Journal of Air Transport Management 37 (2014) 60–68

Contents lists available at ScienceDirect

Journal of Air Transport Management

journal homepage: www.elsevier.com/locate/jairtraman

Airport security measures and their influence on enplanement intentions: Responses from leisure travelers attending a Canadian University

Doug Alards-Tomalin [a], Tamara L. Ansons [b], Tara C. Reich [c], Yumiko Sakamoto [d], Rita Davie [e], Jason P. Leboe-McGowan [a,*], Launa C. Leboe-McGowan [a]

[a] Department of Psychology, University of Manitoba, Canada
[b] Department of Marketing, Warwick Business School, United Kingdom
[c] Department of Management, London School of Economics, United Kingdom
[d] Department of Psychology, York University, Canada
[e] Faculty of Law, University of British Columbia, Canada

A R T I C L E I N F O

Article history:
Available online

Keywords:
Airport security
Humiliation
Perceived safety

A B S T R A C T

Airport security measures can be grouped into two types; standardized screening techniques, which all passengers must undergo (e.g., baggage X-rays, metal detecting scans); and elevated-risk screening (including pat-downs and strip searches) for which only a sub-set of passengers are selected. In the current study, an undergraduate sample ($n = 636$) was surveyed regarding the professionalism of security screening staff, as well as perceived safety, threat to dignity, and enplanement intentions, following standard and elevated-risk screening measures. Consistent with our hypotheses, perceived professionalism and safety were positively correlated with enplanement intentions, and dignity threat was negatively associated with perceived safety. As the perceived safety from the use of a security measure decreased, enplanement intentions also decreased. Notably, when a screening measure is perceived as having negative consequences (e.g., threatening one's sense of dignity) the safety of the measure is personally invalidated.

1. Introduction

Airport security screening has undergone numerous improvements in the past decade. After the events of September 11, 2001, the Transportation Security Administration (TSA) and the Canadian Air Transport Security Authority (CATSA) were developed to improve the screening standards in place in North American airports. Targets were set for North American airports to screen all checked luggage for explosives, and to subject passengers to more intensive security screening procedures, which have continued to evolve. While previous standardized security measures are still routinely administered uniformly across all passengers (e.g., baggage X-rays and metal detector scans); elevated risk screening has become more common-place (which include, but is not limited to, bodily pat-downs, bag searches and explosive trace detection scans) (O'Malley, 2006). Selection for elevated risk screening may be determined based on one's predetermined "risk level" obtained through Computer Assisted Passenger Pre-screening Systems (CAPPS II), or through random selection (Persico and Todd, 2005). While an increase in the use of elevated risk screening has greatly benefited the overall safety of commercial air passengers worldwide —which most United States residents recognize (71% of Americans support the continued use of profiling in airport security[1]) — the application of more intensive screening measures has also led to increased passenger inconvenience (Gkritza et al., 2006), and has brought to light the issue of restricted civil liberties, and privacy concerns.

In a recent study by Hasisi and Weisburd (2011), Arab Israeli and Jewish Israeli passengers who had just passed through a security screening checkpoint in an Israeli airport were provided a

* Corresponding author. Department of Psychology, University of Manitoba, Winnipeg, Manitoba, Canada R3T 2N2. Tel.: +1 204 272 1558.
E-mail address: Jason.Leboe-McGowan@umanitoba.ca (J.P. Leboe-McGowan).

[1] http://www.gallup.com/poll/125078/Americans-back-profiling-air-travelers-combat-terrorism.aspx. The survey consisted of. telephone interviews that included 1023 adults (January 8–10, 2010).

http://dx.doi.org/10.1016/j.jairtraman.2014.02.004
0969-6997/

questionnaire. It was found that Arab Israelis reported higher rates of being selected for elevated-risk security screening, higher rates of perceived humiliation and intimidation, and demonstrated an increased negative appraisal of their treatment by security staff. The researchers also found that perceived humiliation had an influence on the perceived legitimacy of the airport security regulations, and overall safety. While the mean level of trust in the airport security screening staff was high (75%), Jewish Israeli passengers exhibited higher levels of trust (85.4%) than Israeli-Arab passengers (64.7%). Despite safety ratings (the degree to which security checks contributed to overall safety) being rated fairly high overall (83.7%), Israeli–Jewish passengers rated their perceived safety significantly higher (87.6%) than Israeli Arabs (79.6%). This finding suggests that humiliations incurred during security screening by Israeli Arabs may have had negative consequences on their level of trust in the screening personnel, which subsequently had a negative impact on overall safety assessments.

In the current study it was predicted that perceived threat to one's dignity resulting from humiliation experienced during security screening, would lead to forming a negative impression of that measure in enhancing safety, as well as negatively impact intentions to use commercial air carriers in the future (referred to throughout as *enplanement intentions*). Additionally, we predicted that higher levels of professionalism by security staff would be positively related to perceived safety; which in turn would also be positively related to enplanement intentions.

2. Security personnel professionalism

In the current study, the professionalism of security personnel in Canadian airports was measured using three survey questions in which the respondent rated; 1) how appropriate the behaviors of Canadian security personnel behavior are; 2) How well trained Canadian security personnel are; and 3) How confident respondents are that Canadian security personnel make correct decisions. In a previous study, Sindhav et al. (2006) found that passengers going through airport security demonstrated a strong correlation between their level of perceived justice (that the decisions of airport security personnel are judged as fair and unbiased) and their overall satisfaction. In this study, several types of justice were examined, including distributive justice (i.e., the fair distribution of tangible and intangible resources), procedural justice (i.e., outcomes are the result of a fair and unbiased process); and interactional and/or interpersonal justice (i.e., the degree to which the conduct of those enacting the procedures is respectful). They found that while all forms of justice were positively correlated with satisfaction, procedural justice exhibited the strongest relationship. Based on this finding, we hypothesized (**H1A**) that perceived security personnel professionalism (e.g., how appropriate and in-keeping with regulations the behaviors of the security screening personnel were) would positively correlate with enplanement intentions; and (**H1B**) that the effect of security personnel professionalism would be mediated through perceived safety onto enplanement intentions. In essence, if respondents felt security staff professionalism to be high (i.e., a high level of procedural justice), they would also view the security measures being enforced as highly contributing to their overall safety.

3. Perceived safety and dignity

In addition to the perceived professionalism of the security staff, there were a number of other factors relating to security screening that we predicted would impact on enplanement intentions. In the current model, we considered the degree to which the security measures (whether standard or elevated) enhanced passenger's feelings of overall safety, and contributed to their enplanement intentions. Personal safety is reported as one of the most important factors considered when selecting an air carrier (Gilbert and Wong, 2003). Additionally, overall satisfaction tends to decrease as the perceived risk of an activity increases (Johnson et al., 2006). While other studies have failed to find a correlation between perceived safety and enplanement (Squalli and Saad, 2006). Ringle et al. (2011) found a significant positive correlation between perceived safety levels and customer satisfaction for leisure travelers using commercial aviation. Therefore, we predicted in the current model (**H2**) – which was specified using primarily leisure travelers that higher levels of perceived safety arising from the use of a security screening measure (whether standard or elevated) would be positively correlated with enplanement intentions. In essence, respondents that feel that security measures are purposeful and effective, will also be more likely to intend to use commercial air carriers in the future.

