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Using the best - worst scale to assess the relative impact of these behaviors on other passengers on the same flight: The disruptive passenger behavior

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The disruptive behavior of passengers is one of the top concerns for airline crew members (Colehan, 2016; IATA, 2017). In the context of air travel, this issue has been a subject of research interest, not only from a legal perspective to ensure flight safety but also from a service provision perspective, focusing on the passenger experience during the flight. According to Colehan (2016), disruptive passengers can threaten the security and safety of the aircraft, other passengers, and the crew; they can have physical and psychological impacts on both passengers and crew members and disrupt operational activities and service provision. In interviews with IATA members, 53% reported an increase in disruptive passenger incidents in the past five years; 43.4% stated they had witnessed over 100 cases of disruptive passengers in the past 12 months; and 39.6% reported having to divert a flight in the past 12 months due to disruptive passengers. Most disruptive behaviors (96%) fall within Category 1 and 2 in the IATA classification table (IATA, 2017). According to ICAO (2019), unruly and disruptive behavior onboard an aircraft undermines good order and discipline and can threaten the safety and security of the aircraft, as well as the crew and passengers onboard. It can also cause significant disruption to air travel when aircraft have to be diverted to remove unruly passengers from the flight.

According to the recommendations of IATA (2017), the formula for successfully tackling disruptive behavior includes Strong deterrent regulations and Enhanced management and prevention measures. ICAO (2019) has issued Doc 10117 to assist member states in developing more harmonized and effective legal frameworks to prevent and address incidents of unruly and disruptive passenger behavior on international flights. Each country also enacts various administrative penalty regulations for certain disruptive behaviors. However, there are three major obstacles in applying legal measures for prosecution. Firstly, many disruptive behaviors, especially those at the Category 1 level, may not have legal consequences under administrative penalty regulations. However, these behaviors still have a negative impact on the experience of other passengers during the flight. Secondly, applying legal regulations requires significant time and effort for an airline to recognize disruptive behavior within the scope of penalties. The penalty process involves multiple steps that may exceed the airline's authority, which ultimately negatively affects the relationship between the passenger and the airline. Thirdly, the passive response after a disruptive behavior has occurred does not change the negative impact that other passengers have already experienced. The airline needs proactive solutions for early detection, prevention, and management of disruptive behaviors. With the above obstacles, this paper is conducted not from a legal perspective but from a management standpoint of the airline, aiming to contribute to providing additional recommendations for enhanced management and prevention solutions. Subsequently, based on the established block of disruptive behaviors, the paper will assess their relative impacts from an objective perspective

of passengers. Therefore, with limited resources, airlines can prioritize preventing and managing the most negatively impactful disruptive behaviors on passengers during the flight.

Unruly Behavior in the Context of Air Transport Service

Various marketing theories explore and describe customer disruptive behaviors from diverse perspectives. This section analyzes approaches in service marketing regarding disruptive behaviors to establish a definition of such behaviors within the context of airline service delivery. Disruptive behaviors have been studied under different terms, all-encompassing the meaning of deviating from the norm, causing service disruptions, and impacting other employees, companies, and passengers. These behaviors have been referred to as "deviant behavior" (Boo et al., 2013; Lugosi, 2019), "dysfunctional customer behaviors" (Cheng-Hua & Hsin-Li, 2012), "misbehavior" (Harris & Daunt, 2013; Gursoy et al., 2017; Hu et al., 2017), and "disruptive behavior" (Fine, 2008; Gursoy et al., 2017; Cai et al., 2018).

In the context of aviation services, disruptive behavior is referred to by various terms, including disruptive behavior (Bor, 2003; McLinton et al., 2020; Coyle et al., 2021) and unruly behavior (Hu et al., 2017; Tsang et al., 2018). Besides academic research, the terms "disruptive/unruly behaviors" and "air rage" are used interchangeably in the guidance documents of IATA (IATA, 2012), ICAO (ICAO, 2017, 2019), national aviation authorities (EASA, 2014), airlines, and media agents.

