



Perceptions and Strategies:

An Analysis of Gendered Safety Perceptions and Mitigation Strategies for Public Transportation

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Abstract

This research paper investigates how different safety measures influence safety perceptions across genders and shape overall security experiences within public transportation. The study utilizes primary data analysis from a survey focusing on perceptions of safety among users of the Edmonton Transit System, highlighting significant differences between gender and feelings of unsafety as well as preferences for increased safety strategies. The findings suggest that there is a disparity in safety perceptions between genders, with female respondents feeling more unsafe compared to male respondents. Additionally, a content analysis of multiple safety-related documents was conducted to deduce safety perceptions and mitigation strategies. The paper emphasizes the importance of considering gender-specific needs in the design of public transport systems to create a more inclusive and secure environment for all passengers. Overall, this research contributes to the understanding of the intricate relationship between transit safety measures and gender-specific safety perceptions, providing insights for the development of more effective safety strategies in public transportation systems.

Introduction

Public transportation is a vital component of urban life, offering an eco-friendly and efficient mode of commuting that hinges on passengers' perceptions of safety. This research navigates the relationship between transit safety measures, gender-specific safety perceptions, and their impacts on the overall security experiences within public transportation. The core question is twofold: how do different transit safety measures influence safety perceptions across genders, and how do they shape overall security experiences within public transportation?

While studies have explored transit safety, risk mitigation measures, and gender-specific safety experiences, there's a lack of focus on how these measures specifically influence passengers' safety perceptions and interact with gender-specific perceptions. The research addresses critical gaps in knowledge, contributing to gender-sensitive policies and strategies to directly improve the quality of life for Canadians and women. Ensuring the safety and security of all passengers is paramount to making public transportation a more viable option and reducing health issues associated with private vehicles. The design of public transport systems overlook gender-specific needs, creating barriers for female riders. By elucidating these aspects, the research aims to pave the way for a more inclusive and secure public transit system.

Literature Review

Impact of Rail-Based Stations on Safety Perceptions

Sundling and Ceccato (2022) explore quantitative and qualitative data from studies that highlight the impacts of perceived safety regarding rail-bound stations and behavioural outcomes. The characteristics that have an impact highlight the differences among gender and the greater perception of unsafety in transit for women. Moreover, there are few literature reviews regarding the perceived safety in rail-bound stations and a majority are studies from Europe (Sundling and Ceccato, 2022). Evidence from studies display that local contexts, such as gender, culture, and country, can affect safety perception and behaviour differently in specific demographics. Since fear of crime is common and restricts mobility by affecting behaviour, safety needs to be addressed (Sundling and Ceccato, 2022). Place characteristics such as lighting, open environments, and high visibility, as well as neighbourhood and city context, affect perception and behaviour, especially in women as they experience more fear than men (Sundling and Ceccato, 2022). Furthermore, social, individual, and temporal characteristics affect behaviour as a consequence of perceived unsafety (Sundling and Ceccato, 2022). This analysis explores effective safety strategies for specific demographics, however, without making any recommendations.

Impact of Faregates on Safety Perceptions

One avenue to pursue in increasing the perceptions of safety in transit stations is the inclusion of faregates. However, a study prepared for the City of Calgary on faregates has shown there is no correlation between faregates and increased transit safety and only introduces a barrier for transit users. The study analyzed how faregates impacted safety, cost, equity and customer satisfaction in various cities. Each city, operating some form of closed, partially closed or open system, experienced the same pandemic level spikes in crime, and saw limited decreases, or sometimes increases in criminal activity with their implementation. For example, in Toronto, Calls for service from the TTC's Special Constable Service on the subway system have increased from 18,849 in 2019, 21,381 in 2020 and 26,817 in 2021 (City of Calgary, 2023). They are also expensive to implement and maintain. A partially closed system was proposed for the City of Calgary, which would cost 283 million dollars, with minimal benefits. The alternative is

maintaining an open system, and it was determined that investing in safety hubs and advanced staff will meet safety, cost, equity, and customer service goals more efficiently than fare gate systems.

