to voluntarily report hazards and safety occurrences (e.g., [7]). The unclarity of rules does not mean that workers do not perceive and report conditions that can threaten safety. Moreover, due to effects of emotional and cognitive factors, risk perception is linked to the subjective "perceived dread" of an accident rather than "objective risk" [8]. According to Dobbie and Brown [9], the mixture of affective reactions and cognitive processes influencing risk perception involves consequential and ethical evaluations of risk associated with four emotional types: retrospective (i.e., regret) and prospective (i.e., fear) consequential emotions, and self-oriented (i.e., guilt) and externally-focused (i.e., anger) ethical emotions. This argument of Dobbie and Brown [9] underlines the importance of emotion types which determine the basis on which one prioritises risks and may lead to diverse risk perceptions.

In general, researchers view risk perception as a complex construct that regulates behaviour and is affected by cognitive processes (e.g., decision making), emotional attitudes (e.g., fear and guilt), and social projections (e.g., social trust) (e.g., [9,10]). Workers within an organisation may present differences in risk perception [11] which may prove inaccurate due to the desensitisation caused by prolonged exposure to high risks [11,12]. Other factors which contribute to diverse risk perceptions are age [13–15], personality type [16], knowledge or experience of past incidents/accidents and individual beliefs [17]. Additional contributing factors are the motivation level [17,18], the degree of subject knowledge [19,20], and the educational level [13,21].

Apart from factors related to individuals, risk perception has also been linked to the overall safety climate within the organisation and the available safety controls (e.g., personal protective equipment and training) [22]. The National Research Council [1] and Morrow [23] associated risk perception with safety culture and climate. The European Commercial Aviation Safety Team (ECAST) defined safety culture as the "set of enduring values and attitudes regarding safety issues, shared by every member of every level of an organisation. Safety culture refers to the extent to which every individual and every group of the organization is: aware of the risks and unknown hazards induced by its activities; continuously behaving so as to preserve and enhance safety; willing and able to adapt itself when facing safety issues; willing to communicate safety issues; and consistently evaluating safety-related behaviour" [24]. Furthermore, safety climate has been partially connected with occupational risk perception [25,26]. As Sjoberg et al. [2] and Pauley et al. [27] articulated, although risk perception acts unanimously no matter the context for an individual, social factors and ideologies may influence it.

Risk perception has been studied across various industry sectors and professional groups such as oil and gas industry where risk perceptions of experts and non-experts judged overall riskiness almost equally [28]. Research on high-risk industry sectors [29,30] suggested nine parameters at the level of individuals (i.e., excluding the effects of wider organisational and social factors) which are linked to risk perception. According to Slovic, Fischhoff and Lichtenstein [29], experts employ a greater ability to discriminate among the hazards. In addition, the higher the perceived risk of technology, the higher the risk-averse behaviour. Additionally, the results of Slovic, Fischhoff and Lichtenstein [29] showed that experts' judgements of risk factors differed systematically from those of non-experts. The parameters suggested by the particular authors as predictors of perceived and desired risk were voluntariness, controllability, dreadfulness, and lack of knowledge. According to Fischhoff, Hayakawa and Fischbech [30], additional risk perception factors were overconfidence, infliction of damages or injuries, responsibility undertaking and environmental conditions.

Another study by Thomson et al. [31], who investigated the risk perceptions of experts and novice helicopter pilots, suggested 15 factors linked to risk perception in the aviation context. Only five out of the 15 ratings of factors by novices were consistently higher than the ones of experts, suggesting that perceived risk declines with experience and that experts were better at identifying extremely low risks. Thomson et al. [31] also noted that apart from the probability estimation that affects risk perception, there were additional influential parameters such as the dreadfulness of the consequences. The particular authors found a positive association of experience with a set of five scenarios with risk-seeking and risk-aversive choices whereas age was not linked to the choices made across these scenarios. Thomson et al. [31] also revealed that increased experience guides to risk-seeking behaviour as it was shown through the positive correlation of an "index of risk-taking tendency-IRT" with flight hours for experts and novices. Moreover, Morrow [23], based on the work of Slovic, Fischhoff and Lichtenstein [29] and Fischhoff, Hayakawa and Fischbech [30], proposed a list of the effects of risk characteristics on risk perception. The parameters proposed by the studies mentioned above are summarised in Appendix A (Tables A1 and A2).

Professionals and trainees, which are the groups of interest for this study, view risks differently, and the judgements of the former group are more veridical than the ones of trainees [32]. As Wright, Pearman and Yardley [28] and Hobbs and Williamson [14] claimed, professionals possess a different prospect; when they define risks regarding consequences, they tend to give higher risk ratings. A setback is that professionals are not a homogeneous group, and they frequently disagree. On the other hand, they coincide when evaluating trainees, portraying the potential of events to cause widespread disastrous consequences, assessing risks affecting personal safety, deciding to accept or reject risks, and estimating the degree to which risks could be reduced [28]. In addition, professionals might view risks as less significant than trainees [28] and the former group recognises that feelings influence risk perception [33]. Wright, Pearman and Yardley [28] concluded that professionals conceive that risks are more familiar to those who are responsible for managing them and the particular group believes that risks are relatively controllable.

Contradictory to professionals, trainees view risks as higher compared to professionals [28,34], are influenced more by public opinion when they develop their risk perception [32], tend to have less real-world based judgements and evaluate circumstances in a more qualitative manner [28,34]. Older and more recent studies [34,35] showed that trainees obtain limited to complex, higher-order perceptual and cognitive skills required to interact safely with their occupational environment. The possible variations in risk perception amongst professionals and trainees are attributable to a different ecological orientation, dissimilar awareness of the consequences of specific actions, and unlike environmental obligations [9].

Most of risk perception studies in aviation discuss differences amongst flight crews and air traffic control staff. In addition to Thomson et al. [31] who studied differences in risk perceptions between expert and novice helicopter pilots as mentioned earlier, Hunter [7] studied risk perception and tolerance in general aviation pilots. He revealed that differences in personality traits had a lower effect on risk tolerance than differences in cognitive skills had on accurate risk perception. Pauley et al. [27] through a set of 36 written flight scenarios and an adverse weather flight simulation showed that risk is governed more by sensitivity to opportunities for gain than sensitivity to possible losses. The findings of the particular study highlighted that the higher the risk tolerance, the higher the possibilities of risk-taking, hence the former construct could function as a medium to predict potential accident involvement amongst general aviation pilots.

Hunter and Stewart [36] tested the transfer of general aviation pilots' scales to the military aviation context and through four scenario-based online surveys confirmed that all scales demonstrated adequate psychometric reliability and several of the sub-scales were significantly correlated with self-reported accident involvement. Drinkwater and Molesworth [10] sought to determine if risk perception, among other indicators, and personal traits could predict risk decision-making under uncertainty. The results showed that perception of imminent high risks and higher levels of self-confidence were related to risk-mitigating behaviours, while the higher the age, the higher the will of the subjects to engage in risk-seeking behaviours.

Research has shown that maintenance personnel in various fields possess common traits regarding risk perception [37]. Concerning the group of aviation engineers and technicians, the engineering community has expressed the necessity to handle low-frequency hazards with severely negative consequences [38]. According to Shyur [39], particular focus should be given to improper maintenance to prevent the initiation of chains of adverse events, and aviation maintenance error has been viewed as a significant and continuous threat to aviation safety [40]. Drury [41] argued that research in aviation maintenance has focused on a human-centred approach to design new systems and mitigate issues in current system designs, based on human reliability. As Johnson and Hackworth [42] communicated, although there are human factors programs since the 80s, such programs are not mandated universally, and those that exist are not standardised. However, a study on a sample of maintenance personnel coming from more than 50 countries and respective regulatory bodies showed that maintenance human factor programs facilitate safety and control of human error in maintenance [43]. The implication deriving from such approaches is that the human being is a potentially unreliable component of a system, whose underperformance leads to poor risk assessments [43].

Errors of perception are first of a set of six types of psychological errors related to maintenance are, in which one fails to detect an item he/she should have noticed [43]. What is more, risk perception is mainly managed from the aspect of the individual as part of the well-known SHELL model [44]. Literature regarding pro-active risk management methods (e.g., [45,46]) has focused mainly on error management, reporting systems, automation, effective training, and fatigue risk management through various risk assessment tools and techniques (e.g., [47]). Risk perception is related to time pressure and high workload in maintenance ground operations as well as inadequate training and management that in combination lead to misperceptions of actual risks [48,49]. For example, ramp events are increasing due to time pressure, traffic congestion, technology and change management, ineffective training and education of ground personnel, and human factors [49]. According to Sellers [50], technical training institutions cannot still influence human factors issues of maintenance personnel that drive the latter to errors of omission.

The literature cited above shows that although research and studies mention the effects of various factors affecting decision-making and the commission of errors regarding aviation engineers and technicians, it seems that there has been a lack of focus on the variability across risk perception factors and risk behaviour types. Taking into account this gap in the literature, this research was targeted to the specific workforce group, and through a questionnaire survey, we investigated whether professionals and trainees equally appreciate the effects of various risk perception factors mentioned in literature and whether they similarly choose to reject/accept risk in different contexts. Moreover, potential differences were evaluated against age, educational level and years of experience/study within each of the workforce groups.