Martinussen and Hunter (2021) do not provide a specific definition of disruptive behavior, but they describe a disruptive passenger as someone who refuses to comply with applicable regulations on board. This individual may engage in threatening behavior, use offensive language, or exhibit loud and inappropriate conduct, while also refusing to follow instructions from cabin crew members. ICAO (2017) refers to disruptive passengers as "passengers who do not respect rules of conduct at airports or on aircraft and do not comply with the instructions of airport staff, flight crew members, disrupt the order and discipline at airports and on aircraft." ICAO (2019) uses the terms "unruly passenger," "disruptive passenger", and "unruly and disruptive passenger" interchangeably to refer to a disruptive passenger. However, the description of disruptive passengers is not significantly different from that of IATA. Disruptive passengers are commonly understood as passengers who do not respect behavioral rules on board or comply with instructions from the cabin crew and pose a threat to the safety of the flight and/or disrupt discipline on the aircraft. Coyle et al. (2021) also use this concept and emphasize that an inflight rage can potentially threaten the safety of the cabin crew and passengers. In the event of an inflight incident, both passengers and crew members are unable to escape their threatened environment and have no option to request external assistance. Bor (2003) describes disruptive behavior by passengers as a broad range of behaviors that include non-compliance with crew instructions,

interference with crew duties, smoking, intoxication and disorderliness, verbal abuse, and physical assault. Common causes are diverse and include disputes, dissatisfaction with the level of service, arguments over seat allocation, or reclining seats affecting passengers seated behind. Disruptive behavior can range from minor incidents to more severe and life-threatening ones.

Disruptive behavior has negative implications in various aspects. According to Martinussen and Hunter (2021), besides being a safety threat, angry and aggressive passengers often cause discomfort to other passengers, cabin crew, and possibly even the pilots. Emergency landings and flight delays/cancellations may occur. Tsang et al. (2018) also assert the impact of unruly passengers on other passengers, cabin crew, and the entire flight. Grove and Fisk (1997) found that tourists feel frustrated when bothered by rowdy youth groups or intimidated by loud and disruptive foreign passengers. Such experiences adversely affect their service experience.

In addition to direct negative impacts, disruptive behaviors tend to spread among passengers. Fine (2008) argued that customers negatively influence each other when they do not adhere to explicit or implicit "norms of behavior." Situations such as pushing, excessive drinking, verbal abuse, line cutting, invading personal space, behaving rudely, unfriendliness, or even spitefulness from "other customers" lead to passenger dissatisfaction. These behaviors can sometimes propagate, causing other passengers to exhibit inappropriate behavior as well. Kang and Gong (2019) agree with Harris and Reynolds (2003) and Harris and Daunt (2013) regarding the negative impact of disruptive behavior in the service context on other passengers, akin to a domino effect, or potentially spoiling the experience of other passengers, thus reducing their satisfaction and loyalty. This is also affirmed by Fine (2008), stating that dysfunctional customer behavior can spread to other customers witnessing such misbehavior. Therefore, Wu (2008) asserts that in the tourism service context, travel companies must effectively manage compatible customer groups and communicate to ensure their proper conduct, thereby indirectly managing customer satisfaction.

In addition to negatively affecting other passengers, disruptive behavior also impacts service providers' behavior, psychology, emotions, and physical well-being, leading to indirect and direct financial costs for the organization. Cai et al. (2018) argue that customer misconduct influences the intention of other customers to reuse the services in the future within the tourism industry. Gursoy et al. (2017) further add that customer misbehavior can easily undermine the overall service quality and experience of other customers by negatively affecting the production and delivery process, employee performance, and emotional state of service providers.

The civil aviation authorities of most countries, which are mostly members of ICAO, and the airlines themselves, many of which are members of IATA,

generally adopt the classification and description of disruptive behavior as provided by ICAO. The classification, according to ICAO (2002), is as follows:

Level 1: Verbal disruptive behavior: Using offensive language or unacceptable language. Behavior that is directed towards non-crew members, such as expressing dissatisfaction through voice or rude gestures, making arguments or unreasonable demands, displaying suspicious behavior such as provocation, alienation, or unresponsiveness, failing to comply with crew instructions, or challenging authority, violating safety regulations.

Level 2: Physical abuse towards non-crew members: Openly hostile or aggressive actions, including physical actions or contact. Obscene or indecent behavior towards non-crew members: Sexually explicit, promiscuous, or indecent actions. Verbal threats: Threatening a crew member or another passenger with violence or physical harm on board, or when boarding the aircraft, or making threats while attempting to board. False representation of any emergency or safety device on the aircraft. Intentional destruction of any part of the aircraft or property on the aircraft.

Level 3 and Level 4: Threatening the life of others (with weapons) and attempting or actually penetrating the flight deck.