Impact of Design on Safety Perceptions

Research was conducted on the implications of station design reducing the perceptions of crime. Crime Prevention Through Environmental Design (CPTED) seeks to reduce the opportunities for crime by designing open spaces that can be easily monitored by the public realm (City of Mississauga, 2014). Research in Berlin found that women tended to feel less safe when encountering drug use, homelessness, drunkenness, and poor lighting (Schmidt, 2021). CPTED in theory can help mitigate these factors through increased ability for public and security surveillance, reducing the opportunities for crime. However, a study highlighted doubts on the effectiveness of CPTED implementation, as researchers found minimal differences in perceptions of safety between a station constructed with CPTED and one constructed without (Cozens & van der Linde, 2015). There were discrepancies between the opinions of transit safety experts and commuters, as experts highlighted the importance of cameras and panic buttons in increasing perceptions of safety, rather than the concept of public monitoring (Cozens & van der Linde, 2015). Overall, the findings highlight the importance of considering CPTED public realm strategies and more dynamic land uses surrounding stations to increase perceptions of safety.

Impact of Safety Perceptions on Women

Women with lower incomes use public transport more but they are hampered by safety concerns. Efforts have been made to improve public transport accessibility by transforming existing networks into integrated public transport systems (Vassallo & García, 2011). However, integrated systems mean commuters are required to spend more time transferring, thus female riders are at a disadvantage when it comes to using public transport (Chowdhury, 2019). Women's fear of crime influences their perception of waiting time at terminals and they generally feel unsafe at night and alone (Chowdhury, 2019). Female riders use phones to feel safe at night terminals and walking home and factors leading to greater fear in ethnic women are unclear. Anastasia Loukaitou-Sideris (2013) provides some solutions to improve female commuters' safety perception such as regular cleaning of litter, good lighting, property bus stop location, police patrols, and reliable information about bus schedules. Overall, more research is needed to understand why different transit users have varying perceptions of safety.

Addressing Fear of Crime between Gender

Yavuz and Welch delve into the realm of gender-specific reactions to safety measures within the context of train transit. Their study probes whether safety practices and service attributes of the Chicago Transit Authority have varying impacts on the perceived safety of male and female passengers. This research spotlights a gap concerning the limited exploration of gender-specific effects in public transit safety measures as it may hinder the development of comprehensive gender-sensitive policies (Yavuz & Welch, 2010). The paper highlights the influence of local contexts on the effectiveness of safety measures and the potential variations in gender disparity within safety perceptions across different regions (Yavuz & Welch, 2010). A noticeable gap exists between academic understanding and the practical adoption of these gender-sensitive safety measures, potentially leaving women at a disadvantage (Yavuz & Welch, 2010). The paper illuminates the significance of addressing gender-specific reactions to safety measures in train

transit, advocating for the need to formulate gender-specific policies to improve perceptions of transit safety.

Data and Methodology

Survey Analysis

For our research, primary data analysis has been conducted through a Google Form survey that was created and distributed to investigate perceptions of safety between different genders, regarding the use of the City of Edmonton's Light-Rail Transit (LRT) services and stations, in Canada, Alberta. The survey included a series of questions to assess demographics, transit usage, and various aspects of safety, such as perceived risks, experiences, and the impact of safety measures. Over a three-week period, the survey obtained 107 responses which consisted of 23 multiple choice questions, 2 written responses, and 2 ranking questions to understand the overall perceptions of safety on the LRT. Furthermore, the survey was disseminated through University of Alberta sources, such as online student newspapers and QR codes placed on the University campus. The analysis of the responses consisted of accessing the percentages of answers, investigating the differences in responses between females and males, testing for statistical significance, and creating figures that highlight these differences.

It is important to highlight and analyze the limitations with the creation and distribution of the survey that may influence the responses, as this type of primary data collection comes with inherent shortcomings and potential sources of bias. On the positive side, it is efficient, cost-effective, user-friendly, and anonymous, making it accessible to a potentially diverse range of respondents. A limitation of the survey is the amount of questions it considers and the depth it inquires to keep the respondents engaged and more likely to participate. The methods of sharing the survey have led to a limited range of results, primarily from university students, which introduces convenience sampling and skewing towards a specific demographic. Thus, careful consideration of these limitations and biases during data analysis is necessary to ensure the validity of the findings and their applicability to the broader transit user population. Potential bias in response can arise from specific questions that ask about the impact of security presence or the inclusion of faregates, as respondents might not possess sufficient information to assess these factors accurately. This survey-based data collection approach plays a pivotal role in addressing our research question and understanding the impact of transit safety perceptions and measures on passengers and the disparity between different genders.

