Aviation Psychology

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LIST OF ABBREVIATIONS

AIEST:	Association of International Scientific Tourism Experts
AIS:	Automatic Identification System
AME:	Aviation Medicine
APA:	American Psychological Association
BA:	Bachelor of Arts
BALPA:	British Airline Pilots Association
CEO:	Chief Executive Officer
CHP:	Cumhuriyet Halk Partisi
CRM:	Crew Resource Management
EASA:	European Aviation Safety Agency
ECAC:	European Civil Aviation Conference
EFPSA:	European Federation of Psychology Students' Associations
EMDR:	Eye Movement Desensitization and Reprocessing
EQ:	Emotional Qualities
ER:	Extended Range
ERB:	Equivalent Rectangular Bandwidths
FAA:	The Federal Aviation Administration

FBI:	Federal Bureau of Investigation
FO:	First Officer
FRMS:	The Fatigue Risk Management System
FTL:	Flight Time Limitations
GPS:	Global Positioning System
HDP:	Halklarin Demokratik Partisi
HR:	Human Resources
IATA:	International Air Transport Association
ICAO:	International Civil Aviation Organization
İŞİD, ISIS:	The Islamic State of Iraq and al Sham
İSTKA:	Istanbul Development Agency
MA:	Master of Arts
MANPADS:	Man Portable Air Defense Systems
MHP:	Milliyetçi Hareket Partisi
MRI:	Magnetic Resonance Imaging
NCCM:	National Council of Canadian Muslims
NGO:	Non-governmental Organizations
NSF:	National Sleep Foundation
PAC:	Parent, Adult, Child
PESA:	Political, Economic and Social Research
PPS:	Pilot Peer Support

PTSD:	Post Traumatic Stress
RPG:	Rocket Propelled Grenades
RTUK:	Radio and Television Supreme Council
SA:	Situational Awareness
SMS:	Sequrity Menagement System
SOP:	Standard Operating Procedure
SPSS:	Statistical Package for the Social Sciences
SWAT:	Special Weapons and Tactics
TA:	Transactional Analysis
TAPATE:	TA Proficiency Award for Teachers & Educators
TGS:	Turkish Ground Service
THY:	Türk Hava Yollari (Turkish Airlines)
ULR:	Long Range
UN:	United Nations
UNDAC:	UN Disaster Assessment and Coordination Team
VR:	Virtual Reality

INTRODUCTION

This book brings together professors, participants, and students of the Aviation Psychology Certification Course, held in Turkey for the first time and coordinated by our very valuable teacher, flight doctor and psychiatrist Muzaffer Çetingüç, and I. In this atmosphere of coming together, we wished to produce a work that will help interested students cut their teeth on the subject. The idea of writing this book, which is the first collective work in the field in our country, has been a heart filling proposition.

The most important motivations for travel include reunion and escape. As the pioneers of the adventure of human flight, which started with the integration of human intelligence and a desire for freedom, rising to heaven, imagination, power, curiosity, and a sense of discovery (Ikarus, Pegasus, Tulpar, Burak) and continued in the forms of Abbas İbni Firnas in the 9th century, İsmail Cevheri in the 10th century, Hezarfen Ahmet Çelebi Montgolfier in the 17th century, and finally the Wright brothers in the 20th century.

The mechanical adaptability of humanity, in contrast to its lack of ability for natural flight, has become one of the most important examples of human-machine harmony. The adventure of human flight has been achieved by physically straining beyond our nature. The human factor has been identified as one of the most important variables in flight. As Dr. Charles Richet said in 1912, “the most dangerous element for a pilot is his own psychology”; in 1919, Oliver Gotch added “there is no more important field in aviation than flight psychology”; and in 2010 Dr. R.W. McClellan emphasized that “the biggest risk factor in aviation accidents is the pilot's psychology and decision making.” As a result of this awareness, as I mentioned in the Aviation Psychology Course in 2017: “there was a cool air of psychology, now the air has its psychology.”