The debate over privacy issues inherent in security measures that involve pat-downs and body scans continues. For example, American civil liberties organizations have stated that while the body scanners implemented in North America (millimetre wave body-scanning technology) are less invasive than X-ray scanners or pat-downs, intimate details may still be viewed by the operator (Boussadia, 2009). Alternatively, body-scanning technology appears to be gaining favor as an alternative to enhanced pat-downs. For instance, passengers at a United Kingdom airport were found to prefer body scans to pat-downs, which were seen as more intrusive (Mitchener-Nissen et al., 2012). Based on Hasisi and Weisburd's (2011) findings, in which higher levels of humiliation experienced during airport security screening led to lower levels of overall perceived safety, we predicted (**H3A**) that the perceived dignity threat of a security screening measure would be negatively correlated with enplanement intentions. Secondly, we predicted (**H3B**), that the effect of perceived dignity threat of a security screening measure (whether standard or elevated) would be mediated onto enplanement intentions via a significant negative correlation with perceived safety. Lastly, (**H4**) we predicted that age would be positively correlated with future flying intentions, as older aged participants may be more actively engaged in air travel than younger participants. To summarize, H1A, H2, H3A and H4 tested direct effects in the proposed theoretical model, while H1B and H2B tested indirect effects. Wherever means are provided, standard errors are given in brackets.

4. Method

4.1. Participants

4.1.1. Descriptive statistics

The participants were undergraduate students recruited from an Introduction to Psychology course at the University of Manitoba who participated in exchange for partial course credit. Undergraduate students were selected for this study for several reasons: 1) we hypothesized that undergraduate students, despite being on average younger ($M = 20.72$ [4.76]) than the average air traveler in North America (47.5 years[2]), will have had sufficient experience with airport security measures to have formed valid opinions regarding them. For instance, the participants reported a mean number of 6.62 flights (SE = .282) over a period of 3 years, an average of slightly more than 2 flights per year. This is highly consistent with the national average for the United States of America. According to data collected by the Travel Industry

[2] http://www.ustravel.org/news/press-kit/travel-facts-and-statistics.

Association of America (TIA/BTS Air Travel Survey Results November 15, 2002), which represented approximately 76 million commercial flight users, 81% of commercial air travelers took between 1 and 4 flights per year (Mean = 2.0 flights), with 12% taking between 5 and 9, and 7% taking 10+. This suggests that while their reasons for flying may not be the same as the general public; the sample used in the study, according to self-report, were as familiar with airport security measures as the average traveler. Secondly, the undergraduate participant-pool constituted a large, accessible sample on which the proposed models could be validated.

Seven hundred and twelve participants completed the Airport Security Survey online. In the measurement model 68 participants were excluded using the list-wise deletion procedure for failing to complete the questionnaire (81% of the removed participants were missing only a single item). The list-wise deletion procedure assumes that omitted items are missing completely at random, and have no significant impact on the final model (Brown, 1983; Carter, 2006). As the number of participants that were missing data was relatively small, and the omitted items were distributed evenly across the questionnaire items (the mean number of omissions per item = 4.8 [2.5], range = 2–11) this assumption was safely met (Rubin, 1976). Only two items tended to be omitted more frequently: v9 regarding feelings of safety for the use of metal detecting wands (11 omissions) and v10 regarding feelings of safety for the use of enhanced pat-downs (10 omissions), and v9 would be removed from the final measurement model. Another 8 participants were eliminated for failing to either specify their gender ($n = 1$), or their racial ancestry ($n = 7$). The final measurement model and theoretical models were specified with an $n = 636$.

The final sample was composed of 387 (60.8%) females, and 249 (39.2%) males. The mean age of the participants included in the final analysis was 20.7 (4.8) and varied in reported age range from 16 to 50 years old; however the majority of the respondents were between the ages of 18–22 (82.7%). The majority of the respondents indicated that they were Caucasian (62.3%). Respondents of Asian ancestry (including South-West, South-East, North-East and South-Central Asia) comprised the second largest sub-grouping (18.8%), while First-Nations/Metis respondents were the third largest sub-group (8.2%). When collapsed into Caucasian and Other ancestry groupings, 396 had indicated that they were Caucasian, and 240 (60.6%) had indicated an ancestry other than Caucasian. These two groups were large enough, and of similar size, to allow for multi-group comparisons to be performed.

4.1.2. Flight experience information

Six questionnaire items examined the frequency of air travel in the past three years for business or leisure. These items looked at flights within, and outside of Canada, as well as international flights (across borders). It was found that the average number of business flights were significantly lower [$M = 1.24$ (.19)] than the average number of leisure flights [$M = 6.81$ (.45)], $F(1, 571) = 233.629$, $p < .001$. This result was anticipated, as the sample was composed of undergraduate university students. In comparing the average number of leisure flights within Canada [$M = 3.079$ (.142)], against flights outside of Canada [$M = 1.679$ (.187)] and International flights originating or terminating in Canada [$M = 2.238$ (.193)] significant differences between these groups were demonstrated $F(2, 1210) = 33.300$, $p < .001$. The majority of the sample reported flights inside of Canada, followed by International flights (originating or terminating in Canada), with the least number of flights occurring outside of Canada (originating and terminating in another country). This indicates that our sample was primarily familiar with security measures employed in Canadian airports.

4.2. Procedure

The data were collected using an online survey that included multiple questionnaire items (20 of which were included in the final measurement model). In the current study, respondents provided ratings for standard (including X-ray and metal detector scans) and elevated risk (enhanced body pat-downs, full-body scans and strip-searches) security measures on several different scales. For each of these measures, respondents rated how effective each screening measure was at increasing their feeling of personal safety when traveling, as well as the extent to which these measures constituted a threat to human dignity. Additionally, they provided an assessment of their future enplanement intentions given the continued use of each measure.

4.3. Data analysis

The data were analyzed using a structural equation modeling (SEM) approach with AMOS version 20 software. The models tested in this analysis were covariance models which used multiple indicator variables to represent each latent factor. The analysis followed the two-step procedure suggested by Anderson and Gerbing (1988) and Hatcher (1994). The first step in this procedure involves the development of a measurement model using confirmatory factor analysis (CFA) to assess convergent and discriminant validity. In the second step, this model was modified into two full structural equation models to investigate the relations among the noted exogenous and endogenous constructs. These models were then tested for goodness of fit (GOF).