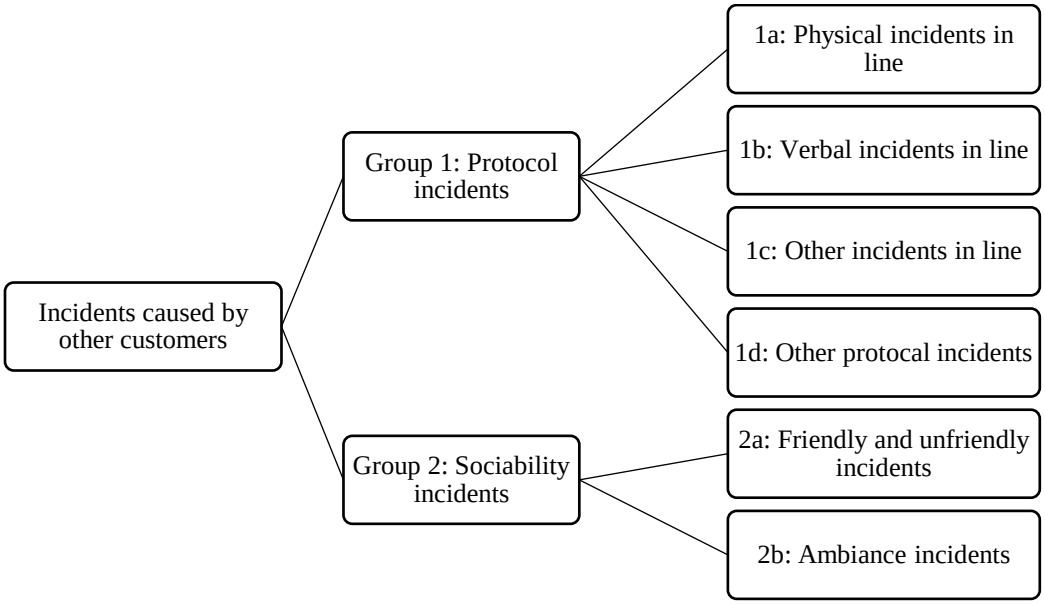
IATA (2012), based on the ICAO (2017) definition of disruptive passengers, has established the following non-exhaustive list of such behaviors: (1) Illegal drug consumption. (2) Refusal to comply with safety instructions/guidelines: failure to comply with seatbelt requirements, smoking, using handheld electronic devices, or disrupting safety announcements. (3) Being confrontational or argumentative with the cabin crew and other passengers. (4) Non-cooperative passengers: interfering with the duties and responsibilities of the cabin crew, refusing to comply with instructions for boarding or disembarking the aircraft. (5) Making threats: including threats against an individual, threatening to cause harm to someone, or causing disruption such as making bomb threats, threats against the cabin crew, other passengers, and the flight. (6) Sexual abuse and misconduct. (7) Other disruptive behaviors: shouting, nuisance, kicking, and hitting seats, trays, and bins.

Grove and Fisk (1997) classified disruptive behaviors into two major groups: protocol incidents and sociability incidents (Figure 1). Zhang et al. (2010) conducted a study across 15 service contexts, including restaurants, movie theaters, air/train/bus travel, cruises, sports events, concerts, healthcare, bars, retail stores, gyms, hair salons, hotels/motels, amusement parks, grocery stores, and banks. They used the critical incident technique (CIT) to categorize the impacts of customers' behaviors. Alongside positive impacts such as playing the role of a helpful person, creating a friendly atmosphere, engaging in friendly conversations, and serving as a role model for other customers, the research also identified negative behaviors affecting other customers. These included intrusive behaviors that violated personal

space, instigating other customers to engage in unfavorable actions, disruptive conversations, loud crying or tantrums from children, nearby customers talking loudly during a movie, intoxicated customers, verbal abuse, hostility, and rudeness towards both service staff and other individuals. Additionally, customers expressing complaints about the service created a significant decline in the natural service experience.

Figure 1

Critical Incidents by Other Customers (Grove & Fisk, 1997)