Content Analysis

Through a comprehensive analysis of various documents which include the 2023 Fall Survey in Calgary, the Transit Safety and Security Plan in Edmonton, The City of Calgary Public Transit Safety Strategy, and the CPTED report, we deduced safety perceptions and mitigation strategies. The 2023 Fall Survey in Calgary provides insights into the safety perceptions of Calgarians as a foundational source which particularly highlights gender-specific and age-specific disparities. The Transit Safety and Security Plan in Edmonton provides valuable information on Edmonton's proactive approach. It emphasizes the coordination between city entities, law enforcement, and community organizations. The City of Calgary Public Transit Safety Strategy aims to enhance the overall effectiveness of safety measures which prioritizes a people-first approach to continuous evaluation for ongoing improvement. The CPTED report added a dimension of environmental design strategies, focusing on surveillance, access control, and

territoriality to reduce both actual and perceived crime. The information from these documents, helps us understand the safety concerns and mitigation strategies in both Calgary and Edmonton.

Findings and Recommendations

Survey Analysis

The data analyzed from the survey reveals the LRT safety perceptions primarily of university students within the age range of 18-24 years old, split between females and males. Half of the respondents frequently utilize the LRT system for travel with varying times of usage throughout a week. 78.5% are aware of safety concerns but still choose to ride public transit, only a few male respondents indicate that safety is not a concern. 87.9% have felt unsafe using the LRT, while 10 males and only 2 females have signified that they have not felt unsafe.

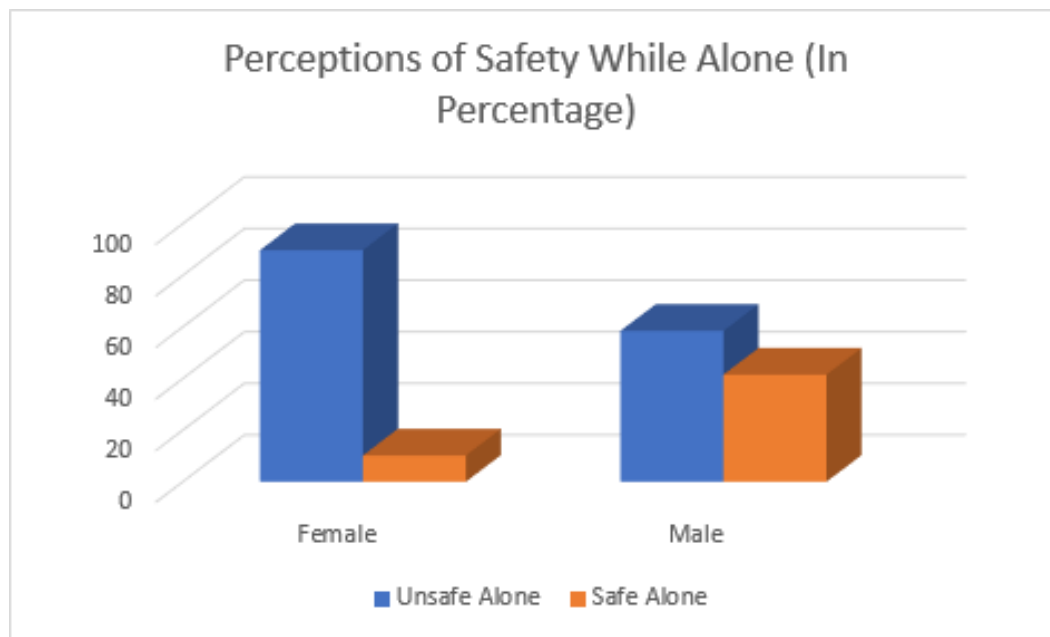


Figure 1. Perceptions of Safety while Alone between Females and Males.

73.8% of respondents feel unsafe alone on LRT services and stations with Figure 1. displaying that 89.8% of females feel unsafe alone, whereas 58.5% of males feel unsafe alone. There is a statistically significant relationship between gender and feeling unsafe alone with a p-value less than 0.05 being 0.000342954.