Generally, GOF is indicated using the chi-square test, which examines the comparability of the proposed (theoretical) model and the independence model (which assumes no relationships between any of the constructs) (Bollen, 1989). It should be noted that the chi-square statistic must be non-significant for the model to be considered to exhibit GOF. However, the chi-square test assumes multivariate normality, and is highly sensitive to sample size, often demonstrating significance for larger samples regardless of good model fit. Therefore, to avoid model rejection when the fit is acceptable; the chi-square test is often presented with other GOF indices that are unbiased by sample size (Hox and Bechger, 1998). The primary index often reported is the relative chi-square, which is the ratio of chi-square to its degrees of freedom (χ^2/χ^2_{df}). In general, a value equal to or less than 3 indicates acceptable model fit (Marsh et al., 2004), however, larger criterions (e.g., 5 or less) have also been suggested (Marsh and Hocevar, 1985).

In the current study, we reported three incremental fit indices for each of the models. These indices compare the hypothesized model against a baseline uncorrelated factors model, and examine the proportionate improvement in fit when transitioned to the theoretical model. These indices included, the CFI (*comparative fit index*), the NFI (*normed fit index*), and TLI (*Tucker–Lewis index*). The CFI was selected because it is unaffected by sample size, and is routinely reported (Gerbing and Anderson, 1993). The TLI was also included because it includes a correction for model complexity. It is recommended that CFI, NFI and TLI all have values exceeding .90 for fit to be considered acceptable (Bentler, 1990). Also included, were two absolute fit indices; which assess how well the hypothesized model reproduces the sample data; the SRMR (standardized root mean square residual) and the RMSEA (root mean square error of approximation). Unlike the incremental fit indices, lower values are indicative of better model fit, with 0 indicating perfect fit (Hu and Bentler, 1999). It is suggested that the SRMR and RMSEA be less than .08 for model fit to be considered adequate.

4.4. Measured and latent variables

Structural equation modeling is a technique for examining the linear relationships between multiple factors. These relationships may be directional or non-directional in nature, and are represented by regression (or path) coefficients which connect the variables (MacCallum and Austin, 2000). In the current study, the models were composed of both measured and latent variables. Latent variables are theoretical constructs that are inferred to underlie multiple measured variables. Factor analysis assumes that the covariances between measured variables can be explained by the presence of underlying latent factors (Hox and Bechger, 1998). In the current study, Bentler's (1990) convention of identifying latent constructs with "F" (Factor) and indicator variables with "v" (variable) was used. Seven latent factors (F's) were defined, each consisting of at least two indicator variables (v's). The majority of the indicator variables were measured using 5-point Likert scales. Items v19-v21 (security personnel professionalism) used a 9-point Likert scale (see Appendix A for the questionnaire items). The mean and standard deviations for each questionnaire item are reproduced in Table 1.

Enplanement Intentions/Standard (F1) was composed of three items asking participants to rate how the regular use of standard security measures (baggage X-rays, metal detector scans, metal detector wand) would influence their intentions to use commercial air travel in the future (1 = much less likely to 5 = much more likely).

Enplanement Intentions/Elevated (F2) was composed of three items asking participants to rate how the regular use of elevated risk security measures (enhanced pat-downs, body-scans, strip searches) would influence their intentions to use commercial air travel (1 = much less likely to 5 = much more likely).

Table 1
Descriptive statistics for Constructs (F) and manifest variables (v).

Constructs and manifest variables	Mean (SD)
Enplanement Intentions (Standard): (F1)	3.60 (.87)
Regular use of scanning bags by X-ray (v1)	3.60 (.89)
Regular use of walking through metal detector (v2)	3.65 (.88)
Regular use of metal detecting wand (v3)	3.54 (.85)
Enplanement Intentions (Elevated risk): (F2)	2.49 (1.15)
Regular use of enhanced body pat-downs (v4)	2.59 (1.07)
Regular use of body scans (v5)	2.70 (1.15)
Regular use of strip searches (v6)	2.17 (1.17)
Feelings of Safety (Standard): (F3)	4.00 (.97)
Scanning bags by X-ray makes me feel (v7)	3.96 (.98)
Using metal detectors makes me feel (v8)	4.03 (.96)
Using a metal detecting wand makes me feel (v9)*	3.74 (1.03)
Feelings of Safety (Elevated risk): (F4)	3.05 (1.28)
Enhanced body pat downs makes me feel (v10)	2.94 (1.19)
Full body scans make me feel (v11)	3.36 (1.29)
Strip searches make me feel (v12)	2.84 (1.31)
Dignity Threat (Standardized): (F5)	1.59 (.83)
Scanning bags by X-ray is a ____ threat (v13)	1.71 (.93)
Using metal detectors is a ____ threat (v14)	1.44 (.74)
Using a metal detecting wand is a ____ threat (v15)	1.62 (.79)
Dignity Threat (Elevated risk): (F6)	3.79 (1.12)
Enhanced body pat downs are a ____ threat (v16)	3.68 (1.06)
Body scans are a ____ threat (v17)	3.48 (1.20)
Strip-searches are a ____ threat (v18)	4.23 (.96)
Professional Assessment: (F7)	6.41 (1.55)
How appropriate are Canadian security staff? (v19)	6.43 (1.60)
How well-trained are Canadian security staff? (v20)	6.50 (1.47)
How confident are you in Canadian security staff (v21)	6.28 (1.58)

Feelings of Safety/Standard (F3) was composed of two items measuring how much safer the regular use of standard security measures made them feel (1 = not at all safer to 5 = very much safer). The security measures were the same as those used in F1, with the exception of the Metal detector wand item (v9), which was dropped from the analysis.

Feelings of Safety/Elevated (F4) was made up of three items measuring how much safer the use of elevated risk security measures made them feel (1 = not at all safer to 5 = very much safer). The elevated risk security measures were the same as those listed in F2.

Dignity Threat/Standard (F5) was composed of three items measuring the degree of perceived threat to human dignity arising from standard security measures (1 = low level of threat to 5 = high threat). These measures were the same as those used in F1.

Dignity Threat/Elevated (F6) was comprised three items measuring the degree of threat to human dignity that arises from the implementation of elevated risk security screening (1 = low level of threat to 5 = high threat). These measures were the same as those listed in F2.

Professionalism Assessment (F7) was made up of three items that measured the level of perceived professionalism of Canadian airport security staff. The first item examined respondent's assessments for how appropriate the behavior of the security personnel was (1 = completely inappropriate to 9 = extremely appropriate). The second item was a measure of how well trained the airport security staff were perceived to be (1 = extremely poorly to 9 = extremely well); and the third item was a measure of how confident respondents were in the judgments of security personnel (1 = not at all to 9 = extremely).