2. Materials and Methods

An online, voluntary and anonymous questionnaire was used to collect data. The survey instrument was administered via e-mail to aviation engineers/technicians who were professionals or trainees. The participants working as maintenance personnel and engineers and being fully licenced according to the respective local or regional regulations were categorised as professionals. Our target group of professionals regarded personnel working either in line maintenance or for an Approved Maintenance Organization. This group of employees has completed on-job-training (OJT) and can perform their tasks without supervision. Trainees were the subjects who had not worked for the industry, and they were undergoing OJT or studying for at least one year at an aviation engineering institution (e.g., college, academy, or approved training organisation). Thus, professionals attending development courses and undergoing conversion or refresh training were not included in the group of trainees. It is also clarified that, due to the exploratory nature of the study, which to the best of the knowledge of the authors was the first of its kind, we followed the strategy of Hackworth et al. [43] and did not aim at a specific region. Therefore, we did not administer the questionnaire to populations under specific regulatory oversight.

The survey tool was developed in two phases. First, an initial questionnaire was composed and aimed at eleven risk perception factors listed below:

1. centrality of the incident for safety;
2. controllability the user has over the situation;
3. importance of team coordination;
4. familiarity with the incident;
5. effects of stress;
6. effects of fatigue;
7. level of confidence in own abilities;
8. effects of the night shift;
9. effects of technological complexity;
10. consequences on humans (i.e., injuries); and
11. material consequences (i.e., damages).

These factors were based on the literature mentioned in Section 1 above [21,29,31]. The mentioned literature was used due to its specific focus on risk perception factors in aviation employees. Additionally, the selection and formulation of the particular factors along with the respective items of the questionnaire were made in consultation with twelve subject matter experts (SMEs). This approach is in line with the suggestions of Bolger and Wright [51] and was employed to ensure relativeness of the survey topics with the context of the target population. The SMEs had on average more than 30 years of experience, including managerial and training duties.

The first version of the questionnaire was sent to SMEs to ensure relevance to the language and terms used in the industry and achieve its face validity. According to the comments received by the experts, some statements were adjusted to avoid biases towards answers or because the terminology used was not suitable for the target research population. The final version of the questionnaire included two main parts and an introductory text explaining the aim of the study, the target group of the survey and the protection of the participants' identity. The main parts referred to scenarios used in training briefings and every-day practice as a means to present risk domains and response modes familiar to the subjects, as proposed by Rowe and Wright [32] and increase veracity of the answers. The first part of the instrument regarded demographic data (i.e., age, years of experience/study, educational level, and job status), and included a description of possible incidents each of which the participants would rate across the eleven risk characteristics/sub-categories mentioned above by using a 7-point Likert scale with labelled points. To avoid respondent fatigue [52,53], eight simply formulated incidents were used as follows:

1. Temporary transmission system failures during a leak check.
2. Temporary blinking instruments during a pre-flight inspection.
3. Slight oscillation of engine power right after starting the engines.
4. Recoverable braking system failures while parking the aircraft.
5. Short distraction while working on a shaft under the aircraft.
6. Minor hydraulic leakage during turnaround under high time pressure.
7. Temporary high engine temperature indications during engine tests.
8. Minor fuel leakage from the bowser during a delayed turnaround.

The selection of 5-point and 7-point Likert scales is an on-going debate. Studies comparing 5-point and 7-point scales showed that the latter superseded the former in accuracy and respondent feedback [54,55]. Specifically, 7-point scales seemed more sensitive to capturing veridical evaluations of participants, better suited for electronically collected data, less vulnerable to interpolation without jeopardising accuracy, and better in obtaining higher variation in responses. On the other hand, there are claims that 5-point scales are more effective than 7-point scales because they yield better data quality on larger samples [56]. We preferred a 7-point scale over a 5-point one because we could not predict the sample size and we aimed at a wider distribution of answers [57]. In addition, we minimized the arbitrary interpretation of the scale points by labelling them: the lowest scale point

"1" corresponded to the choice "Not important/Not at all controllable/Not at all likely/Not at all Familiar" and the highest scale point "7" corresponded to the answer "Extremely important/Extremely controllable/Extremely likely/Extremely Familiar", as applicable per question.

Through the design explained above, the appreciation of the particular risk perception factors could be assessed [58] and differences within and between groups could be estimated [29]. Table 1 presents the risk factors and the corresponding questions addressed to the subjects for each of the incidents.

Table 1. Questions Corresponding to the Eleven Risk Perception Factors.

Risk Factors	Shortcode	Question
Centrality of the incident for safety	Centrality	To what extent is the incident essential for flight safety?
Controllability the user has over the situation	Controllability	How much control does an engineer/technician have over such an incident?
Importance of team coordination	Team coordination	To what extent is team coordination likely to affect the confrontation with such an incident?
Familiarity with the incident	Familiarity	To what extent are engineers familiar with this kind of incident?
Effect of stress	Stress	To what extent is stress likely to affect the engineer/technician in dealing with such an incident?
Effects of fatigue	Fatigue	To what extent is fatigue likely to affect the engineer/technician in dealing with such an incident?
Level of confidence in own abilities	Self-confidence	To what extent is the level of self-confidence likely to affect the decision about the incident in question?
Effects of night shift	Night shift	To what extent is working at night likely to affect decision making about such an incident?
Effects of technological complexity	Technology	To what extent is the complexity of technology used in aircraft essential for dealing with such an incident?
Consequences on humans	Injuries	How likely is that such an incident would cause injuries?
Material consequences	Damages	How likely is that such an incident would cause equipment/property damage?

In the second part of the questionnaire, each participant was prompted to choose a probable course of action that he/she would follow regarding five scenarios. The scenarios were based on the concept of Line Oriented Flight Training (LOFT) [59] and on the premise that a "low-risk aversion or a low perception of risk can drive risky behavior" [60]. The scenario-based training method is common in the aviation context [61], and LOFT constitutes a type of scenario-based training method [62]. Scenarios are connected to risk perception because they reflect the estimation of the quality of risk and offer a chance for its manipulation [63]. It is clarified that in our study we did not aim at connecting risk perception factors with behaviours but to examine them separately.

An adapted version of the part of the questionnaire that included the five scenarios is shown in Appendix B. Each of these scenarios reflected social constructs that may interact with risk perception since knowledge may be arbitrary and a matter of social construction and risk perception reflects various thoughts, beliefs and constructs [64,65]. Scenario 1 regarded the construct of trust to the capabilities and expertise of others; trust is a key aspect of amplification and attenuation efforts [23]. Scenario 2 was linked to the construct of self-sacrifice and ignorance of self-interest based on the premise that individuals tend to ignore self-interest and they put themselves at risk even when their commitments are at stake [66]; commitment is highly influential on decision-making [67]. Scenario 3 examined the preference to compliance with procedures over the breach of the latter when the stakes are high [6,27]. Scenario 4 regarded the stance of responsibility undertaking when one has committed a mistake/error [11,68]. Scenario 5 targeted to the prioritisation of safety over other task objectives [69].

A pilot test was conducted to test the reliability of the survey instrument. Due to limited access to subjects, the pilot tool was administered only to eight professionals and six trainees. Taking into account that the reliability test for an eleven variables survey requires 110 responses (e.g., [70–72]), we presumed that the fourteen participants by the eight incidents the risk perception factors were assessed (i.e., 14 × 8 = 112 subjects) would satisfy adequately the required condition adequately. The pilot test resulted in a Cronbach's alpha a = 0.913 across all risk factors and the post hoc Cronbach's alpha for the whole sample was calculated to a = 0.818. Taking into account the literature suggesting that the specific reliability scores are satisfactory [73,74] and that the reliability scores for the studies of Hunter [7,75], whose work we adapted, were 0.937 and 0.810 correspondingly, we believe that the reliability of the particular part of the questionnaire was adequate.

Regarding the scenarios, a reliability test was not applicable because they represented different cases that were not linked to a single construct. In addition, as part of the pilot study, we performed correlations per participant for all eleven questions across the eight incidents. We found significant correlations only partially between the incidents, and the correlated pairs of incidents differed per participant. These correlations indicated that the employment in the study of various incidents which represented different contexts led to more representative measurements of the risk perception factors. The average time spent by the pilot study participants to complete the survey was 20 min.

To collect data, we used a snowball sampling strategy because there was no definitive list available to form a sampling frame. The specific research was executed as part of an MSc course, and at the time of the study there was no contact list immediately available at any accessible directory of the university. Therefore, taking also into account time limitations and that this was a first exploratory study on the particular topic, no specific organisation or region were targeted. Although possible samples from the same organisation could have increased the likelihood of correlated answers in both parts of the questionnaire, taking into account the snowball sampling strategy and the diversity of contacts the invitation emails were sent, we assume that the observations were independent. Considering that the sample size in the similar study of Thomson et al. [31] was $N = 64$, the minimum accepted sample size for the current study was set to $N = 50$.

Based on an expected response rate of 30%, 167 emails were sent out with the web link directing to the online questionnaire. In total 70 questionnaires were returned, but the authors cannot estimate the actual response rate because they had no information about the number of respondents who accessed the respective link and/or read the invitation emails. All questionnaires returned were complete and included in the data analysis. Table 2 reports the sample size along with the grouping of demographic data which were used as independent variables. The particular grouping was decided to achieve almost equal sizes where possible and allow the execution of statistics without validating their assumptions related to the distribution of the sample. The age and education level of trainees fell only in one category, and the spread of trainees' age data was not sufficient to perform their clustering into groups; hence, no statistics were performed within trainees regarding the particular variables.