After the Germanwings incident, the place and importance of psychology in aviation has been seen to increase due to its positive and negative effects on various facts and processes, such as motivation,

performance, task success, human assets, customer experience, economy, development, and accidents, etc. The aviation sector has become an academy for the most important studies and research into this issue because of the high risks encountered and has become a driver in the sector. Security studies in the aviation sector, such as those on human-based human factors, human performance, SMS, CRM, and PPS etc., where vital responsibilities are assumed, have been pioneering in other sectors too.

We would like to share with you a variety of topics from different schools and disciplines ranging across the field of the behavioural sciences and the aviation industry, to better understand this adventure, which began with the idea of travelling from one place to another, and to raise the psychological perspective to aviation. We wish you pleasant reading with the hope that it will shed light on other work that still needs to be done.

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CHAPTER ONE

THE EFFECT OF AIRCRAFT PILOTS' VOCAL PITCH ON THE TRUST PERCEPTION OF PASSENGERS

GAMZE YEŞILLI PUZELLA AND ÖMER AKGÜL

Abstract

In aircrafts, passenger announcements are the only way to give information to passengers about the general situation of the flight, destination information, and information about unexpected situations. Because the passengers do not have the chance to see the pilot, the only way that they can get information about the professional who flies the plane is through passenger announcements. The articulation skills, vocal characteristics, and vocal pitch of the pilot may all give an impression about the pilot. To understand the effect of a pilot's vocal pitch (lower or higher pitch) on the passengers, we created a sample passenger announcement in a phonetic lab, and manipulated the original version of the announcement to yield higher-pitched and lower pitched versions. 172 participants (78 male and 94 female) with and without fear of flying, and with different levels of education, listened to these higher and lower-pitched versions of the passenger announcement and were asked to choose between them (higher or lower-pitched) or suggest that 'they don't differ' in answering four questions aimed to evaluate trust perception. The results revealed that participants of different educational levels, and with and without fear of flying, preferred the lower-pitched pilot voice, rather than the higher-pitched pilot voice or choosing the 'they don't differ' option for each question. The results of this study suggest that a lower-pitched pilot voice has an important influence on enhancing trust among passengers.

Pilot training schools should perhaps include vocal training lessons to train pilot candidates to use a lower-pitched voice during passenger announcements.

Introduction

Fundamental frequency (F0) refers to the vibratory closing and opening of the vocal cords in one second—it is measured in Hz. Developmentally, F0 values for humans change throughout their lives. The F0 value for men is generally around 125 Hz; for women it is around 225 Hz and F0 values change with age. For example, at the ages of 6 and 7, boys and girls have a similar F0 value of near 285-295 Hz. Later, with the effect of maturation, by young adulthood the F0 of males starts to descend to about 125 Hz, while the F0 of females drops to about 220 Hz. With aging, the F0 values of women start to drop and the values of men start to rise (Boone & McFarlane, 1999; Sataloff, 2005).

F0 is defined by the thickness, length, and elasticity of the vocal cords. Anatomically, shorter, thicker, and laxer vocal cords tend to vibrate more slowly. The vocalis contracts and vocal cord length shortens; as a result, a lower F0 is produced and listeners perceive a low F0 as having a low pitch. Contrary to this, longer, thinner, and tenser vocal cords have a faster vibration rate. With the contraction of the cricothyroid muscle vocal cords lengthen, a higher F0 is generated and listeners perceive these high F0 values as high pitched (Boone & McFarlane, 1999; Stemple, Glaze & Klaben). F0 and pitch are related to each other, but they do not refer to the same thing. F0 is a physical attribute of voice, whereas pitch is the perception of F0 by the human ear and is more closely related to the psychological properties of voice (Sataloff, 2005).

Even if the production of high or low pitch is mostly defined by larynx anatomy, it is possible for a person to change his/her speaking pitch. For this reason, some professionals undergo vocal training to have a more impressive effect on their audiences, since vocal pitch may impact the perception of listeners in both positive and negative ways. There are some scientific studies showing the effect of vocal pitch on listeners. Tigue, Borak, O'Connor, Schandl, and Feinberg (2012), tested the influence of voice pitch on voting behaviours and found that people preferred to vote for lower-pitched politicians, rather than higher-pitched politicians.