Wu (2008) categorizes these behaviors into six groups. Group 1 consists of protocol and social incidents, such as excessive physical greetings. Group 2 involves violent incidents, including hitting or pounding on tables and chairs, as well as anger and arguments with other customers. Group 3 encompasses discomforting incidents, such as body odor, putting feet on tables, and pushing in line. Group 4 involves dissatisfaction incidents, such as expressing discontentment after receiving poor service, complaining about the service, and being unwilling to place an order. Group 5 comprises uncivil incidents, such as telling inappropriate stories, being intoxicated, and being unruly. Group 6 involves inconsiderate incidents, such as letting children run around unsupervised, shouting loudly, and smoking. Gursoy et al. (2017) identified seven groups of disruptive customer behaviors that impact the service experience of other customers. These behaviors include undisciplined children and inattentive parents; verbal abuse, offensive language, and derogatory remarks towards staff and other customers; demanding

excessive attention, time, and personalization, preventing other customers from being served, and expressing dissatisfaction when their demands are not met; disruptive and aggressive behavior, such as loudly berating the service provider and other customers for any service failure; unhygienic behaviors, such as body odor, changing diapers on tables, and not covering mouths when coughing; rule-breaking behaviors that violate social norms in service establishments; and ignorant behaviors, where customers intentionally disregard standard service procedures and disrespect the needs of others. Wirtz et al. (2018) refer to these individuals as lawbreakers when they fail to comply with safety regulations throughout various stages of the service process. Particularly in the context of air transportation services, physically fit and mentally capable adult customers are significantly restricted in their behaviors to ensure safety. Furthermore, they exhibit aggressive behaviors, such as turning red-faced and angrily shouting, or perhaps inexplicably losing their composure and resorting to abusive, threatening, and vulgar language in stores or at airports. They may express discontent when asked to comply with rules or may be under the influence of alcohol or drugs. Alcohol and drug intoxication are also prevalent in such cases. Additionally, the study points out that this group of people frequently engages in disputes with family members and other passengers, contributing to disruptive behavior. Kang et al. (2019) constructed a framework of disruptive behaviors consisting of three groups (verbal abuse, disproportionate demand, and illegitimate complaint), as illustrated in Table 1.

Table 1
The Measurement Scale of Customer Disruptive Behavior Developed by Kang et al. (2019)

Factor	Measure
Verbal abuse	Customers yelled at me
	Customers threatened me
	Customers insulted me
	Customers got into arguments with me
Disproportionate demand	Customers demanded special treatment
	Customers demanded to talk to my supervisor
	Customers asked me to give them a special deal
	Customers pestered me to make exceptions to company policy
Illegitimate complaint	Customers blamed me for a problem I did not cause
	Customers got angry at me even over minor matters
	Customers complained without reason
	Customers continued to complain despite my efforts to assist them
	Customers complained to me about the value of goods and service

Based on previous research classifications of customer behaviors that cause annoyance to other customers, we proposed the behaviors as listed in Table 2.

Table 2

The Disruptive Behaviors in Aviation Services

Behaviors	References	Descriptions
Provoking, disturbing public order	Grove & Fisk (1997), Zhang et al. (2010), IATA (2012), Gursoy et al. (2017), Tsang et al. (2018), ICAO (2019)	Behaviors such as sexual harassment, verbally abusing staff due to dissatisfaction with the service, property destruction, physically assaulting or banging one's head on the table in front, and displaying an arrogant attitude.
Not following the instructions of the cabin crew	Wu (2008), Zhang et al. (2010), IATA (2012), Boo et al. (2013), Gursoy et al. (2017), ICAO (2019)	Fighting with other passengers, not fastening the seatbelt, smoking in the aircraft cabin, not switching off electronic devices, using a mobile phone when the plane has just landed, disrupting the safety instructions.
Threatening, causing distress	ICAO (2019), Cheng-Hua & Hsin-Li (2012), IATA (2012), Boo et al. (2013), Kang & Gong (2019)	Using language or speech to insult the dignity, humanity of others, verbally abusing other passengers with vulgar, obscene, and suggestive words.
Intrusion of personal space	Wu (2008), Boo et al. (2013), Tsang et al. (2018)	Stepping on someone else's seat, frequently moving back and forth between other people's seats, causing others' belongings to fall while retrieving one's own, tilting the seat back while someone is eating, having the person behind shake their leg, kicking or propping their feet on other customer’s seat, and engaging in unwanted conversation when other people do not desire it.