5. Results

5.1. Measurement model analysis

In the initial measurement model, 21 indicator variables were loaded onto 7 factors using the maximum likelihood method. A confirmatory factor analysis was first conducted to verify the reliability and validity of the indicator variables. The Chi-square for the model was statistically significant $\chi^2(168, N = 636) = 1144.8$, $p < .0001$, TLI = .86, CFI = .89 indicating inadequate fit. Further analysis of the modification indices (Lagrange Multiplier test) revealed that item v9 (Feelings of Safety/standard for use of the metal detecting wand) loaded highly on two factors, F3 (*Feelings of Safety/Standard*) and F4 (*Feelings of Safety/Elevated*). To address this, v9 was removed from the model. The revised measurement model's (M_m) was also statistically significant $\chi^2(149, N = 636) = 654.8$, $p < .001$. However, model fit (as indicated by the GOF indices) was substantially improved over the initial measurement model (see Table 2), and was therefore used to formulate the theoretical models.

The standardized factor loadings for each indicator variable are listed in Table 3. The z scores for each of the coefficients ranged from 17.5 to 44.9, and were all statistically significant ($p < .001$), demonstrating convergent validity (Anderson and Gerbing, 1988). Also listed in Table 3 are the indicator and composite reliabilities for each construct. The composite reliabilities are analogous to coefficient alpha (Fornell and Larcker, 1981), which is a metric that represents the internal consistency of the items representing each latent construct. The reliabilities of all seven factors were larger than .80, with composite reliabilities ranging from .945 to .827. This indicates an acceptable level of internal consistency.

The error variances for each item are provided with the variance extracted estimates for each construct (see Table 3). The variance extracted estimates are a measurement of the amount of variance

Table 2
Goodness of fit indices for the different SEM models.

Models	Relative chi-square			Incremental fit indices			Absolute fit indices	
	χ^2	χ^2_{df}	χ^2/χ^2_{df}	CFI	NFI	TLI	SRMR	RMSEA
Independence model (M_0)	8505	190	44.8	–	–	–	–	.26
Measurement model (M_m)	655	149	4.4	.94	.92	.92	.05	.07
Theoretical model 1 (M_{T1})	684	170	4.0	.94	.92	.92	.05	.07
Theoretical model 2 (M_{T2})	684	172	3.9	.94	.92	.93	.05	.07
Males vs. females	1535	516	2.9	.94	.91	.93	.05	.04
Caucasian vs. other	1503	516	2.9	.94	.91	.93	.06	.04

Note. CFI, NFI (normed fit index), TLI (Tucker–Lewis index), SRMR (standardized root mean square residual), RMSEA (root mean square error).

captured by the latent factor versus measurement error. The recommended minimum variance extracted estimate is .50 (Fornell and Larcker, 1981). Therefore, in the measurement model, all of the factors uniquely accounted for a majority of the total variance (all variance extracted estimates $\geq$ .61). Discriminant validity – the concept that each latent factor represents a unique psychological construct – was assessed using the variance-extracted test (Fornell and Larcker, 1981). According to this test, for any two factors, discriminant validity is considered to be demonstrated if the variance-extracted estimates are greater than the squared correlations between two factors (correlations are provided in Table 4). In the revised measurement model, all of the squared correlations were minimal (<.20) and were smaller than the smallest variance extracted estimate (.61), providing evidence for discriminant validity.

Table 3
Measurement model (M_m) equation properties.

Construct and indicators	Z-score[a]	Standardized Loading	Indicator Reliability	Error Variance
Enplanement Intent/Standard (F1)				
v1	–	.927	.859	.141
v2	44.9	.958	.918	.082
v3	36.2	.884	.781	.219
			.945[b]	.853[c]
Enplanement Intent/Elevated (F2)				
v4	–	.923	.852	.148
v5	29.2	.858	.736	.264
v6	28.2	.831	.691	.309
			.904[b]	.760[c]
Feelings Safety/Standard (F3)				
v7	–	.861	.741	.259
v8	17.5	.858	.736	.264
			.850[b]	.739[c]
Feelings Safety/Elevated (F4)				
v10	–	.856	.732	.268
v11	24.5	.826	.682	.318
v12	26.4	.868	.753	.247
			.886[b]	.722[c]
Dignity Threat/Standard (F5)				
v13	–	.682	.465	.535
v14	23.9	.952	.906	.094
v15	26.1	.809	.654	.346
			.860[b]	.675[c]
Dignity Threat/Elevated (F6)				
v16	–	.810	.656	.344
v17	18.2	.758	.574	.426
v18	19	.783	.613	.387
			.827[b]	.614[c]
Professionalism (F7)				
v19	–	.772	.596	.404
v20	20.1	.833	.694	.306
v21	19.8	.827	.684	.316
			.852[b]	.658[c]

[a] All reported Z statistics are significant at $p < .001$.
[b] Composite reliability estimates.
[c] Variance extracted estimates.

Table 4
Correlation matrix of the factors included in M_m, M_{T1}, and M_{T2}.

	F1	F2	F3	F4	F5	F6
F1: Enplanement Intentions Standard						
F2: Enplanement Intentions Elevated	.37					
F3: Feelings of Safety Standard	.45	.21				
F4: Feelings of Safety Elevated risk	.21	.51	.35			
F5: Dignity Threat Standard	−.24	−.05	−.30	−.15		
F6: Dignity Threat Elevated risk	−.05	−.50	−.04	−.38	.08	
F7: Professionalism	.28	.23	.44	.26	−.27	−.19

5.2. Theoretical model analysis

Two theoretical models were tested (M_{T1} and M_{T2}) using the factorial structure indicated in the measurement model. In M_{T1} (see Fig. 1), factors F3 (*Feelings of safety/Standard*), F5 (*Dignity threat/Standard*), F4 (*Feelings of safety/Elevated*), F6 (*Dignity threat/Elevated*), and F7 (*Security Professionalism*) acted as independent, exogenous factors, and F1 (*Enplanement Intentions/Standard*) and F2 (*Enplanement Intentions/Elevated*) as dependent, endogenous, factors. This model did not include any mediators, but did include age as a control. In both hypothetical models, age was found to negatively co-vary with security professionalism assessments (−.06), and so this covariance path was included post-hoc. The results obtained indicated that M_{T1} and M_{T2} both exhibited acceptable fit (see Table 2). As revealed in Figs. 1 and 2, all of the regression weights, for all of the paths proposed in both models achieved a significance level $\leq$ .05 confirming hypotheses H1A, H2 and H3A. However, contrary to our expectations, age had no influence on flight intentions (H4 was disconfirmed). The five exogenous factors (in M_{T1}) accounted for 22% of the variance in F1 (*Enplanement Intentions/Standard*) and 37% of the variance in F2 (*Enplanement Intentions/Elevated*), indicating that enplanement intentions, after considering the impact of elevated security measures, is better predicted by the factors included in the model.