The data were processed with the SPSS 22 software [76]. To gain an overall picture, the medians per risk perception factor were calculated for each group of participants across the eight incidents, and Friedman tests were used to evaluate significant differences amongst the eleven risk perception factors. Then, we calculated per participant the medians of each risk perception factor across the eight incidents; these scores comprised the dependent variables for the statistical tests. Mann-Whitney tests were conducted to evaluate significant differences in the medians between professionals and trainees and between the age, years of experience and educational level variables for professionals. Kruskal-Wallis tests were performed to evaluate significant differences in risk perception factors among completed years of studies of trainees. To examine any differences between specific pairs of risk perception factors within each of the professionals' and trainees' groups, we performed pair comparisons with the Wilcoxon test.

Table 2. Research Sample.

Group of Independent Variables	Values	Sample Size (*N*)	Percentage (%)
Job status	**Professional**	35	50.0
	Trainee	35	50.0
Age professionals	<36	18	51.4
	≥36	17	48.6
Age trainees	<36	35	100
Working experience of professionals (years)	≤10	17	48.6
	≥11	18	51.4
Completes years of studies of trainees (years)	1	8	22.9
	2–4	23	65.7
	4–5	4	11.4
Educational level (Professionals)	≤Graduate	13	37.1
	≥Post-Graduate	22	62.9
Educational level (Trainees)	≤Graduate	35	100

Regarding the second part of the questionnaire, Chi-square tests were conducted to evaluate significant differences between professionals and trainees as well as regarding differences across the independent variables per group. When the assumptions of Chi-square tests data were not met due to the distribution of the sample, we consulted the results of the Fisher's exact tests [77,78]. The execution of non-parametric statistics was chosen due to the collection of ordinal and nominal data [79,80]. The level of statistical significance was set at $p < 0.05$ for all tests.

3. Results

Overall, Friedman tests showed that the eleven risk perception factors were rated differently within both groups of professionals ($N = 35$, $\chi^2 = 47.750$, DF = 10, $p = 0.000$) and trainees ($N = 35$, $\chi^2 = 157.251$, DF = 10, $p = 0.000$). Table 3 depicts the results regarding the differences between professionals and trainees. Professionals were significantly more appreciative than trainees in the risk factors of Familiarity, Fatigue, Self-confidence, and Injuries. In addition, professionals were significantly more risk-averse than trainees in three out of the five scenarios where professionals appeared more ignorant of self-interest, keener on adhering to procedures and more eager to undertake responsibilities.

Tables A3 and A4 in Appendix C depict the results for the rest of the demographic variables. Regarding the professionals' age groups, the fatigue factor medians were significantly higher for group "≥36", and no significant differences emerged from the scenarios. Concerning the years of professional experience, the group "≥11 years" was noted as the most appreciative of the controllability factor and the most risk-averse for Scenario 4 (i.e., responsibility undertaking). Concerning the academic level, no significant differences were revealed in the eleven risk factors, and the "≤Graduate" group was significantly more risk-averse for Scenario 1 (i.e., trust). When considering the differences among the groups of years of studies for trainees, it was indicated that the fewer the years, the higher the rating of the Night Shift factor. No significant differences across the years of study groups were noted for the five scenarios.

Table A5 in Appendix C depicts the differences of risk perception factors within the professionals' group. The results showed that the Technology factor was appreciated less than Centrality, Controllability, Team coordination and Familiarity. In addition, the Injuries factor scored lower than the rest of the factors apart from Technology and Damages. In Table A6 (Appendix C), where the differences in risk perception factors within the Trainees group are presented, the results revealed several differences in the rating across the factors, without though showing any consistent pattern or concentration of the significant differences around specific risk perception factors.

Table 3. Differences between Professionals and Trainees.

Risk Perception Factors	Medians (across All Participants and Incidents)		Mann-Whitney Test Results (significant results in bold)
	Professionals	Trainees	
Centrality	5	5.5	$p = 0.262$
Controllability	5.5	6	$p = 0.156$
Team coordination	5	5	$p = 0.624$
Familiarity	5.5	3.5	**$p = 0.000$**
Stress	5	5	$p = 0.342$
Fatigue	5	3	**$p = 0.000$**
Self-confidence	5	3.5	**$p = 0.000$**
Night Shift	5.5	5	$p = 0.578$
Technology	3.5	3	$p = 0.286$
Injuries	3.5	2	**$p = 0.027$**
Damages	4.5	5	$p = 0.530$
Scenarios	**Percentage for Choice B–Risk Aversion**		**Chi-Square Test Results (significant results in bold)**
	Professionals	**Trainees**	
Scenario 1 *(trust)*	51.4%	40%	$p = 0.337$
Scenario 2 *(ignorance of self-interest)*	54.3%	28.6%	**$p = 0.029$**
Scenario 3 *(compliance with procedures)*	80%	37.1%	**$p = 0.000$**
Scenario 4 *(responsibility undertaking)*	88.6%	42.9%	**$p = 0.000$**
Scenario 5 *(prioritisation of safety)*	62.9%	52.9%	$p = 0.094$

4. Discussion

In general, the findings of this research suggested that there are significant differences among professionals and trainees, but these were not evident across all risk perception factors and behaviours included in this study. Notably, the minimum scores assigned by professionals to all risk factors were at the median of the measurement scale (3.5), whereas trainees rated three out of the eleven factors (i.e., Fatigue, Technology and Injuries), with values lower than the scale's median. The overall results as well as the statistically significant differences found in four out of the eleven risk factors seem contrary to the results of Thomson et al. [31] and Hunter [7] who, based on a probability estimation of risks, found that experts' risk perceptions in overall were lower than those of novices. This contrast can be explained from the fact that in our study we did not include wider environmental, organisational and social factors that can directly affect risk perception or moderate the perception of the parameters studied in the current research. However, based on our findings above, it can be claimed that a mere measurement of risk perceptions might mask important information that a more in-depth examination of different influential parameters can reveal. Thus, although the rating of some of the risk factors employed in this research might be statistically higher in professionals than trainees, the opposite can happen for other factors, leading to counteracting and combined effects that shape final risk perception levels.

Professionals rated the risk of reoccurrences (i.e., Familiarity factor) and the Fatigue factor higher than trainees. These differences might be attributed to the minimal exposure of the latter group to real-world conditions during their training. Moreover, the lack of working experience of trainees might also be a valid explanation about the higher scores professionals attributed to the effects of self-confidence and the probability of adverse implications on people. According to Von der Heyde [17], trainees are in the phase of developing their knowledge and experience while they might underestimate some of the factors related to incidents and accidents.

Regarding age, the higher perception of older professionals regarding the fatigue risk factor might be attributed to the effect of prolonged personal fatigue due to a decrease of mental and physical capacity over time [81,82]. Concerning the years of job experience, the fact that the group of professional participants with more working experience assigned higher scores to the controllability factor confirms that the degree of subject knowledge [19,20] and knowledge or experience of past incidents/accidents [17] might lead to such differences. This finding seems contrary to the literature suggesting that risk perception might be falsified due to desensitisation resulting from prolonged exposure to hazards in the working environment [11,12]. Thus, although higher experience, built-in corporate knowledge and in-depth knowledge about existing controls may predispose professionals to assume control, invulnerability and high compensatory skills, the particular group might have interfaced with reoccurring safety events that provided learning experiences when hazards were not managed timely or effectively.

The results regarding Scenario 4 (i.e., responsibility undertaking) showed that more experienced professionals seemed more risk-averse, which can be attributed to their increased exposure to teamwork that develops values that are oriented to the benefit of others, creates a sense of responsibility, and fosters an ethos of mutual support [83]. In addition, it is expected that professionals with more working experience have undertaken supervisory and managerial roles that are typically followed by a sense of accountability [84,85]. Concerning the educational level, professionals holding a bachelor's degree or lower qualification were more risk averse at Scenario 1 (i.e., trust on others). Trust is earned through exhibitions of competence and character [86]. Based on that premise, respondents holding a post-graduate degree may have developed a questioning and demanding attitude, this possibly leading to a decreased trust in others' judgements. However, individuals with higher education attainment show higher levels of generalised trust due to residual effects of personality traits and non-cognitive skills [87]. Therefore, our interpretation of the particular finding is that professionals with higher education qualifications might not trust everyone in a working environment that dictates high responsibilities and accountabilities but they might confide in colleagues who exhibit similar competencies.

Regarding the years of study, interestingly the group with "1 year of study" appeared as the most appreciative of the effects of the night shift, whereas the participants belonging in the group "4–5 years of study" were the least perceptive of the same factor. Although researchers are not knowledgeable about the training and educational programmes followed by the participants, the specific difference might be attributed to the point that, typically, fatigue is discussed as a risk factor early in the studies when general physiological and psychological aspects of human performance are addressed. The lack of working experience during the studies might contribute over time to a lower appreciation of fatigue as an adverse factor.