Making frequent demands of the cabin crew	Cheng-Hua & Hsin-Li (2012), Gursoy et al. (2017), Tsang et al. (2018)	Frequently demanding the flight attendant, making unreasonable and persistent requests, making it difficult for the flight attendant to serve other passengers.
Dragging, inciting other passengers	Grove & Fisk (1997), Zhang et al. (2010), Cheng-Hua & Hsin-Li (2012)	Inciting other passengers to carry out unreasonable demands or displaying a hostile, discriminatory attitude toward other passengers.
Occupying shared space	Grove & Fisk (1997), Wu (2008), IATA (2012), Boo et al. (2013), Tsang et al. (2018)	Occupying all space for luggage, pushing and shoving to retrieve luggage; Squeezing into board or disembark the aircraft ahead of others; Occupying the restroom for a long time.
Insensitive or unconcerned	Grove & Fisk (1997), Zhang et al. (2010), Boo et al. (2013), Tsang et al. (2018)	Allowing children to scream, run around, engage in loud kissing, talk loudly, shout, play games without muting the sound.
Causing unsanitary conditions	Grove & Fisk (1997), Wu (2008), Boo et al. (2013), Gursoy et al. (2017)	Coughing, sneezing without covering the mouth, spitting, littering gum everywhere, allowing children to defecate in public, strong body odor, smelly feet, spitting gum everywhere, bringing odorous food onto the airplane.

Methodology

Data Collection

The sample was collected using a convenience sampling method. The survey participants were individuals aged 18 and above, with knowledge or previous experience of air travel, without any restriction on the number of times they used air travel services within a year. Data was gathered through an online survey. Respondents were provided with a link to the survey questionnaire and were instructed to carefully read each block of questions and select one factor they

considered "least desirable, least important" and one factor they considered "most desirable, most important" The online survey allowed respondents to review their answers before submitting them. A total of 240 survey questionnaires were collected over a period of 3 months. We eliminated questionnaires with invalid responses. The remaining number of observations for analysis was 203. This number of observations satisfies the conditions of the central limit theorem (Siegmund-Schultze, 2006; Hair et al., 2010).

Best – Worst Scaling Method

The method used in this study is best-worst scaling (BWA). This scale is also known as Maximum Difference Scaling (Cohen, 2003). It was initially proposed by Louviere & Woodworth (1990) based on the random utility theory in psychology (Thurstone, 1927) and economics (McFadden, 1986). The scale is used to quantify the importance or preference of individual factors or a group of factors under consideration. After being inherited and developed by Finn and Louviere (1992), and Marley and Louviere (2005), the formal statistical and measurement properties of BWS have been widely applied. The method aids in decision-making based on multiple criteria to determine the optimal weights of a group of criteria through "pairwise comparisons are then conducted between each of these two criteria (best and worst) and the other criteria." (Rezaei, 2015). This method allows researchers to measure items or objects on a scale with known attributes. It is a quantitative tool for assessing the level of importance of a group of factors influencing a relevant issue (Cohen, 2003). Various studies have developed, used, and validated this scale (Cohen, 2003; Lee et al., 2008; Louviere et al., 2015; Marley & Pihlens, 2012).

We chose the BWS method because it helps reduce the number of comparisons compared to previous methods, such as the analytic hierarchy process (Rezaei, 2015). This method also aims to achieve higher reliability. In other words, this method helps reduce the time for comparisons and delivers good results. For this reason, many researchers prefer and widely apply this method in various fields (Xiaomei et al., 2019).

The advantage of BWS for respondents is that it requires them to perform a simple task with a small number of choices, making it easy for them to compare and consider their choices for each block of options. Subsequent survey respondents will see different blocks of questions and complete the task multiple times. Researchers tally the number of times an item is selected as the best and the number of times it is selected as the worst: items that consistently receive more favorable responses across a specific criterion are chosen as the best, and items that are less frequently chosen are designated as the worst in any given block of questions. The block of questions may encompass various aspects, such as brands or products (in this study, human needs), where individuals indicate which option works best and worst based on an underlying or specific criterion. This method

requires respondents to consider multiple factors simultaneously and nominate the most appropriate factor based on the researcher's specific criteria. Among the remaining factors, they specify the least suitable factor for that criterion. What makes this method more reliable than the Likert scale is that it involves direct comparisons between factors, whereas the Likert scales require respondents to rate the importance of all factors at once without direct comparison between them. The method of assigning points to each factor guides respondents to make tradeoffs and choices, which is often not helpful for the study conductors (Carson & Groves, 2007). With the BWS method, respondents are forced to consider and trade-off options within a block of questions (Louviere & Islam, 2008). This is crucial because the trade-offs have been shown to lead to a clear differentiation between the evaluated items and a higher level of predictive validity (Chrzan & Golovashkina, 2006; Cohen, 2003).

Furthermore, BWS requires respondents to choose the most differentiating pairs of answers (Chrzan & Golovashkina, 2006). They cannot use a midpoint, endpoint, or one end of the scale to select their response. As a result, the survey results will minimize response patterns that are influenced by previous answers. In contrast to rating scales where attributes appear only once, BWS asks similar questions multiple times, thereby increasing the survey's reliability.