In theoretical model, M_{T2} (see Fig. 2), F3 and F4 (*Feelings of Safety*) acted as mediating factors, conveying the effect of F5 and F6 (*Dignity threat*), and F7 (*Security professionalism*) onto F1 and F2 (*Enplanement intentions*). In Table 4, the Pearson's correlation coefficients are provided in a correlation matrix. Most of the factors were positively correlated with F1 (*Enplanement Intentions/Standard*) with the exception of F5 (*Dignity threat/Standard*), with which it was negatively correlated, which was also the case for the factors related to elevated risk measures. As the degree of perceived threat to overall dignity increased, there was a measurable decrease in enplanement intentions. In addition to this finding, an increased perceived threat to dignity was negatively correlated with overall safety. This led us to propose our secondary, mediated, theoretical model (M_{T2}), in which we hypothesized that the negative relationship between dignity threat and enplanement intentions was being mediated through feelings of safety. In essence, that an increased impression of dignity threat resulting from the use of a security measure, will reduce overall perceived safety, which is the key determinant in forming enplanement intentions. In addition to safety acting as a mediator for dignity threat, we also hypothesized that it would mediate the effect of professionalism assessments on enplanement intentions. In essence, the level of professionalism perceived in the security personnel's behavior would be positively related with the overall feeling of safety arising from the use of an airport screening measure, which subsequently determines enplanement intentions.

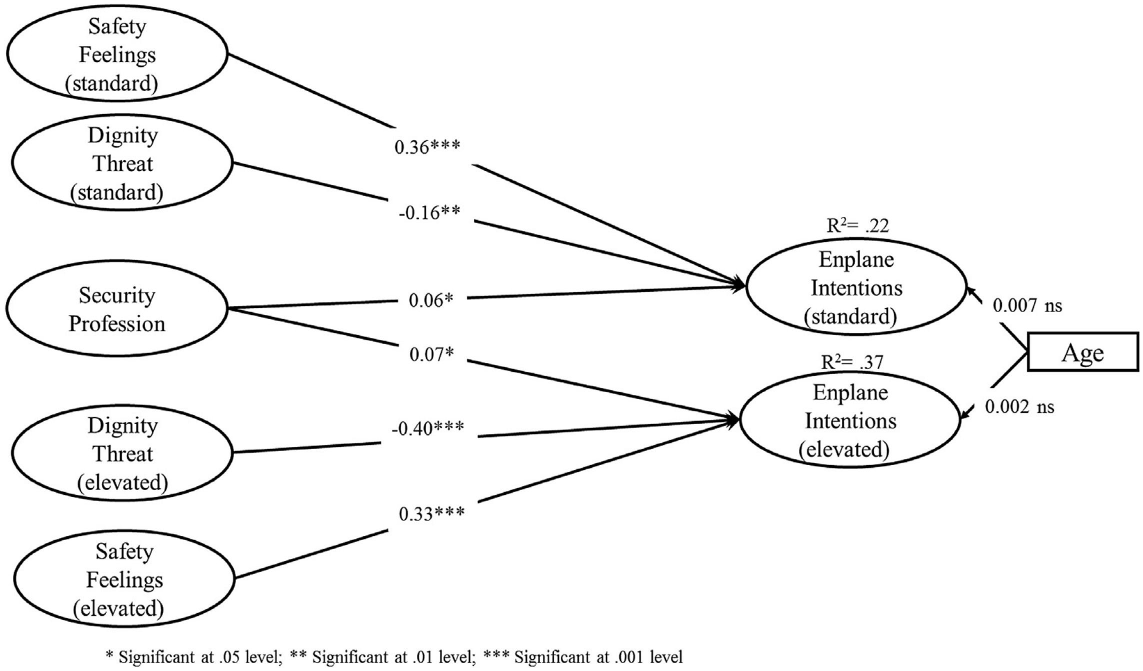

Fig. 1. Theoretical model 1 (M_{T1}).

5.3. Mediation analysis

To test the hypotheses regarding mediated effects (see, H1B and H3B); a mediation analysis was performed by testing the significance of the indirect (mediated) effects in the model (MacKinnon et al., 2007; Preacher and Hayes, 2004; Shrout and Bolger, 2002). A bias-corrected bootstrapping test with 2000 replications was used to produce estimates of the regression coefficients for the standardized direct and indirect effects, with significance levels and 95% confidence intervals. If the indirect effect for a tested path is significant, and the confidence interval does not include 0, the effect is said to be either fully or partially mediated through a factor. The estimated standardized direct and indirect effects are provided below with standard errors in brackets.

Firstly, the standardized indirect effect of F7 (*Security professionalism*) on F1 (*Enplanement Intentions/Standard*) as mediated through F3 (*Safety Feelings/Standard*), was statistically significant ($b = .130$ [.022], $p < .001$, 95% CI [.09, .181]). A further examination

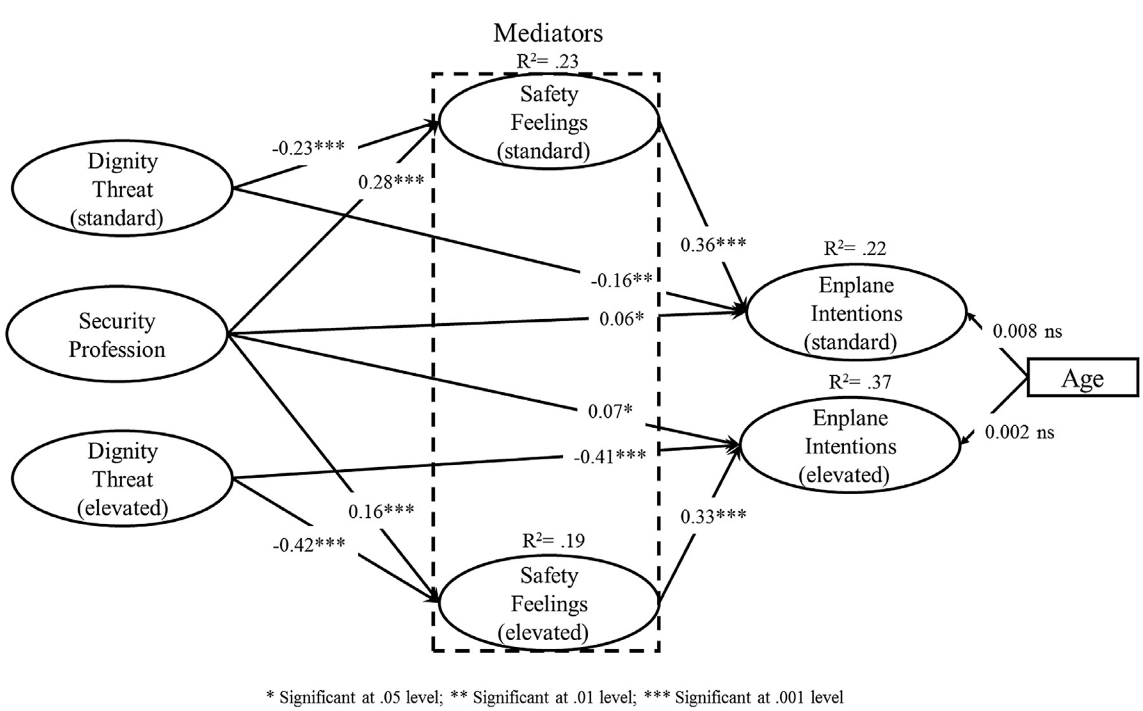

Fig. 2. Revised model (M_{T2}).