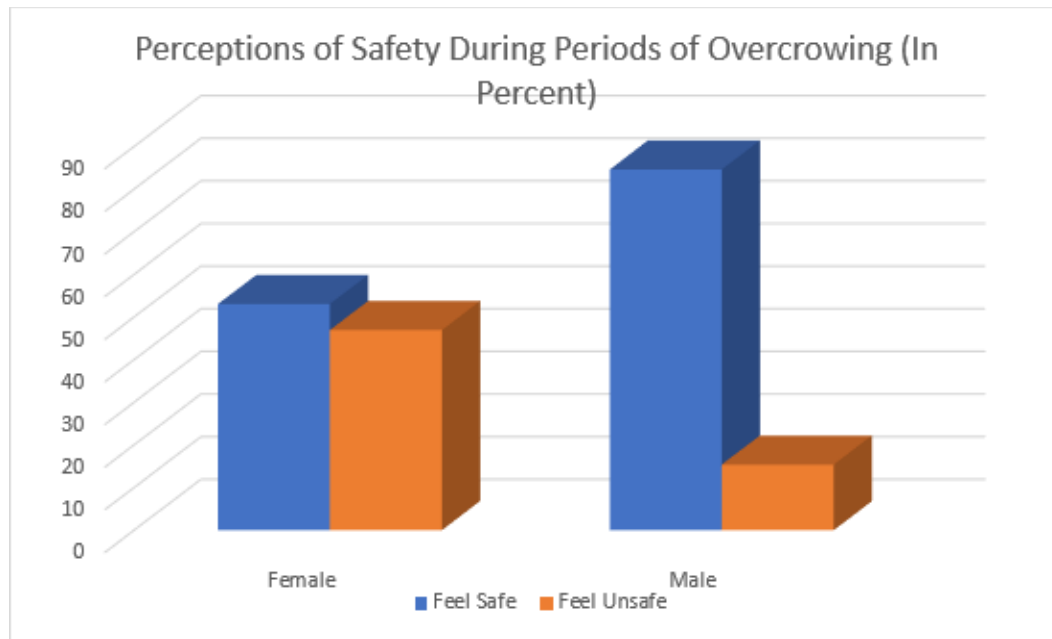


Figure 2. Perceptions of Safety during Periods of Overcrowding between Females and Males.

68.9% of respondents feel safe with overcrowding on LRT services and stations with Figure 2. displaying that 46.9% of females feel unsafe with overcrowding, whereas 15.4% of males feel unsafe with overcrowding. There is a statistically significant relationship between gender and feeling unsafe during overcrowding with a p-value less than 0.05 being 0.000589785.

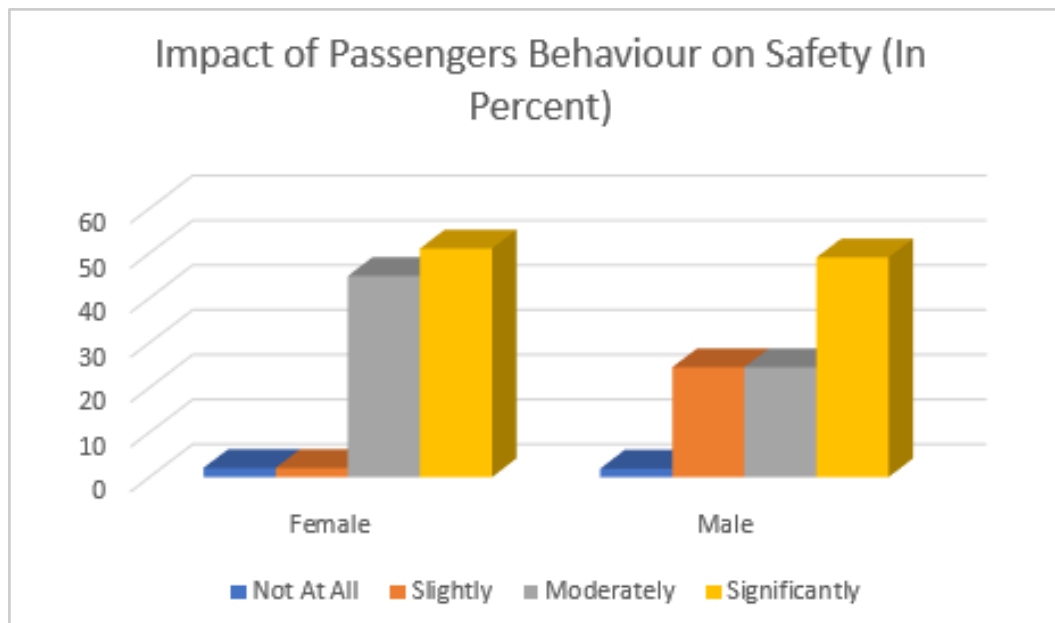


Figure 3. Impact of Passenger Behaviour on Safety between Females and Males.