Best–worst scaling has also been found to significantly save time for survey respondents compared to evaluation or ranking tasks (Lee et al., 2008). Furthermore, administering BWS is relatively inexpensive, increasing its appeal in marketing research applications (Cohen, 2003).

In our model, we have made some adaptations to the scaling approach. Instead of using the original scale, we interpreted the wording in a more appropriate manner to facilitate respondents' answers. In this study, "best" represents the option "most desirable, most important" and "worst" represents the option " least desirable, least important." These expressions do not alter the selection outcomes as they still signify two completely contrasting emotional extremes. Therefore, in this step, we ask respondents about their emotions using a table with four options. In the following section, we will present the technique for generating question blocks with four options each.

Designing Question Blocks

The balanced incomplete block design (BIBD) tool (Cox & Reid, 2000) is used to design question matrices (Parvin, 2016). In BIBD design, no object appears more than once within a block; every pair of objects appears together in the same number of blocks; each block has an equal size; and every object appears equally. BWS design controls for potential order effects as each respondent sees each item in the first position, second position, third position, and so on, across the entire block.

The subsequent behaviors were encoded (Table 3) and processed using R programming language to generate question blocks (Table 4).

Table 3

Proposed Disruptive Behaviors

Code	Behavior
fac1	Provoking and disrupting public order, such as harassment, verbally abusing flight attendants, damaging property, and displaying an arrogant attitude.
fac2	Not following the crew's instructions such as fighting with other passengers, not fastening seatbelts, disrupting safety instructions, etc.
fac3	Threatening and causing distress such as making threats of violence, claiming to have a bomb, falsely signaling a fire alarm, etc., posing a threat to flight safety.
fac4	Using language, speech to insult the dignity and integrity of others.
fac5	Invading personal space, such as kicking the seat of others, frequently moving back and forth in their seat, etc.
fac6	Frequently demanding and making unreasonable requests to the flight attendant, making it difficult for the flight attendant to serve other passengers.
fac7	Provoking, instigating other passengers to carry out unreasonable requests or displaying hostile, discriminatory attitudes towards other passengers.
fac8	Occupying common space such as taking up all the luggage space, intruding, occupying the restroom for an extended period, etc.
fac9	Being inconsiderate and affecting others, such as kissing loudly, talking loudly, shouting, playing games without turning off the sound, etc.
fac10	Causing uncleanliness such as coughing, sneezing without covering the mouth, allowing children to defecate in public, strong body odor, littering chewing gum everywhere, etc.

Table 4

The Balanced Incomplete Block Design

Block	a = 10 r = 6		b = 15 k = 4	
1	2	4	8	9
2	7	8	9	10
3	1	4	5	10
4	5	6	8	10
5	1	4	7	8
6	5	6	7	9
7	3	4	5	7
8	3	4	6	9
9	1	3	9	10
10	1	3	6	8
11	2	4	6	10
12	1	2	6	7
13	1	2	5	9
14	2	3	7	10
15	2	3	5	8

With a = 10 being the number of attributes included in the questionnaire, which corresponds to 10 behaviors that can cause discomfort to others during the flight. Each attribute is encoded as a number from 1 to 10, corresponding to the ordinal number of each attribute introduced in Table 3. b = 15 represents the presence of 15 choice blocks. Each choice block is similar to a question in the survey. And with k = 4, it is the number of choices appearing in each choice block, meaning each choice block will have four elements to evaluate. Therefore, there are a total of 15 * 4 = 60 attributes in the survey table, and each element appears 6 times in the survey table (r = 6), as shown in Table 4.

Based on the results in Table 4, a question block-1 will include attributes 2, 4, 8, and 9. In each block, the respondent will compare the behaviors to each other and provide one answer for the behavior that is "most desirable, most important" and one answer for the behavior that is "least desirable, least important". The same process is followed for all 15 blocks.

Calculate the Best-Worst Scores from the Data

There are two ways to calculate the scores. The first method is to process each respondent's answers separately and then calculate the total difference. The

second method is to calculate the total number of times each factor is rated as "most desirable, most important" and the total number of times it is rated as "least desirable, least important" and then calculate the difference between these two totals. Both methods will yield the same results. The smaller the best-worst score for a factor, the more discomfort it causes in the respondents' evaluations. The best-worst scores can be standardized at the level of each respondent's answer or at the aggregate level. The standardized score is calculated at the respondent level by dividing the best-worst score by r, where r is the number of times that factor appears in the survey table.