Research made on voting preferences revealed that male and female participants chose lower-pitched politicians when they were asked to vote for digitally manipulated voice recordings with higher and lower-pitched versions of the original voice. This result is thought to be related to the fact that lower pitched voices are perceived to be stronger and more trustworthy (Klofstad, Anderson & Peters, 2012, pp.2698-2704). Cartei, Bond, and Reby (2014), asked female participants to listen to male voices and vote on their masculinity based only on their voices. The results revealed that male speakers who had a lower F0 were rated as more masculine. Feinberg, Jones, Little, Burtand, and Perrett (2005), manipulated the F0 values of male voice recordings and asked female listeners to assess their masculinity. They found out that female ratings for masculinity increased for lower-pitched voices.

Considering the voice pitch and its impact on the perception of people, many professionals seek voice therapy support to change their voice pitch. The idea that some professions could achieve more trust with voice pitch control could be beneficial for both professionals and customers. Flight pilots are one group of those professionals that warrant specific occupational properties. Passengers do not see or meet the pilots. The only way that passengers get an impression of a pilot is through passenger announcements. Passengers need to get information about the general situation of the flight and any problems that occurr during it. Because passengers can only hear the voice of the pilots, it is important they have clear, appropriate pitch control and articulation skills. To our knowledge, no research has been done to evaluate the effect of pilot voice pitch on the passenger perceptions of trust. The aim of this study is to evaluate the effect of flight pilots' voice pitch on passengers' trust perception.

Material and Methods

Experimental Stimuli

The voice of a young male speaker in the role of a pilot was recorded making a passenger announcement. The voice recording was made in an acoustically isolated environment with an Audio-Techica (www.audio-technica.com) AT2005 microphone at a 44.1 kHz sampling rate with 16-bit amplitude. Audacity (R) version 2.3.1 recording and editing software was used to save the pilot announcement. The announcement was in the

Turkish language and said: “Ladies, gentlemen, and dear children, this is the captain speaking. In a few minutes, we will be passing through an area of turbulence. Please remain seated with your seat belts fastened. Thank you for your cooperation” (for the announcement text with original language see appendix A). The voice recording was saved in WAV format and Praat (Boersma & Weenink, 2009) software was used to measure and manipulate the pitch of the voice. A standard pitch manipulation technique used in previous voice pitch perception research was used in our research (Apicella & Feinberg, 2009; Feinberg et al., 2005; Klofstad et al., 2012; O’Connor, Pisanski, Tigue, Fraccaro, & Feinberg, 2014; Tigue et al., 2012, pp.1077-1082). The Pitch-synchronous Overlap Add (PSOLA) method was used with Praat software (Boersma & Weenink, 2009) to create lower and higher- pitched versions of the original recording. With this technique, the voice recording was changed +/– 0.5 equivalent rectangular bandwidths (ERBs). Manipulation of hertz was not used because the relationship between absolute and perceived pitch in humans is logarithmic (Klofstad et al., 2012, pp.2698-2704). With the manipulation of ERB, one higher and one lower-pitched version of the original recording were produced and each manipulated recording yielded a perception of around of +/– 20 Hz.

Participants

The participants of this study were (N = 172) 78 males of age 18-68 and 94 females of age 17-65 (table 1). Participants with different educational levels (high school and less than high school certificate; bachelor’s degree; and postgraduate degree) participated in our study (table 2). This study comprised participants who did and not have a fear of flying, of varying degrees (table 3).

Table 1 - Participants

	N	Age				
		Mean	Standard Deviation	Median	Minimum	Maximum
Female	94	34	12	32	17	65
Male	78	38	10	36	18	68
Total	172	35 (mean)				

Table 2 - Level of Education

Level of Education	N	%
Post graduate	37	0,22
High school and less than high school	29	0,17
Bachelor	106	0,62

Procedure

The participants filled in a demographic information form (tables 1 and 2). To evaluate their fear of flight status, they were asked to answer the question 'Are you afraid during a flight?' and chose one of the options given to them (never; sometimes; always) (table 3).