of the standardized direct effects, revealed that the direct effect of F7 on F3 was non-significant ($b = .09$ [.048], $p = .072$, 95% CI [−.008, .176]). This indicates that the effect of F7 on F1 was fully mediated through F3. Additionally, the standardized indirect effect of F7 (*Security professionalism*) on F2 (*Enplanement Intentions/Elevated*), as mediated through F4 (*Feelings of safety/Elevated*) was also significant ($b = .034$ [.017], $p < .05$, 95% CI [.002, .069]), while the direct effect of F7 on F4 was non-significant ($b = .078$ [.042], $p = .072$, 95% CI [−.006, .159]). This also indicates, that this effect was fully mediated, confirming hypothesis H1B.

The same mediation analysis was used to test the standardized indirect effect of F5 (*Dignity threat/Standard*) on F1 (*Enplanement Intentions/Standard*) as mediated through F3 (*Safety Feelings/Standard*). The indirect effect analysis revealed a significant, negative, relationship of F5 on F1 ($b = -.064$[.017], $p < .001$, 95% CI [−.034, −.102]). As the direct effect was also statistically significant ($b = -.120$ [.033], $p < .001$, 95% CI [−.049, −.182]), this suggests that the effect was only partially mediated through F3. Additionally, the standardized indirect effect of F6 (*Dignity threat/elevated*) on F2 (*Enplanement Intentions/elevated*) as mediated through F4 (*Feelings of safety/Elevated*) was also analyzed. Similar to standard security measures, the indirect effect for elevated measures also demonstrated a significant negative relationship, ($b = -.122$ [.02], $p < .001$, 95% CI [−.087, −.167]), and the direct effect was also statistically significant ($b = -.405$ [.052], $p < .001$, 95% CI [−.314, −.513]), indicating partial mediation confirming hypothesis H3B.

5.4. Multi-group moderation results

To determine whether the relationships in the theoretical model are affected by multi-group moderators (racial ancestry, gender), two multi-group analyses were performed. To summarize, we tested whether any of the path coefficients in the M_{T2} model differed between groups for Caucasians vs. other ancestries, and for females vs. males. Similar to Radomir and Nistor (2013), we followed Gaskin's (2011, 2012) method of multi-group moderation using critical ratios. AMOS generates a pairwise parameter comparison matrix which tests all of the pairwise differences between the model parameters generating z-scores. Using these values as critical ratios, the regression weights for each path in the model can be compared between groups. Firstly, it is noted that racial ancestry did not significantly moderate any of the relationships in the model (see Table 5A). Secondly, gender was found to moderate one relationship in the model, the path from F7 (*Security professionalism*) to F4 (*Safety feelings/Elevated*) (see Table 5B). It was found that while men tended to exhibit a significant positive association between these factors (standardized regression coefficient = .261), women exhibited no significant relationship.

Table 5
Significance of group differences for each relationship in theoretical model M_{T2}. A. Group differences for Racial Ancestry (Caucasian vs. other). B. Group differences for gender (Female vs. male).

Causal path (in M_{T2})	Estimated regression weight		*Z*-score	Significance
	Caucasian	Other		
Dignity/stand → Safety/stand	−.285	−.191	.811	ns
Dignity/elev → Safety/elev	−.344	−.464	−1.094	ns
Professional → Safety/stand	.236	.301	.976	ns
Professional → Safety/elev	.158	.152	−.073	ns
Safety/stand → Intent/stand	.405	.344	−.621	ns
Safety/elev → Intent/elev	.245	.364	1.402	ns
Dignity/stand → Intent/stand	−.131	−.178	−.450	ns
Dignity/elev → Intent/elev	−.510	−.353	1.495	ns
Professional → Intent/stand	.057	.053	−.057	ns
Professional → Intent/elev	.046	.064	.286	ns
Age → Intent/stand	−.002	.008	.697	ns
Age → Intent/elev	.002	.014	.921	ns
Causal path (in M_{T2})	Estimated regression weight		*Z*-score	Significance
	Women	Men		
Dignity/stand → Safety/stand	−.206	−.268	−.537	ns
Dignity/elev → Safety/elev	−.486	−.319	1.569	ns
Professional → Safety/stand	.270	.272	.024	ns
Professional → Safety/elev	**.091**	**.261**	**2.281**	**
Safety/stand → Intent/stand	.300	.419	1.293	ns
Safety/elev → Intent/elev	.360	.316	−.0547	ns
Dignity/stand → Intent/stand	−.194	−.111	.810	ns
Dignity/elev → Intent/elev	−.355	−.504	−1.507	ns
Professional → Intent/stand	.050	.078	.438	ns
Professional → Intent/elev	.108	−.008	.864	ns
Age → Intent/stand	.009	.008	−.106	ns
Age → Intent/elev	−.006	.012	1.216	ns

Note. ns − not significant. Intent = Enplanement Intentions, stand = standard security measures, elev = elevated security measures. **$p < .05$.

6. Discussion and conclusions

The current study makes a unique contribution to the literature in that the current model is the first to examine standard and elevated-risk security measures independently in a single model. The results indicate that while both are similarly considered by travelers, elevated security measures introduce added concerns regarding personal privacy, and the heightened potential for humiliation; this caused the perceived dignity threat for elevated procedures to exhibit much stronger negative relationships with perceived safety and with enplanement intentions. Additionally, women, unlike men, did not demonstrate a positive relationship between the perceived professionalism of Canadian airport security personnel and feelings of safety judgments for elevated risk screening techniques, suggesting a fundamental difference in how standard and elevated risk screening measures are viewed by women versus men. While more research is required, it may be that generally, men are more inclined to feel that if airport security are acting professionally, elevated screening measures will, in turn, enhance safety. Women may be less inclined to perceive this connection due to heightened concerns regarding personal privacy issues arising from elevated screening.