The results regarding the differences across all risk perception factors within each group of professionals and trainees were also stimulating. Concerning the professionals, the Injuries factor was underrated against the rest of the factors. Our interpretation of this attitude is two-fold: (a) the heuristic of "small numbers" [88]; and (b) safety illiteracy. Specifically, an expert motivated from a belief of "small numbers" built with experience may fall victim to complacency regarding the actual possibility that his/her decisions will result in injuries. For example, according to To70's Civil Aviation Safety Review [89], the year 2017 was recorded as the safest one since 2010. However, as it is highlighted in the particular review "With so few fatal accidents to examine, it is worth remembering that there were also several quite serious non-fatal accidents in 2017". Nevertheless, we are not in a position to argue if our sample has attributed injuries of any level with the probability of fatality since this was out of the scope of this study. Regarding safety literacy, the abundance and plethora of safety information and safety policies may be challenging to comprehend even for a professional recognised as an "expert" [90]. Hence, safety illiteracy can be attributed to the ineffective conveyance of information related to communication and management of risks within an organisation.

In addition, in the professionals' group, the technological complexity was underperceived in comparison with centrality, controllability, team coordination, and familiarity. In addition to the explanations above about the group in the higher age cluster, a probable explanation of this finding could be the fact that automation has been found partially improving team coordination and performance [91–93], thus technology possibly seen as a positive element and less as a risk factor. Moreover, the indication that professionals are more perceptive to the influence of "familiarity" potentially indicates that they possess a level of awareness in the context of out-of-the-loop unfamiliarity problem [94] that might render them less capable of handling risks when automation fails. This indication could also explain the increased perception of professionals regarding centrality and controllability.

Concerning the trainees, there was a high inconsistency among the risk perception factors. However, taking into account the main objective of this research to compare appreciations of factors between professionals and trainees, we focused on the factors of injuries and technological complexity discussed above for the group of professionals. The "injuries" factor was consistently underscored in comparison with eight out of the eleven factors, while technological complexity was underrated compared to five out of the eleven factors. Our interpretation for the "injuries" factor relies on the common bias among young adults of invincibility which may lead to the perception that the consequences of risky behaviour will not occur to them [95], and the "bubble of overconfidence" effect [96]. As Sanchez and Dunning [96] indicated more precisely, this situation could be described as the Dunning–Kruger effect where individuals lack the insight to recognise their shortcomings. Regarding technological complexity, we believe that familiarity and trust of new generations on technology could be a plausible explanation of the corresponding finding. Younger engineers have been exposed to modern technology as early as during their elementary education in some cases. As such, younger engineers rely more on modern technology and possess a positive attitude towards it [97,98].

Regarding the scenarios, professionals chose the risk-averse option more frequently than trainees across all cases, three of which were found significantly different. When examining the frequencies per group, it seems that the views of professionals were almost evenly distributed regarding Scenario 1 (i.e., trust on others) and Scenario 2 (i.e., ignorance of self-interest), and the same group was considerably risk adverse for Scenario 3 (i.e., compliance with procedures) and Scenario 4 (i.e., responsibility undertaking). On the other hand, the choices of trainees were almost evenly distributed only in Scenario 5 (i.e., prioritisation of safety), whereas the risk-averse options regarding the rest of the scenarios were selected by less than half of the participants of the specific group. The differences within groups across the five scenarios included in this study confirm Wright, Pearman and Yardley [28] and Rowe and Wright [32] who found that experts and non-expert groups are not homogeneous. Although the behaviours examined through the five scenarios are not inclusive of the whole list of risky behaviours, we believe that the particular findings are interesting and worth to consider.

The differences between professionals and trainees regarding Scenarios 2–4 indicate thought-provoking implications. These differences can be explained from the fact that professionals have a broader horizon during their decision-making, accounting not only for the probable short-term harm but also for the long-term [99]. Professionals due to possibly additional managerial experience are also able to plan at a strategic level and demonstrate a proactive behaviour [99]. Furthermore, professionals might have acquired the capacity to handle safety priority conflicts and discrepancies between organisational and personals goals [100]. In addition, working experience might lead to the development of a positive attitude towards compliance due to the involvement in audits, safety events attributed to the breaching of rules and much more valued experience. It is typical for trainees and students to attribute successes or failures to luck or task difficulty (e.g., [101]) whereas professionals comprehend more the concept of risk management and appear more risk averse [102]. Additionally, professionals may conform with safety rules or even internalise them over years of employment [103], leading to a gradual replacement of their self-interest by a priority to the interests of their teams and organisations [104,105].

5. Conclusions

This research examined differences in risk perception factors and behaviours among professionals and trainees in the aviation maintenance/engineering sector. Whereas most risk studies in aviation focus on differences within flight crews and air traffic control staff, this paper offers insights into an under-researched workforce group within engineering. Overall, the results suggested that professionals and trainees presented statistically significant differences in four out of the eleven risk perception factors and three out of the five risk behaviours examined by the authors. The findings were mostly in congruence with past research regarding other groups of end-users in the aviation sector but with a few exceptions. Although older studies claimed an overall difference in risk perceptions between experts and novices, in our research such differences were found only in particular risk perception factors.

Although this research was exploratory as a means to examine potential differences and did not aim at collecting explanations of the results, our interpretation of the findings converged on the effects of the accumulation of working experience over time and the effectiveness of initial, recurrent and professional training, especially regarding adaptability, flexibility and literacy. Risk perception factors might be influenced by the lack of progressive adaptability to new working requirements which are naturally dynamic. This potential lack indicates the need to adjust training to enable aviation engineers to develop and maintain appreciations of risk perception factors according to the context of their duties. To realise individual initiatives, we suggest establishing and enhancing the effectiveness of risk related training by customising it through context-tailored coaching (e.g., [106]) and utilisation of augmented/virtual reality technologies [107]. Within an effective Safety Management System, competency training through methods such as Hands-On and Virtual Reality simulations can be tailored to the nature of tasks and associated hazards [108,109].

In addition, training could be provided to professionals and trainees separately regarding risk perception factors and could be offered commonly for risk behaviours. Engineering and maintenance teams are often composed of trainees and professionals with diverse working experience. Hence, a standard approach to hazardous conditions could minimise possible conflicts amongst team members and would boost effective risk communication. Concerning the professionals, our results indicated that training could focus on enhancing cognitive adaptability to hazardous situations associated with new technologies, night shift effects, influences of stress, team coordination challenges, and building of self-management skills. Regarding trainees, education and training could emphasise on increasing familiarity with more or less probable hazards and risks, understanding and experience the effects of fatigue, and managing self-confidence.

Moreover, training could be enriched with scenarios similar to Scenario 2 (i.e., ignorance of self-interest), Scenario 3 (i.e., preference of compliance with procedures over the breach of the latter when the stakes are high) and Scenario 4 (i.e., the stance of responsibility undertaking when one has committed a mistake/error) tested in this research and found significantly different between professionals and trainees. Under the proposed approach, on the one hand, aviation engineering professionals and trainees would become gradually able to appreciate the effects of risk perception factors in correspondence with their status. On the other hand, the effectiveness of risk perception training could be assessed through real-world and context-specific scenarios (e.g., case studies, serious games combining frequently experienced conditions with improbable but yet possible adverse situations).

Although this research employed a valid context-tailored tool, the small sample size employed does not allow the generalisation of the findings. Therefore, the results are indicative and limited to the survey participants. In addition, the interpretation of the results was performed against the literature reviewed and not according to the perspectives of the participants. However, to the knowledge of the authors, this study was the first to explore possible differences in the appreciation of risk perception factors and risk behaviours among professionals and trainees in the aviation maintenance/engineering sector. In addition, determining actual risk and indicating its gap from perceptual risk was not feasible in the context of this study because we did not measure risk perception. Such an approach would, for example, necessitate an observational study with standard participants and a validated risk perception measurement instrument, meaning a completely different research design and scope. We envisage that this study could function as a trigger to develop a uniform framework and tool for assessing risk perceptions and behaviours along with associated factors for the specific workforce group by considering the suggestions stated above.

For future research, similar studies could be executed with additional groupings of the aviation maintenance population (e.g., airframe vs. electrical/avionics specialties) and probably include additional social, organisational and systemic factors (e.g., national and organisational culture, leadership, oversight, management structure and type, and task complexity). Another possibility worth examining is the level of risk tolerance level of on-the-job trainees due to the security feeling that can stem from their "protection" when working with experienced professionals. In addition, research is suggested to be conducted with larger samples by including open-ended questions to allow participants to state reasons for their choices. Moreover, the assessment of variations in the appreciation of particular risk factors could be considered as supplementary to the evaluations of overall risk perceptions performed within and outside the aviation sector with the scope to examine the necessity for adjustments to existing risk training and communication programmes.

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Appendix A

Table A1. Risk perception factors.

Risk Assessment Experts [29]	Drivers [30]	Helicopter Pilots [31]	Coastal Services [23]
Voluntariness of risk	Dread	centrality of event to flight safety	voluntariness of risk
Immediacy of effect	Unknown risk	controllability over an incident	immediacy of effect
Knowledge about risk	Novelty	severity of consequences to self	knowledge about the risk
Control over risk	Understood by science	severity of consequences to property	knowledge about the risk in science
Newness	Overconfidence	quality of general training	control over risk
Chronic-catastrophic	Catastrophic to environment	adequacy of training for dealing with incidents	degree of familiarity
Common-dread	Accountability	altitude margins	risk exposure
Severity of consequences	Monetary loss	crew coordination during an incident	common dread
Exposure	Caused damages/injuries	personal experience with incidents	severity of consequences
Observability		stress levels	
		fatigue	
		overconfidence about the result	
		maintenance of the result	
		night operations	
		behaviour of technology	

Table A2. Effects of risk perception factors on risk perception (adapted from [23]).