For the announcement task, participants listened to the pair of passenger announcements created by us (lower-pitched and higher pitched versions). They were then asked to choose one of three options (pilot A; pilot B; they don't differ) for the following questions: (1) which pilot would you trust more if you were in the aircraft? (2) With which pilot would you have less fear of flying if you were in the aircraft? (3) Which pilot do you think is more experienced in his professional life? (4) If there was an unexpected emergency situation (bad weather conditions, technical problems etc.), which pilot do you think could manage the situation better? The subjects listened to the pair of passenger announcement recordings before each question and were asked to choose one of the three options mentioned above.

Table 3 - The existence and frequency of fear of flying status

	Frequency	N	%
'Are you afraid during a flight?'	Sometimes	70	0,41
	Always	50	0,29
	Never	52	0,30

Statistics

Statistical analyses in this study were carried out using the IBM SPSS statistical analysis program version 20.0 (IL, Chicago, USA). The data are presented in the form of the mean, median, standard deviation, minimum,

maximum, percentage and number. The Shapiro Wilk test is used to test the normalisation control of continuous variables. The independent samples T test is used to compare the normally distributed data of two independent groups. For variables that are not normally distributed, the Mann Whitney U test is used. The Chi-square test and Fisher's exact test are used to define the association between categorical variables. The significance interval was taken as $p<0.05$.

Results

At the end of this research, we found a statistically significant difference between the rates of the answers given to the four questions (table 4). The results revealed that the participants chose the lower-pitched pilot voice (pilot B) significantly more than the higher-pitched pilot voice (pilot A) and the 'they don't differ' choice ($p<0.001$).

Table 4 - Results of statistical analysis of the choices of participants for the four questions

Questions	Answers	N	%	Chi-square	p value
Which pilot would you trust more if you were in the aircraft?	Higher-pitched	23	0,13	99,919	,000
	Lower-pitched	119	0,69		
	They don't differ	30	0,17		
With which pilot would you have less fear of flying if you were in the aircraft?	Higher-pitched	17	0,10	77,174	,000
	Lower-pitched	109	0,63		
	They don't differ	46	0,27		
Which pilot do you think is more experienced in his professional life?	Higher-pitched	16	0,09	154,093	,000
	Lower-pitched	134	0,78		
	They don't differ	22	0,13		

If there was an unexpected emergency situation (bad weather conditions, technical problems etc.), which pilot do you think could manage the situation better?	**Higher-pitched**	**16**	**0,09**	**115,337**	**,000**
	Lower-pitched	123	0,72		
	They don't differ	33	0,19		

Table 5 shows the ratio of the answers to the four questions given by men and women. The results of this study reveal that both men and women chose the lower pitched pilot voice (pilot B) significantly more than the higher-pitched pilot voice (pilot A) and the 'they don't differ' choice ($p<0.001$). Table 6 shows detailed results of the statistical analysis of the answers to the four questions given by men and women.

Table 5 - Results of statistical analysis of the answers to the four questions given by men and women

Sex	Questions	Answers	N	%	Chi-square	p value
Male	Which pilot Would you trust more if you were in the aircraft?	Higher-pitched	8	0,10	46,462	,000
		Lower-pitched	54	0,69		
		They don't differ	16	0,21		
	With which pilot would you have less fear of flying if you were in the aircraft?	Higher-pitched	6	0,08	36,077	,000
		Lower-pitched	49	0,63		
		They don't differ	23	0,29		
	Which pilot do you think is more experienced in his professional life?	Higher-pitched	7	0,09	70,846	,000
		Lower-pitched	61	0,78		
		They don't differ	10	0,13		

	If there was an unexpected emergency situation (bad weather conditions, technical problems etc.), which pilot do you think could manage the situation better?	Higher-pitched	7	0,09	56,385	,000
		Lower-pitched	57	0,73		
		They don't differ	14	0,18		
Female	Which pilot would you trust more if you were in the aircraft?	Higher-pitched	15	0,16	54,277	,000
		Lower-pitched	65	0,69		
		They don't differ	14	0,15		
	With which pilot would you have less fear of flying if you were in the aircraft?	Higher-pitched	11	0,12	41,638	,000
		Lower-pitched	60	0,64		
		They don't differ	23	0,24		
	Which pilot do you think is more experienced in his professional life?	Higher-pitched	9	0,10	83,255	,000
		Lower-pitched	73	0,78		
		They don't differ	12	0,13		
	If there was an unexpected emergency situation (bad weather conditions, technical problems etc.) which pilot doyou think could manage the situation better?	Higher-pitched	9	0,10	59,128	,000
		Lower-pitched	66	0,70		
		They don't differ	19	0,20		