Additionally, while our study did not find any differences between the Caucasian respondents and respondents who answered a different racial ancestry category, there is evidence from previous research to indicate that some ethnic groups may be more sensitive to the issue of airport security than others. For example, African-American respondents believed that racial profiling at airports was more widespread, and were less likely to consider it justified than members of other ethnic groups (Gabbidon et al., 2009), and in general believe there to be more biases in the justice system (Gabbidon and Greene, 2009; Gabbidon and Higgins, 2008). Therefore, collapsing all of the respondents who answered an ancestry besides Caucasian into a single group, while convenient for structuring the current model, may not yield completely accurate results. Future studies in this area should to represent racial ancestry categories as independent groups.

The current study also highlights the importance of security professionalism, particularly in the wake of several recent studies suggesting a large degree of subjectivity in how airport security personnel interprets the administration of security screening measures. For example, a recent ethnography study revealed that airport security employees often reported being willing to bend or fully break the rules when the situation “called for it” (Kirschenbaum et al., 2012a, 2012b). The most common form of reported injustice experienced when dealing with people in a position of administrative power – in general – involves disrespectful treatment (Lupfer et al., 2000; Mikula, 1986). However, when one aspect of justice is retained, people tend to perceive their treatment as having been fair. For example, an unfavorable procedural outcome – such as being randomly selected for elevated security screening – can still result in satisfaction as long as interpersonal treatment (i.e., procedural justice) is perceived as satisfactory (Skarlicki and Folger, 1997). As Hasisi and Weisburd (2011), and the results of the current study demonstrated, perceived safety – a factor that is highly important in determining satisfaction, and in turn enplanement intentions (Gilbert and Wong, 2003) – is directly, negatively impacted by increased feelings of humiliation, or dignity threat, an important consideration for airport security personnel training.

Additionally, there is good reason to believe that intentions are in fact predictive of behavior (Manski, 1990), for example, voting intentions have been used to successfully predict the outcomes of elections (Turner and Martin, 1984), while it has long been known that surveys on buying intentions can successfully predict future purchasing behavior (Juster, 1966). Similarly, attitudes and social norms, in addition to behavioral intentions have been used to successfully predict overt behavior using basic path models (Fishbein and Ajzen, 1975; Ajzen and Fishbein, 1980). As a result, enplanement intentions may be a good indicator of airplane ticket purchasing behaviors, however, this will need to be further addressed.

This study exhibited a number of major limitations. Firstly, as mentioned above, the questionnaire was administered to a sample of undergraduate university students causing the sample to be relatively homogeneous in both age and education-level. Secondly, the current study did not distinguish between different passenger sub-groups, for instance frequent versus infrequent flyers; or business from leisure flyers. Since the model was developed using a student sample, where the majority of the flights were intended for leisure purposes, it is therefore possible that this model may not be valid for business travelers. As previous studies have shown, business travelers appear to place less emphasis on overall safety than leisure travelers (Ringle et al., 2011), these travelers should be investigated as separate groups.

Thirdly, it should be noted that the questionnaire was generally worded, and did not directly tap into the respondent's first-hand experiences with airport security measures. It may be the case that these assessments are also being influenced by second-hand sources of information (e.g., stories heard from friends/family, news reports), and that their reactions, based on these second-hand sources, is more extreme than would have occurred from firsthand experience. A study by Gilovich (1987) found, for instance, that participants subjected to second-hand information about a target person tended to have more extreme ratings of that person's attributes than participants receiving information first-hand. Additionally, listeners in general do not tend to weigh situational information very heavily when forming second-hand impressions (Inman et al., 1993). Therefore, it is possible that negative second-hand information heard about airport security measures may cause assessments towards these measures to be more extreme than firsthand knowledge. One method around this issue would be for future studies validating this, or similar models, to use samples that have just passed through security screening.

Lastly, there were a number of other variables that were not factored into the current model that may also be impacting enplanement intentions. Financial losses incurred from decreased airline ticket sales were substantial in the past decade – a loss of $49.1 billion dollars in revenue (International Air Transport, 2009) – and are likely the result of numerous complex, interacting factors, including economic downturns paired with the rising price of airline tickets and the increased use of communication technology (e.g., teleconferencing, social media websites). Future research in this area should consider that these, in addition to dignity and safety concerns, will also significantly impact enplanement intentions.

Authors' note

We are grateful to Alexandra Smith for assisting with data entry. Funding for her assistance was provided by the University of Manitoba's Psychology Undergraduate Research Experience (PURE) award. We would also like to thank Cam Huynh and Clove Haviva for their helpful feedback on earlier versions of this manuscript.

Appendix A

Enplanement intentions

Rate the degree to which regular use of each of the following measures would influence your decision to participate in future air travel (1 = much less likely to 5 = much more likely):

Feelings of safety

Rate the degree to which each of the following measures makes you feel safe (1 = not at all safer to 5 = very much safer).

Dignity threat

=Rate the degree to which each of the following measures constitutes a threat to human dignity (1low threat to 5 = high threat)

(1) Passenger bags are scanned by X-ray.
(2) Passengers walk through a metal detector.
(3) A metal detecting wand is used on passengers.
(4) Enhanced hand-to-body pat-downs are used on passengers.
(5) Full body scans.
(6) Strip searches are used on passengers.

Professionalism

(1) Overall, I think behaviors of security personnel at Canadian airports are _____ (1 = completely inappropriate to 9 = extremely appropriate)
(2) Overall, I think security personnel at Canadian airports are ______ trained (1 = extremely poorly to 9 = extremely well)
(3) Overall, I think I am _____ confident about the judgments made by security personnel at Canadian airports (1 = not at all to 9 = extremely)

References

Ajzen, I., Fishbein, M., 1980. Understanding Attitudes and Predicting Social Behavior. Prentice-Hall, Englewood Cliffs, NJ.
Anderson, J.C., Gerbing, D.W., 1988. Structural equation modeling in practice: a review and recommended two-step approach. Psychol. Bull. 103, 411–423.
Bentler, P.M., 1990. Comparative fit indexes in structural models. Psychol. Bull. 107, 238–246.
Bollen, K.A., 1989. Structural Equations with Latent Variables. Wiley, New York.
Boussadia, K., 2009. The evolution of airport screening technology. Biom. Technol. Today 17, 7–8.
Brown, C.H., 1983. Asymptotic comparison of missing data procedures for estimating factor loadings. Psychometrika 48, 269–292.

Carter, R.L., 2006. Solutions for missing data in structural equation modeling. Res. Pract. Assess. 1, 1–6.

Fishbein, M., Ajzen, I., 1975. Belief, Attitude, Intention, and Behavior: an Introduction to Theory and Research. Addison-Wesley, Reading MA.

Fornell, C., Larcker, D.F., 1981. Evaluating structural equation models with unobservable variables and measurement error. J. Mark. Res. 18, 39–50.

Gabbidon, S.L., Greene, H.T., 2009. Race and Crime, second ed. Sage, Thousand Oaks, CA.