Effects of Risk Perception Factors on Risk Perception	
Higher Acceptance of Risk	**Lower Acceptance of Risk**
Voluntary	Coerced or imposed
Has clear benefits to individual	Has little or no benefit
Under the individual's control	Controlled by others
Fairly distributed	Unfairly distributed
Open, transparent, and responsive risk management process	Secretive, unresponsive process
Natural hazard	Manmade or technological hazard
Statistical and diffused over time and space	Catastrophic
Message generated by trustworthy, honest, and concerned risk managers	Message generated by untrustworthy, dishonest, or unconcerned managers
Affects adults only	Affects children
Familiar	Unfamiliar or exotic

Appendix B

Scenarios (Second Part of Questionnaire)

Please consider each of the following scenarios and select the action alternative (a or b) that best describes your probable reaction in such circumstances.

<u>Scenario 1</u>

You are handling a 2000lt mini-bowser carrying aviation fuel during a turnaround. The pump was essentially designed for water but the engineering department approved its installation. What would be your probable action?

a. I use it to finish my tasks ASAP, and I will inspect the pump later for any issues. I trust the judgment of the engineering department.
b. I ask for another bowser, even if the turnaround will be delayed. The engineering department could have underestimated the dangers in such situation.

<u>Scenario 2</u>

The condition of runway/taxiway markings and lights, lack of vertical signage and frequent failures of the ground radar affect the ground operation at the airport. You are charged to replace some of the lights during the night because further flights are expected to operate. What would be your probable action?

a. I am heading to replace the lights even if I do not have the whole set of personal protective equipment foreseen. The runway is dangerous for landing.
b. I postpone the task for the next morning and inform the control tower. I do not have a flashlight, and it is dangerous for me.

<u>Scenario 3</u>

You are checking hydraulics during a Cessna-172's turnaround which has to depart ASAP to transfer a sick child in critical condition but stable. You notice some suction screens plugged from degradation deposits. What would be your probable action?

a. I replace the suction screens and run the minimum checks. The patient is in critical condition, and there is no warranty that will remain stable.
b. I replace the suction screens, replace the fluid, check for supplementary contamination sources, and test the engine. The patient is stable and delaying the flight will not have detrimental effects.

<u>Scenario 4</u>

Just before you deliver an aircraft after its post-flight maintenance, you notice that you are missing a tool. What would be your first probable action?

a. I won't tell anyone. I will try to find it myself.
b. I will immediately ask for help from a colleague.

<u>Scenario 5</u>

You have just completed a two days' maintenance with limited resources, limited help and you miss home and your new-born baby. You need to drive 35 Km to return home, but meteorological conditions are already heavily adverse. There must be little traffic, and the road is quite safe. What would be your probable action?

a. I would drive carefully and get home. The family is above all.
b. I would get some sleep at work and wait for better weather conditions

Appendix C

Table A3. Within groups differences—risk perception factors (significant results in bold).

Risk Perception Factors	Age Groups (Professionals)			"Years of Experience" Groups (Professionals)			Academic Level Groups (Professionals)			"Years of Study" Groups (Trainees)		
	Mann-Whitney Test Results	Ranks		Mann-Whitney Test Results	Ranks		Mann-Whitney Test Results	Ranks		Kruskal-Wallis Test Results	Ranks	
		Highest	Lowest		Highest	Lowest		Highest	Lowest		Highest	Lowest
Centrality	$p = 0.628$	<36(18.81)	≥36(17.15)	$p = 0.751$	≥11(18.53)	≤10(17.44)	$p = 0.743$	G*(18.73)	PG**(17.57)	$p = 0.326$	2–4(19.65)	1(13.63)
Controllability	$p = 0.256$	≥36(20.00)	<36(16.11)	**$p = 0.022$**	**≥11(21.81)**	**≤10(13.97)**	$p = 0.397$	G(19.88)	PG(16.89)	$p = 0.490$	2–4(19.39)	1(13.63)
Team coordination	$p = 0.782$	<36(18.47)	≥36(17.50)	$p = 0.868$	≥11(18.28)	≤10(17.71)	$p = 0.491$	PG(18.91)	G(16.46)	$p = 0.941$	1(19.06)	2–4(17.61)
Familiarity	$p = 0.358$	≥36(19.62)	<36(16.47)	$p = 0.146$	≥11(20.42)	≤10(15.44)	$p = 0.592$	PG(18.7)	G(16.81)	$p = 0.169$	2–4(19.83)	4–5(9.63)
Stress	$p = 0.677$	≥36(18.74)	<36(17.31)	$p = 0.652$	≤10(18.79)	≥11(17.25)	$p = 0.317$	G(20.23)	PG(16.68)	$p = 0.120$	4–5(25.00)	1(12.69)
Fatigue	**$p = 0.049$**	**≥36(21.50)**	**<36(14.69)**	$p = 0.158$	≥11(20.36))	≤10(15.50)	$p = 0.210$	PG(19.66)	G(15.19)	$p = 0.111$	2–4(19.80)	4–5(8.38)
Self-confidence	$p = 0.485$	≥36(19.24)	<36(16.83)	$p = 0.218$	≥11(20.06)	≤10(15.82)	$p = 0.986$	G(18.04)	PG(17.98)	$p = 0.129$	1(20.31)	4–5(8.50)
Night Shift	$p = 0.689$	<36(18.67)	≥36(17.29)	$p = 0.244$	≤10(20.06)	≥11(16.06)	$p = 0.570$	PG(18.75)	G(16.73)	**$p = 0.046$**	**1(22.31)**	**4–5(7.00)**
Technology	$p = 0.517$	<36(19.08)	≥36(16.85)	$p = 0.921$	≤10(18.18)	≥11(17.83)	$P = 1.000$	G(18.00)	PG(18.00)	$p = 0.231$	2–4(19.13)	4–5(9.88)
Injuries	$p = 0.528$	≥36(19.12)	<36(16.94)	$p = 0.715$	≥11(18.61)	≤10(17.35)	$p = 0.135$	PG(19.98)	G(14.65)	$p = 0.224$	2–4(19.28)	4–5(9.88)
Damages	$p = 0.715$	<36(18.61)	≥36(17.35)	$p = 0.426$	≥11(19.33)	≤10(16.59)	$p = 0.824$	PG(18.30)	G(17.50)	$p = 0.317$	4–5(22.00)	1(13.63)

* G: ≤Graduate, ** PG: ≥ Post-Graduate.

Table A4. Within groups differences—risk behaviours (significant results in bold).

Scenarios*	Age Groups (Professionals)			"Years of Experience" Groups (Professionals)			Academic Level Groups (Professionals)			"Years of Study" Groups (Trainees)		
	Chi-Square Test Results	Percentages		Chi-Square Test Results	Percentages		Chi-Square Test Results	Percentages		Chi-Square Test Results	Percentages	
		Highest	Lowest		Highest	Lowest		Highest	Lowest		Highest	Lowest
Scenario 1	$p = 0.395$	≥36(58.8%)	<36(44.4%)	$p = 0.238$	≥11(61.1%)	≤10(41.2%)	**$p = 0.049$**	**G**(76.9%)**	**PG***(36.4%)**	$p = 0.907$	4–5(50.0%)	1(37.5%)
Scenario 2	$p = 0.227$	<36(55.6%)	≥36(52.9%)	$p = 0.877$	≥11(55.6%)	≤10(52.9%)	$p = 0.508$	G(61.5%)	PG(50.0%)	$p = 0.176$	1(50.0%)	4–5(0.0%)
Scenario 3	$p = 0.402$	≥36(88.2%)	<36(72.2%)	$p = 0.228$	≥11(88.9%)	≤10(70.6%)	$p = 0.220$	G(92.3%)	PG(72.7%)	$p = 0.235$	1(62.5%)	4–5(25.0%)
Scenario 4	$p = 0.104$	≥36(100%)	<36(77.8%)	**$p = 0.045$**	**≥11(100%)**	**≤10(76.5%)**	$p = 0.618$	PG(90.9%)	G(84.6%)	$p = 0.142$	2–4(52.2%)	4–5(0.0%)
Scenario 5	$p = 0.02$	≥36(82.4%)	<36(44.4%)	$p = 0.631$	≥11(66.7%)	≤10(58.8%)	$p = 1.000$	PG(63.6%)	G(61.5%)	$p = 0.708$	1(50.0%)	4–5(25.0%)

* The values for all variables refer to the risk advert choice B of the scenarios, ** G: ≤ Graduate, *** PG: ≥ Post-Graduate.

Table A5. Differences in risk perception factors within professionals.