Table 6 - Results of statistical analysis of the answers of men and women to the four questions

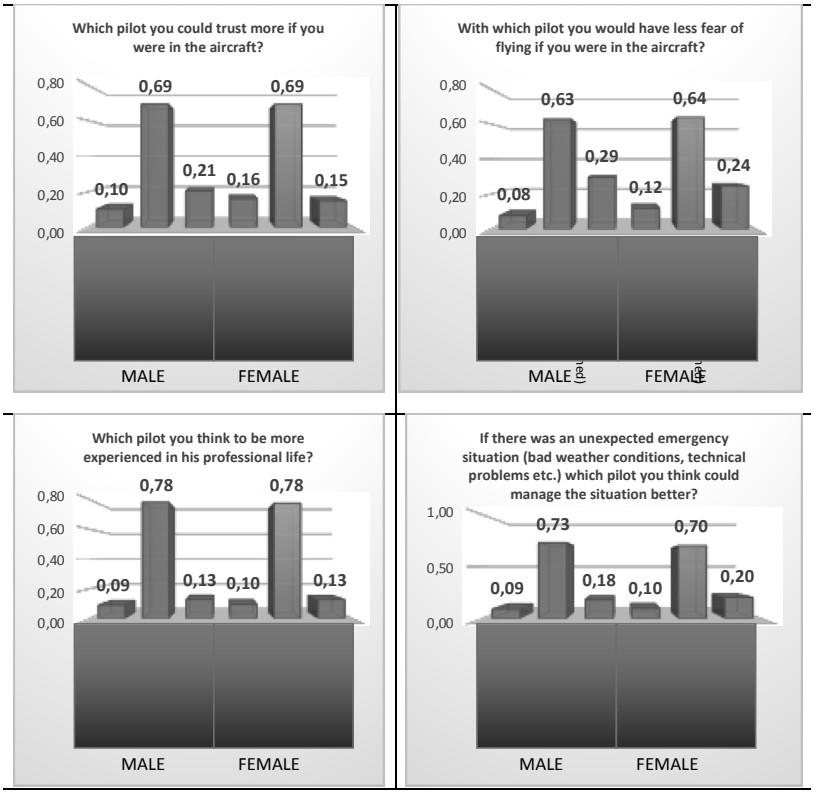

Table 7 shows the ratio of the answers given by the participants with ther level of education (high school and less than high school; bachelor; postgraduate). The results showed that no matter what the participant's education level, they chose the lower pitched pilot voice (pilot B) significantly more often than the higher-pitched pilot voice (pilot A) and the 'they don't differ' choice ($p<0.05$).

Table 7 - Results of statistical analysis of the answers of the participants according to different educational levels

Level of education	Questions	Answers	N	%	Chi-square	p value
Post graduate	Which pilot would you trust more if you were in the aircraft?	Higher-pitched	5	0,14	29,892	,000
		Lower-pitched	28	0,76		
		They don't differ	4	0,11		
	With which pilot would you have less fear of flying if you were in the aircraft?	Higher-pitched	2	0,05	24,703	,000
		Lower-pitched	26	0,70		
		They don't differ	9	0,24		
	Which pilot do you think is more experienced in his professional life?	Higher-pitched	3	0,08	47,081	,000
		Lower-pitched	32	0,86		
		They don't differ	2	0,05		
	If there was an unexpected emergency situation (bad weather conditions, technical problems etc.), which pilot do you think could manage the situation better?	Higher-pitched	2	0,05	27,622	,000
		Lower-pitched	27	0,73		
		They don't differ	8	0,22		
High school	Which pilot would you trust	Higher-pitched	7	0,24	6,276	,043