Gabbidon, S.L., Higgins, G.E., 2008. Profiling white Americans: a research note on "shopping while white. In: Lynch, M.J., Patterson, E.B., Childs, K. (Eds.), Racial Divide: Race, Ethnicity and Criminal Justice. Criminal Justice Press, Monsey, NY.

Gabbidon, S.L., Penn, E.B., Jordan, K.L., Higgins, G.E., 2009. The influence of race/ethnicity on the perceived prevalence and support for racial profiling at airports. Crim. Justice Policy Rev. 20, 344–358.

Gaskin, J., 2011. Multigroup Moderation in Amos – Made Easy. Retrieved from Gaskination's statistics: http://youtube.com/Gaskination (accessed 20.01.14.).

Gaskin, J., 2012. Group Differences. Retrieved from Stats Tools Package: http://statwiki.kolobkreations.com (accessed 20.01.14.).

Gerbing, D.W., Anderson, J.C., 1993. Monte Carlo Evaluations of Goodness-of-fit Indices for Structural Equation Models, vol. 154. SAGE Focus Editions, p. 40.

Gilbert, D., Wong, R.K.C., 2003. Passenger expectations and airline services: a Hong Kong based study. Tour. Manag. 24, 519–532.

Gilovich, T., 1987. Secondhand information and social judgment. J. Exp. Soc. Psychol. 23, 59–74.

Gkritza, K., Niemeier, D., Mannering, F., 2006. Airport security screening and changing passenger satisfaction: an exploratory assessment. J. Air Transp. Manag. 12, 213–219.

Hasisi, B., Weisburd, D., 2011. Going beyond ascribed identities: the importance of procedural justice in airport security screening in Israel. Law Soc. Rev. 45, 867–892.

Hatcher, L., 1994. A Step-by-step Approach to Using SAS for Factor Analysis and Structural Equation Modeling. SAS Institute Inc, Cary.

Hox, J.J., Bechger, T.M., 1998. An introduction to structural equation modeling. Fam. Sci. Rev. 11, 354–373.

Hu, L., Bentler, P.M., 1999. Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives. Struct. Equ. Model. 6, 1–55.

Inman, M.L., Reichl, A.J., Baron, R.S., 1993. Do we tell less than we know or hear less than we are told? Exploring the teller-listener extremity effect. J. Exp. Soc. Psychol. 29, 528–550.

International Air Transport Association, 2009. US $5.6 Billion Loss in 2010 – Low Yields and Rising Costs Keep Industry in the Red, Press Release no.55, Montreal, December 15. Available online at: www.iata.org/pressroom/pr/2009-12-15-01.htm.

Johnson, M.S., Garbino, E., Sivadas, E., 2006. Influences of customer differences of loyalty, perceived risk and category experience on customer satisfaction ratings. Int. J. Mark. Res. 48, 601–622.

Juster, T., 1966. Consumer buying intentions and purchase probability: an experiment in survey design. J. Am. Stat. Assoc. 61, 658–696.

Kirschenbaum, A., Mariani, M., Gulijk, C.V., Lubasz, S., Rapaport, C., Andriessen, H., 2012a. Airport security: an ethnographic study. J. Air Transp. Manag. 18, 68–73.

Kirschenbaum, A., Rapaport, C., Lubasz, S., Mariani, M., Gulijk, C.V., Andriessen, H., 2012b. Security profiling of airport employees: complying with the rules. Airport Manag. 6, 373–380.

Lupfer, M.B., Weeks, K.P., Doan, K.A., Houston, D.A., 2000. Folk conceptions of fairness and unfairness. Eur. J. Soc. Psychol. 30, 299–346.

MacCallum, R.C., Austin, J.T., 2000. Applications of structural equation modeling in psychological research. Annu. Rev. Psychol. 51, 201–226.

MacKinnon, D.P., Fairchild, A.J., Fitz, M.S., 2007. Mediation analysis. Annu. Rev. Psychol. 58, 593.

Manski, C.F., 1990. The use of intentions data to predict behavior: a best-case analysis. J. Am. Stat. Assoc. 85, 934–940.

Marsh, H.W., Hocevar, D., 1985. Application of confirmatory factor analysis to the study of self-concept: first and higher order factor models and their invariance across groups. Psychol. Bull. 97, 562.

Marsh, H.W., Hau, K.T., Wen, Z., 2004. In search of golden rules: comment on hypothesis testing approaches to setting cutoff values for fit indexes and dangers in over-generalizing Hu & Bentler's (1999) findings. Struct. Equ. Model. 11, 320–341.

Mikula, G., 1986. The experience of injustice: toward a better understanding of its phenomenology. In: Bierhoff, H.W., Cohen, R.L., Greenberg, J. (Eds.), Justice in Social Relations. Plenum, New York, pp. 103–124.

Mitchener-Nissen, T., Bowers, K., Chetty, K., 2012. Public attitudes to airport security: the case of whole body scanners. Secur. J. 25, 229–243.

O'Malley, P., 2006. Risks, ethics, and airport security. Can. J. Criminol. Crim. Justice 48, 413–421.

Persico, N., Todd, P.E., 2005. Passenger profiling, imperfect screening and airport security. Am. Econ. Rev. 95, 127–131.

Preacher, K.J., Hayes, A.F., 2004. SPSS and SAS procedures for estimating indirect effects in simple mediation models. Behav. Res. Methods, Instrum. Comput. 36, 717–731.

Radomir, L., Nistor, V.C., 2013. An application of technology acceptance model to internet banking services. In: International Conference "Marketing – from Information to Decision", vol. 6, pp. 251–266.

Ringle, C.M., Sarstedt, M., Zimmermann, L., 2011. Customer satisfaction with commercial airlines: the role of perceived safety and purpose of travel. J. Mark. Theory Pract. 19, 459–472.

Rubin, D.B., 1976. Inference and missing data. Biometrika 61, 581–592.

Sindhav, B., Holland, J., Rodie, A.R., Adidam, P.T., Pol, L.G., 2006. The impact of perceived fairness on satisfaction: are airport security measures fair? Does it matter? J. Mark. Theory Pract. 14, 323–335.

Shrout, P.E., Bolger, N., 2002. Mediation in experimental and nonexperimental studies: new procedures and recommendations. Psychol. Methods 7, 422.

Skarlicki, D.P., Folger, R., 1997. Retaliation in the workplace: the roles of distributive, procedural, and interactional justice. J. Appl. Psychol. 82, 434–443.

Squalli, J., Saad, M., 2006. Accidents, airline safety perceptions and consumer demand. J. Econ. Financ. 30, 297–305.

Travel Industry Association of America Research Department, United States Bureau of Transportation Statistics, November 15, 2002. TIA/BTS Air Travel Survey Results. Travel Industry Association of America.

Turner, C., Martin, E., 1984. Surveying Subjective Phenomena, vol. 1. Russell Sage Foundation, New York.