	Professionals										
Risk Factors (Medians)	**Cent (5)**	**Cont (5.5)**	**T-C (5)**	**Fam (5.5)**	**Stress (5)**	**Fatigue (5)**	**S-C (5)**	**N-S (5.5)**	**Tech (3.5)**	**Inj (3.5)**	**Dam (4.5)**
Cont (5.5)	Z = −0.598, *p* = 0.550										
T-C (5)	Z = −0.92, *p* = 0.357	Z = −1.209, *p* = 0.227									
Fam (5.5)	Z = −0.057, *p* = 0.954	Z = −0.525, *p* = 0.599	Z = −1.256, *p* = 0.209								
Stress (5)	Z = −0.639, *p* = 0.523	Z = −1.164, *p* = 0.244	Z = −0.148, *p* = 0.882	Z = −0.836, *p* = 0.403							
Fatigue (5)	Z = −1.287, *p* = 0.198	Z = −1.363, *p* = 0.173	Z = −0.149, *p* = 0.882	Z = −1.324, *p* = 0.185	Z = −0.404, *p* = 0.686						
S-C (5)	Z = −1.607, *p* = 0.108	Z = −1.545, *p* = 0.122	Z = −0.433, *p* = 0.665	Z = −0.983, *p* = 0.326	Z = 0.000, *p* = 1.000	Z = −0.550, *p* = 0.583					
N-S (5.5)	Z = −0.374, *p* = 0.708	Z = −0.987, *p* = 0.324	Z = −0.185, *p* = 0.853	Z = −0.297, *p* = 0.766	Z = −0.307, *p* = 0.759	Z = −0.687, *p* = 0.492	Z = −0.609, *p* = 0.542				
Tech (3.5)	Z = −3.470, *p* = 0.001	Z= −3.690, *p* = 0.000	Z = −2.990, *p* = 0.003	Z = −3.270, *p* = 0.001	Z = −2.570, *p* = 0.010	Z = −2.373, *p* = 0.018	Z = −2.826, *p* = 0.005	Z = −2.581, *p* = 0.010			
Inj (3.5)	Z = −4.260, *p* = 0.000	Z= −3.870, *p* = 0.000	Z = −4.040, *p* = 0.000	Z= −3.860, *p* = 0.000	Z = −3.690, *p* = 0.000	Z = −3.380, *p* = 0.001	Z = −3.980, *p* = 0.000	Z = −3.606, *p* = 0.000	Z = −1.450, *p* = 0.147		
Dam (4.5)	Z = −2.098, *p* = 0.036	Z = −2.373, *p* = 0.018	Z = −1.169, *p* = 0.242	Z = −2.308, *p* = 0.021	Z = −0.603, *p* = 0.547	Z = −0.630, *p* = 0.529	Z = −0.860, *p* = 0.390	Z = −0.954, *p* = 0.340	Z = −2.245, *p* = 0.025	Z = −3.750, *p* = 0.000	

Table A6. Differences in risk perception factors within trainees.

	Trainees										
Risk Factors (Medians)	**Cent (5.5)**	**Cont (6)**	**TC (5)**	**Fam (3.5)**	**Stress (5)**	**Fatigue (3)**	**S-C (3.5)**	**N-S (5)**	**Tech (3)**	**Inj (2)**	**Dam (5)**
Cont (6)	Z = −1.191, *p* = 0.234										
TC (5)	Z = −3.120, *p* = 0.002	Z = −3.580, *p* = 0.000									
Fam (3.5)	Z = −4.560, *p* = 0.000	Z = −4.420, *p* = 0.000	Z = −2.234, *p* = 0.025								
Stress (5)	Z = −0.675, *p* = 0.500	Z = −1.456, *p* = 0.145	Z = −1.640, *p* = 0.101	Z = −3.390, *p* = 0.001							
Fatigue (3)	Z= −4.970, *p* = 0.000	Z = −4.640, *p* = 0.000	Z = −3.410, *p* = 0.001	Z = −2.471, *p* = 0.013	Z = −4.030, *p* = 0.000						
S-C (3.5)	Z = −5.17, *p* = 0.000	Z = −4.74, *p* = 0.000	Z = −3.79, *p* = 0.000	Z = −1.196, *p* = 0.232	Z = −4.08, *p* = 0.000	Z = −0.805, *p* = 0.421					
N-S (5)	Z = −1.904, *p* = 0.057	Z = −2.386, *p* = 0.017	Z = −0.413, *p* = 0.680	Z = −3.180, *p* = 0.001	Z = −1.529, *p* = 0.126	Z = −3.970, *p* = 0.000	Z = −3.956, *p* = 0.000				
Tech (3)	Z = −5.060, *p* = 0.000	Z = −4.970, *p* = 0.000	Z = −3.570, *p* = 0.000	Z = −1.058, *p* = 0.290	Z = −4.020, *p* = 0.000	Z = −0.942, *p* = 0.346	Z = −0.230, *p* = 0.818	Z = −3.630, *p* = 0.000			
Inj (2)	Z = −5.090, *p* = 0.000	Z = −4.870, *p* = 0.000	Z = −4.340, *p* = 0.000	Z = −4.390, *p* = 0.001	Z = −4.570, *p* = 0.000	Z = −2.421, *p* = 0.015	Z = −2.960, *p* = 0.003	Z = −4.230, *p* = 0.000	Z = −3.060, *p* = 0.002		
Dam (5)	Z = −3.390, *p* = 0.001	Z = −3.000, *p* = 0.003	Z = −0.361, *p* = 0.718	Z = −3.305, *p* = 0.001	Z = −1.849, *p* = 0.064	Z = −4.050, *p* = 0.000	Z = −3.933, *p* = 0.000	Z = −0.118, *p* = 0.906	Z = −4.226, *p* = 0.000	Z = −4.719, *p* = 0.000	

References

1. National Research Counsil. *Improving Risk Communication: National Research Council*; National Research Council: Washington, DC, USA, 1989.
2. Sjoberg, L.; Moen, B.; Rundmo, T. *Explaining Risk Perception: An Evaluation of the Psychometric Paradigm in Risk Perception Research*; Norwegian University of Science and Technology Department of Psychology: Trondheim, Norway, 2004.
3. You, X.; Ji, M.; Han, H. The effects of risk perception and flight experience on airline pilots' locus of control with regard to safety operation behaviors. *Accid. Anal. Prev.* **2013**, *57*, 131–139. [CrossRef] [PubMed]
4. Weber, E.U. The Utility of Measuring and Modeling Perceived Risk. In *Decision and Measurement: Essays in Honor of R. Duncan Luce*; Marley, A., Ed.; Erlbaum: Mahwah, NJ, USA, 1997; pp. 45–97.
5. Weber, E.U. Who's afraid of a little risk? New evidence for general risk aversion. In *Decision Research from Bayesian Approach to Normative Systems: Reflections on the Contributions of Ward Edwards*; Shanteau, J., Mellers, B.A., Schum, D., Eds.; Kluwer Academic Press: Norwell, MA, USA, 1998.
6. McDonald, N.; Corrigan, S.; Daly, C.; Cromie, S. Safety management systems and safety culture in aircraft maintenance organizations. *Saf. Sci.* **2000**, *34*, 151–176. [CrossRef]
7. Hunter, D.R. *Risk Perception and Risk Tolerance in Aircraft Pilots*; Office of Aerospace Medicine: Washington, DC, USA, 2002.
8. Bohn, J.; Harris, D. Risk Perception and Risk-Taking Behavior of Construction Site Dumper Drivers. *Int. J. Occup. Saf. Ergon.* **2010**, *16*, 55–67. [CrossRef] [PubMed]
9. Dobbie, M.; Brown, R. A Framework for Understanding Risk Perception, Explored from the Perspective of the Water Practionioner. *Risk Anal.* **2014**, *34*, 294–308. [CrossRef] [PubMed]
10. Drinkwater, J.L.; Molesworth, B. Pilot see, pilot do: Examining the predictors of pilots' risk management behavior. *Saf. Sci.* **2010**, *48*, 1445–1451. [CrossRef]
11. Health and Safety Executive (HSE). *Research into the Behavioral Aspects of Slips and Trip Accidents and Incidents Research REPORT 396*; MCA Limited: Rossmore, UK, 2005.
12. Brink, T.L. Unit 6: Learning. In *Psychology*; Unit 6: Learning-218; Spielman, R.M., Ed.; Rice University: Houston, TX, USA, 2014.
13. Cooper, D. Safety Culture: A model for understanding & quantifying a difficult concept. *Prof. Saf.* **2002**, *32*, 30–36.
14. Hobbs, A.; Williamson, A. Associations between Errors and Contributing Factors in Aircraft Maintenance. *Hum. Factors* **2003**, *45*, 186–201. [CrossRef] [PubMed]
15. Hobbs, A. *An Overview of Human Factors in Aviation Maintenance*; Australian Transport Safety Bureau: Canberra, Australia, 2008.
16. Beus, J.; Dhanani, L.; McCord, M. A Meta-Analysis of Personality and Workplace Safety. *J. Appl. Psychol.* **2015**, *100*, 481–498. Available online: http://openurl.ebscohost.com/linksvc/linking.aspx?sid=pdh&volume=100&date=2015&spage=481&issn=0021-9010&stitle=&genre=article&issue=2&title=Journal+of+Applied+Psychology&epage=498 (accessed on 1 March 2016). [CrossRef] [PubMed]
17. Von der Heyde, A. Understanding the Determinants of Safety-Related Rule Deviations. University of Duisburg-Essen, 2015. Available online: http://d-nb.info/1067055193/34 (accessed on 17 February 2016).
18. Diefendorff, J.; Mehta, K. The Relations of Motivational Traits with Workplace Deviance. *J. Appl. Psychol.* **2007**, *92*, 967–977. [CrossRef] [PubMed]
19. Griffin, M.; Neal, A. Perceptions of Safety at Work: A Framework for Linking Safety Climate to Safety Performance, Knowledge, and Motivation. *J. Occup. Health Psychol.* **2000**, *5*, 347–358. [CrossRef] [PubMed]
20. Christian, M.; Bradley, J.; Wallace, C.; Burke, M. Workplace Safety: A Meta-Analysis of the Roles of Person and Situation Factors. *J. Appl. Psychol.* **2009**, *94*, 1103–1127. [CrossRef] [PubMed]
21. Oltendal, S.; Moen, B.; Klempe, H.; Rundmo, T. (Eds.) *Explaining Risk Perception: An Evaluation of Cultural Theory*; Norwegian University of Science & Technology Department of Psychology: Trondheim, Norway, 2004.
22. Rundmo, T. Safety climate, attitudes and risk perception in Norsk Hydro. *Saf. Sci.* **2000**, *34*, 47–59. [CrossRef]
23. Morrow, B.H. *Risk Behavior and Risk Communication: Synthesis and Expert Interviews*; SocResearch: Miami, FL, USA, 2009.