and less than high school	more if you were in the aircraft?	Lower-pitched	16	0,55		
		They don't differ	6	0,21		
	With which pilot would you have less fear of flying if you were in the aircraft?	Higher-pitched	5	0,17	10,828	,004
		Lower-pitched	18	0,62		
		They don't differ	6	0,21		
	Which pilot do you think is more experienced in his professional life?	Higher-pitched	4	0,14	13,724	,001
		Lower-pitched	19	0,66		
		They don't differ	6	0,21		
	If there was an unexpected emergency situation (bad weather conditions, technical problems etc.), which pilot do you think could manage the situation better?	Higher-pitched	7	0,24	11,241	,004
		Lower-pitched	18	0,62		
		They don't differ	4	0,14		
Bachelor	Which pilot would you trust more if you were in the aircraft?	Higher-pitched	11	0,10	67,943	,000
		Lower-pitched	75	0,71		
		They don't differ	20	0,19		
	With which pilot would you have less fear of flying if you were in the	Higher-pitched	10	0,09	43,604	,000
		Lower-pitched	65	0,61		

	aircraft?	They don't differ	31	0,29		
	Which pilot do you think is more experienced in his professional life?	Higher-pitched	9	0,08	96,811	,000
		Lower-pitched	83	0,78		
		They don't differ	14	0,13		
	If there was an unexpected emergency situation (bad weather conditions, technical problems etc.), which pilot do you think could manage the situation better?	Higher-pitched	7	0,07	80,057	,000
		Lower-pitched	78	0,74		
		They don't differ	21	0,20		

Table 8 shows the results of statistical analysis of participants' answers to the question 'Are you afraid during the flight?' No matter what their answer (sometimes; never; always), participants chose the lower pitched pilot voice (pilot B) significantly more often than the higher-pitched pilot voice (pilot A) and the 'they don't differ' choice ($p<0,001$).

Table 8 - Results of statistical analysis of the answers given to the question 'Are you afraid during a flight?'

Frequency of fear of flying status	Questions	Answers	N	%	Chi-square	p value
Sometimes	Which pilot would you trust more if you were in the aircraft?	Higher-pitched	11	0,16	33,114	,000
		Lower-pitched	46	0,66		
		They don't differ	13	0,19		
	With which pilot would you have less fear of flying if you were in the aircraft?	Higher-pitched	8	0,11	29,600	,000
		Lower-pitched	44	0,63		
		They don't differ	18	0,26		
	Which pilot do you think is more experienced in his professional life?	Higher-pitched	5	0,07	61,229	,000
		Lower-pitched	54	0,77		
		They don't differ	11	0,16		
	If there was an unexpected emergency situation (bad weather conditions, technical problems etc.), which pilot do you think could manage the situation better?	Higher-pitched	7	0,10	35,171	,000
		Lower-pitched	46	0,66		
		They don't differ	17	0,24		
Always	Which pilot would you trust more if you were in the	Higher-pitched	5	0,10	53,320	,000
		Lower-pitched	41	0,82		

	aircraft?	They don't differ	4	0,08		
	With which pilot would you have less fear of flying if you were in the aircraft?	Higher-pitched	5	0,10	31,000	,000
		Lower-pitched	35	0,70		
		They don't differ	10	0,20		
	Which pilot do you think is more experienced in his professional life?	Higher-pitched	5	0,10	53,320	,000
		Lower-pitched	41	0,82		
		They don't differ	4	0,08		
	If there was an unexpected emergency situation (bad weather conditions, technical problems etc.), which pilot do you think could manage the situation better?	Higher-pitched	5	0,10	57,880	,000
		Lower-pitched	42	0,84		
		They don't differ	3	0,06		
Never	Which pilot would you trust more if you were in the aircraft?	Higher-pitched	7	0,13	19,654	,000
		Lower-pitched	32	0,62		
		They don't differ	13	0,25		
	With which pilot would you have less fear of flying if you were in the aircraft?	Higher-pitched	4	0,08	19,538	,000
		Lower-pitched	30	0,58		
		They don't differ	18	0,35		
	Which pilot do you think is more	Higher-pitched	6	0,12	40,654	,000
		Lower-	39	0,75		