Another approach applied by Parvin et al. (2016), based on the proposal by Louviere et al. (2015), is to calculate the square root of the best/worst scores. Taking the square root helps eliminate concerns related to negative values. The higher the value of the square root of the best/worst scores, the more important the factor is considered. An advantage of this scoring method is the ability to assess the relative importance of factors compared to the remaining factors based on standardized values. The least important factor among the ten criteria is selected as the reference point with a value of 1. To further ascertain if choices were consistent across participants, we calculated the standard deviation of best-worst scores.

Results and Discussions

Descriptive Statistics

Through the survey conducted from December 2021 to February 2022, we collected a total of 240 surveys, of which 203 were valid. Among the 203 respondents, 46% were male, and 54% were female. Among them, 70% of the respondents were in the age group of 20-55, 28% were in the age group of 18-20, and 2% were in the remaining age groups. Those with a College/University degree accounted for 81.3%, while 15.3% had a postgraduate degree. This indicates that the respondents have a higher ability to quickly and deeply understand the criteria arranged in the questionnaire. Those who travel 2-5 times per year accounted for the majority at 40.9%. The group traveling once a year accounted for 30.5% of the sample. The group traveling 5-10 times per year accounted for 13.3%. The remaining respondents either travel once every few years or more than 10 times yearly. These findings reflect the diverse experiences of the respondents and contribute to the relevance of the dataset. The seat class used by the respondents was evenly distributed, ranging from first or business class (2.5%), economy class (73.9%), and economy flex (17.2%).

Reviewing Data for Reasonableness

The BWS score is calculated by subtracting the total number of times an attribute is evaluated as "most desirable, most important" from the total number of times it is evaluated as "least desirable, least important." The sample size is 203, with each questionnaire consisting of 15 choice blocks, and the total number of most bothersome and least bothersome choices must be equal and equal to 3045.

Furthermore, the sum of the B-W scores in the collected dataset must equal to 0. Any surveys with missing answers for the Best or Worst choices are excluded to ensure data balance. Therefore, after the process of filtering and cleaning the data, the data is considered complete and reliable for analysis.

Data Analysis and Discussion

The survey results are ranked based on the number of selections for "most desirable, most important" (Best) minus the number of selections for "least desirable, least important" (Worst) for disruptive behaviors during the flight. Factors with lower B-W scores reflect a higher level of annoyance caused by those factors. Table 5 presents the summary of the analysis results.

The two methods for the results of the four factors considered most bothersome, with their respective B-W scores, include: (1) fac3 - [Threatening, causing distress, such as physical assault, bomb threats, false fire alarms, posing a safety threat to the flight]; (2) fac1 - [Provoking disturbances affecting public order, such as harassment, verbal abuse towards crew members, property damage, and displaying aggressive behavior]; (3) fac10 - [Causing unsanitary conditions, such as coughing or sneezing without covering the mouth, allowing children to defecate in place, strong body odor, spreading chewed gum everywhere]; (4) fac2 - [Not complying with the crew's instructions, such as fighting with other passengers, not fastening seat belts, disrupting safety instructions]. The two factors considered most bothersome to other passengers are only at level 2 in ICAO's (2002) classification of disruptive behavior. Fac2 is classified at level 1 according to ICAO's classification. The ranking results of the behaviors align with the perspective of aviation authorities. However, upon a deeper examination of the ranking and the relative importance of each factor, the data analysis results reveal some interesting aspects.

One notable factor is fac10 - [Causing unsanitary conditions, such as coughing or sneezing without covering the mouth, allowing children to defecate in place, strong body odor, spreading chewed gum everywhere,...]. This is a new factor not included in the classification table, yet it is considered more bothersome than [Using language, words to offend the dignity, honor of others] or [Not complying with the crew's instructions, such as fighting with other passengers, not fastening seat belts, disrupting safety instructions]. Sanitation has always played a significant role in the context of service provision. In addition to ensuring sanitation from the service provider's side, maintaining cleanliness among customers is equally important. This has been confirmed through studies by Grove & Fisk (1997), Wu (2008), and Gursoy et al. (2017). These studies suggest that [Foot odor, removing shoes to expose bare feet, strong body odor, smelly foods brought onto the aircraft] or [Changing diapers on the dining table, allowing children to defecate in their seats], or leaving chewed gum everywhere are negative factors that impact the service experience of other passengers. As for behaviors like [Coughing,

sneezing, sharing illness without covering the mouth, spitting on the floor or someone's feet], this can be explained by the survey being conducted during the Covid-19 pandemic outbreak. Respondents would pay more attention to factors related to sanitation and disease prevention. Due to the rapid spread, serious danger to life, and the negative consequences and impacts of Covid-19, symptoms such as coughing or sneezing become sensitive to those around them.