24. Maragakis, I.; Clark, S.; Piers, M.; Prior, D.; Tripaldi, C.; Masson, M.; Audard, C. *Safety Management System and Safety Culture Working Group: Guidance on Hazard Identification*. ESSI/ECAST. 2009. Available online: https://www.icao.int/SAM/Documents/2017-SSP-GUY/ECAST%20SMS%20WG%20-%20Guidance%20on%20Hazard%20Identification%201.pdf (accessed on 15 April 2018).
25. Vinodkumar, M.N.; Bhasi, M. Safety management practices and safety behavior: Assessing the mediating role of safety knowledge and motivation. *Accid. Anal. Prev.* **2010**, *42*, 2082–2093. [CrossRef] [PubMed]
26. National Transportation Safety Board (NTSB). *Procedural Compliance*. Edited by NTSBgov. 3 December 2015. Available online: https://www.youtube.com/watch?v=M4NL4m5cnhs (accessed on 16 March 2016).
27. Pauley, K.; O'Hare, D.; Wiggins, M. Risk tolerance and pilot involvement in hazardous events and flight into adverse weather. *J. Saf. Res.* **2008**, *39*, 403–411. [CrossRef] [PubMed]
28. Wright, G.; Pearman, A.; Yardley, K. Risk Perception in the UK Oil and Gas Production Industry: Are Expert Loss-Prevention Managers' Perceptions Different from those of Members of the Public? *Risk Anal.* **2000**, *20*, 681–690. [CrossRef] [PubMed]
29. Slovic, P.; Fischhoff, B.; Lichetenstein, S. Characterizing Perceived Risk. In *Perilous Progress: Managing the Hazards of Technology*; Kates, C.H., Kasperson, J.X., Eds.; Westview Press: Boulder, CO, USA, 1985.
30. Fischhoff, B.; Hayakawa, H.; Fischbech, P.S. Traffic accident statistics and risk perceptions in Japan and the United States. *Accid. Anal. Prev.* **2000**, *32*, 827–835.
31. Thomson, M.E.; Onkal, D.; Avcioglu, A.; Goodwin, P. Aviation Risk Perception: A Comparison between Experts and Novices. *Risk Anal.* **2004**, *24*, 1585–1595. [CrossRef] [PubMed]
32. Rowe, G.; Wright, G. Differences in Experts and Lay Judgements of Risk: Myth or Reality? *Risk Anal.* **2001**, *21*, 341–356. [CrossRef] [PubMed]
33. Marx, S.M.; Weber, E.U.; Orlove, B.S.; Leiserowitz, A.; Krantz, D.H.; Roncoli, C.; Phillips, J. Communication and Mental Processes: Experiential and Analytic Processing of Uncertain Climate Information. *Glob. Environ. Chang.* **2007**, *17*, 47–58. [CrossRef]
34. Grote, G. How We Perceive and Live with Risk and Uncertainty. 2011. Available online: https://www.youtube.com/watch?v=xLbU_AVIzzk (accessed on 17 April 2016).
35. Deery, H.A. Hazard and Risk Perception among young novice Drivers. *J. Saf. Res.* **1999**, *30*, 225–236. [CrossRef]
36. Hunter, D.R.; Stewart, J.L. *Locus of Control, Risk Orientation, and Decision Making Among U.S. Army Aviators*; United States Army Research Intitute for the Behavior and Social Sciences: Arlington, VA, USA, 2009.
37. GadBall. Airframe-and-Power-Plant Mechanics Job Description. 2007. Available online: https://www.youtube.com/watch?v=cTEm9yPK_KQ&index=1&list=PLF8BB110B33A9B32A (accessed on 17 March 2016).
38. Pidgeon, N.F. Safety Culture and Risk Management in Organizations. *J. Cross-Cult. Psychol.* **1991**, *22*, 129–140. [CrossRef]
39. Shyur, H.-J. A quantitative model for aviation safety risk assessment. *Comput. Ind. Eng.* **2008**, *54*, 34–44. [CrossRef]
40. Werfelman, L. *Error Management*; Aerosafety World: Alexandria, VA, USA, 2009; pp. 26–31.
41. Drury, C.G. Human Factors in Aircraft Maintenance. In *Aging Aircraft Fleets: Structural and Other Subsystem Aspects*; Human Factors in Aircraft Maintenance-1-15-9; Defense Technical Information Center: Fort Belvoir, VA, USA, 2000.
42. Johnson, W.B.; Hackworth, C. *Human Factors in Maintenance*; Aerosafety World: Alexandria, VA, USA, 2008.
43. Hackworth, C.; Holcomb, K.; Banks, J.; Schroeder, D. A Survey of Maintenance Human Factors Programs across the World. *Int. J. Appl. Aviat. Stud.* **2007**, *7*, 212–231.
44. Safety Regulation Group. *CAP 716: Aviation Maintenance Human Factors (EASA/JAR145 Approved Organisations)*; TSO/UK Civil Aviation Authority: Norwich, UK, 2003.
45. Latorella, K.A.; Prabhu, P.V. A review of human error in aviation maintenance and inspection. *Int. J. Ind. Ergon.* **2000**, *26*, 133–161. [CrossRef]
46. Hobbs, A.; Avers, K.B.; Hiles, J.J. *Fatigue Risk Management in Aviation Maintenance: Current Best Practices and Potential Future Countermeasures*; Technical; FAA Civil Aerospace Medical Institute: Oklahoma City, OK, USA, 2011.
47. Bailey, M. Nuts, Bolts, and Electrons Avoiding Risky Business. *FAA Aviat. News* **2009**, *48*, 30–31. Available online: https://www.faa.gov/news/safety_briefing/2009/media/janfeb2009.pdf (accessed on 25 May 2018).
48. Safety Regulation Group. *CAP 715: An Introduction to Aircraft Maintenance Engineering Human Factors for JAR 66*; TSO/UK Civil Aviation Authority: Norwich, UK, 2002.

49. Pierobon, M. *Covering the Ground*; Aerosafety World: Alexandria, VA, USA, 2012; pp. 44–48.
50. Sellers, R. Managing the risks of interruptions and distractions during safety critical maintenance. *Focused Maint. Environ.* **2013**. Available online: https://www.casa.gov.au/files/hf-engineers-res-ch6pdf (accessed on 19 May 2018).
51. Bolger, F.; Wright, G. Assessing the quality of expert judgement. *Decis. Support Syst.* **1994**, *11*, 1–24. [CrossRef]
52. Krosnick, J.A.; Presser, S. Question and Questionnaire Design. In *Handbook of Survey Research*; Marsden, P.V., Wright, J.D., Eds.; Emerald Group Publishing Limited: Bingley, UK, 2010; p. 313.
53. Karlberg, C. The Survey Fatigue Challenge: Understanding Young PEOPLE'S motivation to Participate in Survey Research Studies. Master's Thesis, Lund University, Lund, Sweden, 2015.
54. Peterson, R.A. A Quantitative Analysis of Rating-scale Response Variability. *Mark. Lett.* **1997**, *8*, 9–21. [CrossRef]
55. Finstad, K. Response Interpolation and Scale Sensitivity: Evidence against 5-point Scales. *J. Usabil. Stud.* **2010**, *5*, 104–110.
56. Revilla, M.; Saris, W.E.; Krosnick, J.A. Choosing the Number of Categories in Agree-Disagree Scales. *Soc. Methods Res.* **2014**, *43*, 73–97. [CrossRef]
57. Leung, S.-O. A Comparison of Psychometric Properties and Normality in 4-, 5-, 6-, and 11-Point Likert Scales. *J. Soc. Serv. Res.* **2011**, *37*, 412–421. [CrossRef]
58. Slovic, P. Perception of risk: Reflections on the psychometric paradigm. In *Social Theories of Risk*; Krimsky, S., Golding, D., Eds.; Praeger: Westport, CT, USA, 1992; pp. 117–152.
59. Lauber, J.K.; Foushee, H.C. *Guidelines for Line-Oriented Flight Training (NASA Rep. CP-2184)*; NASA Ames Research Center, Scientific and Technical Information Branch: Moffett Field, CA, USA, 1981.
60. Eisenbach, T.M.; Schmalz, M.C. *Anxiety, Overconfidence, and Excessive Risk-Taking*; Federal Reserve Bank of New York Staff: New York, NY, USA, 2015. Available online: https://www.newyorkfed.org/medialibrary/media/research/staff_reports/sr711.pdf (accessed on 18 May 2018).
61. Federal Aviation Administration (FAA). *Aviation Instructor's Handbook*; U.S Government Printing Office: Washington, DC, USA, 2008.
62. Cox, B. *Scenario Based Training in an Aviation Training Environment (A Research Project Presented in Partial Fulfillment of the Requirements for the Degree Master of Education)*; Regis University: Denver, CO, USA, 2010.
63. Kuhberger, A. The Influence of Framing on Risky Decisions: A Meta-Analysis. *Org. Behav. Hum. Decis. Process.* **1998**, *75*, 23–55. [CrossRef]
64. Sjöberg, L. Strength of belief and risk. *Policy Sci.* **1979**, *11*, 39–57. [CrossRef]
65. Sjöberg, L. The Methodology of Risk Perception Research. *Qual. Quant.* **2000**, *34*, 407–418. [CrossRef]
66. Appleby, P.R.; Miller, L.C.; Rothspan, S. The paradox of trust for male couples: When risking is part of loving. *Personal Relatsh.* **1999**, *6*, 81–93. [CrossRef]
67. Godin, G.; Conner, M.; Sheeran, P. Bridging the intention-behaviour 'gap': The role of moral norm. *Br. J. Soc. Psychol.* **2005**, *44*, 497–512. [CrossRef] [PubMed]
68. Sellers, R. A professional culture of safety—The influence, measurement and development of organisational safety culture. In Proceedings of the ISASI Seminar, Adelaide, Australia, 13–16 October 2014; International Society of Air Safety Investigators: Adelaide, Australia, 2014; pp. 1–11.
69. Industry Safety Strategy Group. Global Aviation Safety Roadmap. Flight Safety Foundation. Available online: https://flightsafety.org/files/roadmap1.pdf (accessed on 29 August 2017).
70. Bonett, D.G. Sample Size Requirements for Testing and Estimating Coefficient Alpha. *J. Educ. Behav. Stat.* **2002**, *27*, 335–340. [CrossRef]
71. Javali, S.B.; Gudaganavar, N.V.; Raj, S.M. *Effect of Varying Sample Size in Estimation of Coefficients of Internal Consistency*; WMC001649; Webmed Central Biostatistics 2; Webmed Limited: Durham, UK, 2011.
72. Samuels, P. *Statistical Methods—Scale Reliability Analysis with Small Samples*; Worksheet; Birmingham City University, Centre for Academic Success: Birmingham, UK, 2015.
73. George, D.; Mallery, P. *SPSS for Windows Step by Step: A Simple Guide and Reference. 11.0 Update*; Allyn & Bacon: Boston, MA, USA, 2003.
74. Coolican, H. *Research Methods and Statistics in Psychology*, 6th ed.; Psychology Press: Sussex, UK, 2014.
75. Hunter, D.R. Risk Perception among General Aviation Pilots. *Int. J. Aviat. Psychol.* **2006**, *16*, 135–144. [CrossRef]
76. IBM. *IBM SPSS Statistics for Windows version 22*; IBM Corp: Armonk, NY, USA, 2013.

77. Montgomery, D.C.; Runger, G.C. *Applied Statistics and Probability for Engineers*, 2nd ed.; John Wiley and Sons: Hoboken, NJ, USA, 1999.
78. Armitage, P.; Berry, P.J.; Matthews, J.N.S. *Statistical Methods in Medical Research*, 4th ed.; Blackwell Publishing: Oxford, UK, 2002.
79. Kuzon, W.M.; Urbanchek, M.G.; McCabe, S. The Seven Deadly Sins of Statistical Analysis. *Ann. Plast. Surg.* **1996**, *37*, 265–272. [CrossRef] [PubMed]
80. Egboro, F.O. The Implications of Parametric and Non-Parametric Statistics in Data Analysis in Marketing Research. *Int. J. Hum. Soc. Sci.* **2015**, *5*, 74–83.
81. Afari, N.; Buchwald, D. Chronic Fatigue Syndrome: A Review. *Am. J. Psychiatry* **2003**, *160*, 221–236. [CrossRef] [PubMed]
82. Marcora, S.M.; Staiano, W.; Manning, V. Mental fatigue impairs physical performance in humans. *J. Appl. Physiol.* **2009**, *106*, 857–864. [CrossRef] [PubMed]
83. Bridges, S.J. Professional identity development: Learning and journeying together. *Res. Soc. Adm. Pharm.* **2018**, *14*, 290–294. [CrossRef] [PubMed]
84. Ilias, N.; Abdulatiff, N.K.; Mohamed, N. Management Control System and Performance: Accountability Attributes in Local Authorities. *Int. J. Econ. Financ. Issues* **2016**, *6*, 26–35.
85. Regional School of Public Administration-ReSPA. *Managerial Accountability and Risk Management: Concept and Practical Implementation*; Discussion Paper; Regional School of Public Administration-ReSPA: Danilovgrad, Montenegro, 2017.
86. Doty, J.; Fenlason, J. It's not about trust; It's about thinking and judgement. *Mil. Rev.* **2015**. Available online: http://www.armyupress.army.mil/Portals/7/military-review/Archives/English/MilitaryReview_20150630_art016.pdf (accessed on 28 May 2018).
87. Kan, K.; Lai, T. Does Education Affect Trust Attitude? Evidence from Europe. 29 May 2018. Available online: https://editorialexpress.com/cgi-bin/conference/download.cgi?db_name=EEAMannheim2015&paper_id=74229 (accessed on 18 May 2015).
88. Tversky, A.; Kahneman, D. Belief in the law of small numbers. *Psychol. Bull.* **1971**, *76*, 105–110. [CrossRef]
89. To70. Civil Aviation Safety Review 2017. Available online: http://to70.com/to70s-civil-aviation-safety-review-2017/ (accessed on 13 January 2018).
90. AERIC Inc. *All Signs Point to Yes: Literacy's Impact on Workplace Health and Safety*; AERIC Inc.: Ottawa, ON, Canada, 2008.
91. Wright, M.C.; Kaber, B. Effects of Automation of Information-Processing Functions on Teamwork. *Hum. Factors* **2005**, *47*, 50–66. [CrossRef] [PubMed]
92. Metzger, U.; Parasuraman, R. Automation in Future Air Traffic Management: Effects of Decision Aid Reliability on Controller Performance and Mental Workload. *Hum. Factors* **2005**, *47*, 35–49. [CrossRef] [PubMed]
93. Rovira, E.; McGarry, K.; Parasuraman, R. Effects of Imperfect Automation on Decision Making in a Simulated Command and Control Task. *Hum. Factors* **2007**, *49*, 76–87. [CrossRef] [PubMed]
94. Wickens, C.D. *Engineering Psychology and Human Performance*, 2nd ed.; Harper Collins: Scranton, PA, USA, 1992.
95. Wickman, M.; Greenberg, C.; Boren, D. The Relationship of Perception of Invincibility, Demographics, and Risk Behaviours in Adolescents of Military Parents. *J. Pediatric Health Care* **2010**, *24*, 25–33. [CrossRef] [PubMed]
96. Sanchez, C.; Dunning, D. Overconfidence Among Beginners: Is a Little Learning a Dangerous Thing? *J. Personal. Soc. Psychol.* **2018**, *114*, 10–28. [CrossRef] [PubMed]
97. Morris, M.G.; Venkatesh, V. Age Differences in Technology Adoption Decisions: Implications for a Changing Work Force. *Personnel Psychol.* **2000**, *53*, 375–403. [CrossRef]
98. Hulse, L.M.; Xie, H.; Galea, E.R. Perceptions of autonomous vehicles: Relationships with road users, risk, gender and age. *Saf. Sci.* **2018**, *102*, 1–13. [CrossRef]
99. Thunström, L.; Nordström, J.; Shogren, J.F.; Ehmke, M.; van't Veld, K. *Strategic Self-Ignorance*; Working Paper; Lund University: Lund, Sweden, 2016.
100. Gonzalez, J.J.; Sawicka, A. The Role of Learning and Risk Perception in Compliance. In Proceedings of the 21st International Conference of the System Dynamics Society, New York, NY, USA, 20–24 July 2003.

101. Agung, I. How Student Understand of Success and Failure: Internal or External Factor? *SSRN* **2017**. [CrossRef]
102. Martin, W.E.; Martin, I.M.; Kent, B. The role of risk perceptions in the risk mitigation process: The case of wildfire in high risk communities. *J. Environ. Manag.* **2009**, *91*, 489–498. [CrossRef] [PubMed]
103. Van Tonder, C.L.; Lessing, B.C. From Identity to Organisation Identity: The Evolution of a Concept. *J. Ind. Psychol.* **2003**, *29*, 20–28. [CrossRef]
104. Miller, D.T. The norm of self-interest. *Am. Psychol.* **1999**, *54*, 1053–1060. [CrossRef] [PubMed]
105. De Dreu, C.; Nauta, A. Self-Interest and Other-Orientation in Organizational Behavior: Implications for Job Performance, Prosocial Behavior, and Personal Initiative. *J. Appl. Psychol.* **2009**, *94*, 913–926. [CrossRef] [PubMed]
106. Kurtz, S.; Silverman, J.; Draper, J. *Teaching and Learning Communication Skills in Medicine*, 2nd ed.; Taylor & Francis Group, LLC: Boca Raton, FL, USA, 2004.
107. Higgins, V. Augmented & Virtual Reality: The Future of Work, Not Just Play. *Prof. Saf.* **2017**, *62*, 86–87.
108. International Civil Aviation Organisation (ICAO). *Safety Management Manual Doc 9859*; International Civil Aviation Organization: Montreal, QC, Canada, 2013.
109. SKYbrary. Safety Management System. 22 September 2017. Available online: https://www.skybrary.aero/index.php/Safety_Management_System#Definition (accessed on 7 May 2018).