The three factors considered to be least bothersome are (1) fac6 - [Frequently demanding service, making unreasonable requests,... making it difficult for the flight attendants to serve other passengers], (2) fac8 - [Occupying common space such as occupying all the space for luggage, crowding, monopolizing the restroom for a long time,...], and (3) fac9 - [Insensitive behavior affecting others such as excessive public displays of affection, loud talking, shouting, playing games without turning off the sound,...]. These three factors, along with fac5, are not listed in the official classification table. However, the impact of these behaviors on the experience of other passengers cannot be ignored.

Table 5

Summary of Best-Worst Scaling Survey Results

Code	Most desirable, most important (B)	Least desirable, least important (W)	-W scores	Square root of the B/W scores	Standardized root of the B/W	Rank $\sqrt{\left(\frac{W}{B}\right)}$	Rank (B-W)
fac6 [The requirement for regular cabin crew service]	567	90	77	.16	1.00	2	1
fac8 [Occupying common space]	536	74	62	.14	0.87	1	2
fac9 [Insensitive behavior affecting others]	462	171	91	.37	2.33	3	3
fac7 [Pulling, instigating other passengers]	363	149	14	.41	2.59	4	4
fac5 [Infringing upon personal space]	379	225	54	.59	3.74	6	5
fac4 [Using speech to insult the dignity and character of others]	241	111	30	.46	2.90	5	6
fac2 [Not complying with the crew's instructions]	219	382	163	.74	10.99	7	7
fac10 [Causing unsanitary conditions such as coughing or sneezing without covering the mouth]	163	412	249	.53	15.92	8	8
fac1 [Provoking disturbances affecting public order]	71	515	444	.25	45.70	9	9
fac3 [Threatening, causing distress]	44	916	872	0.82	131.15	10	10
Total	3045	3045					

The evidence shows that flight attendants mentioned 90 times that [Frequently demanding service, making unreasonable requests,... making it difficult for the flight attendants to serve other passengers] is the most bothersome behavior. Fac9 [Insensitive behavior affecting others such as excessive public displays of affection, loud talking, shouting, playing games without turning off the sound,...] was mentioned 171 times as the most bothersome factor. Fac5 [Intrusion of personal space such as kicking the seat of others, frequently moving back and forth in their seats,...] was mentioned 225 times as the most bothersome factor. Although these factors are considered less bothersome than other behaviors, airline service providers should pay attention to them.

The standardized square root of the B/W scores indicates the relative impact of the factors in comparison with fac6 [Frequently demanding service, making unreasonable requests, making it difficult for the flight attendants to serve other passengers]. Accordingly, the behavior [Threats, causing panic such as physical assault, making bomb threats, falsely activating fire alarms,... posing a threat to aviation safety] causes 131 times more annoyance, and the behavior [Creating unsanitary conditions such as coughing, sneezing without covering the mouth, allowing children to defecate in place, strong body odor, littering chewing gum everywhere,...] causes 46 times more annoyance compared to the behavior [Frequently demanding service, making unreasonable requests,... making it difficult for the flight attendants to serve other passengers].

The comparative values of the standardized square root of the B/W scores demonstrate a significant contribution when airlines aim to manage their service environment. In the context of limited resources, carriers can focus on a few behaviors for management before implementing restrictive measures on all 10 behaviors.

Conclusion

This study developed a definition of disruptive behavior in flights as behaviors that passengers unintentionally or intentionally perform in violation of legal regulations or social norms within the civil aviation service space, causing negative effects on the service provider organization and other customers. Subsequently, we constructed a set of disruptive behaviors in the context of air transportation services, including aggression, public disturbance; non-compliance with crew instructions; threats, causing panic; verbal abuse; invasion of personal space; excessive demands on flight attendants; harassment, incitement of other passengers; lack of consideration; and sanitary violations. Through a survey with 203 flight attendants, the study revealed the impact of these behaviors on other passengers. The three most bothersome behaviors were identified as (1) Threats, causing panic, (2) Aggression, public disturbance, and (3) Sanitary violations.

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