51.4% of respondents say their perception of safety is significantly impacted by the behaviour of passengers with Figure 3. displaying that the majority of females are moderately and significantly impacted, whereas half of the males are significantly impacted and the remaining

responses are split between slightly and moderately. There is a 95% chance of a statistically significant relationship between gender and the impact of passenger behaviour with a p-value less than 0.05 being 0.00590204.

Additional analysis from the survey reports that 66.3% of respondents feel unsafe at night with 31.7% feeling unsafe in both the day and night. 60.7% have witnessed or experienced a safety incident. 53.8% feel more safe with security on the station and train, while 31.1% say they would feel safe with security only at stations. 61.5% feel that the presence of security personnel will help with safety, while 20.2% prefer high visibility and open environments. 50.9% think faregates would help with safety, while the remaining responses are split between no and unsure. 54.7% always feel safe with high visibility, whereas 14.2% would feel unsafe alone while being highly visible. 66% would feel safer with pedestrian infrastructure with the remaining responses split between no and unsure. Overall safety perception leans towards feeling unsafe, and low satisfaction with safety measures indicate that they need to be improved upon and more effective measures need to be explored. Respondents suggest that more security measures, presence, and monitoring will make them more likely to use transit.

Based on the responses from a written question on the survey, the majority of respondents avoid LRT stops located in downtown Edmonton, more specifically Corona Station, Bay Enterprise Square Station, Central Station, and Churchill Station. Common reasons were fear of crime. When compared to the Edmonton Community safety map, we can see that there are more criminal incidents reported in the Downtown area, where all the identified train stations are located.

Station	Amount of Crimes Recorded
Corona	70
Bay Enterprise Square	72
Central	146
Churchill	56

Figure 4. Data from the Edmonton Community Safety Map (Edmonton Police Service, 2023)

The High frequency of Crimes reported in the vicinity of these transit stops are indicative of broader societal contexts, such as homelessness and drug abuse. These stops are particularly vulnerable to crime due to their environmental design as they are underground, and have narrow sightlines and chokepoints. Further, due to Edmonton's climate, homeless people tend to use transit stops as a respite from the cold. According to the CPTED Handbook, clear sightlines, lighting, concealed routes, entrapment, isolation, land-use, activity, maintenance, information, and design of the built environment all contribute to perceptions of safety (National Crime Prevention Handbook, 2003). The majority of the stations are relatively well-lit, maintenance is conducted frequently, and adequate information through signage and staff is provided. However, the stations are all underground, which makes clear sightlines, concealed routes and entrapment areas common aspects in the design of the station. Land-use contexts are also important factors in why these stations are perceived as unsafe. There are very few residential uses located around these stations, resulting in less usage during off-peak hours, which can exacerbate feelings of uneasiness.

Content Analysis

The Calgary 2023 fall survey reveals concerning trends in transit safety perceptions. Regardless of the mode of transit or the time of day, Calgarians, especially females, express feeling less safe on transit compared to the previous year. Older Calgarians also report feeling less safe than their younger counterparts in similar transit scenarios. Frequent transit users and victims of violent crime or threatening behaviour exhibit lower feelings of safety, emphasizing the impact of experience on perceptions. Overall, the findings highlight the urgency of addressing gender-specific disparities in transit safety perceptions to enhance the overall sense of security among all transit users.

The Edmonton Transit Safety and Security Plan focuses on enhancing coordination and integration between the City of Edmonton and the Edmonton Police Service. The plan allocates \$3.9 million in funding to appoint a project director overseeing joint operations, increase resources for the Community Outreach Transit Team (COTT), and add two Transit Peace Officer foot patrol sergeant positions. Building on previous foundational investments, the plan aims to deliver a safe experience for transit riders and users. The number of Peace Officers has increased from 70 to 84 since the beginning of the year, with additional resources funded temporarily, pending the outcomes of pilot programs like COTT. Additionally, the Downtown Safety and Vibrancy Initiative involves partnering with law enforcement and allocating funds for social workers and mental health specialists in the downtown core, Chinatown, and the transit system, emphasizing a holistic approach to safety and well-being.

The proposed safety initiatives for Calgary's transit system encompass a wide-ranging and integrated model, aiming to enhance the overall effectiveness of safety measures and address concerns for both transit users and the broader community. Key objectives include increasing the visibility of staff on station platforms, coordinating subject matter experts for public transit safety, and improving customer experiences and perceptions of safety. Additionally, the plan emphasizes increased support and shelter for vulnerable groups, introducing a new district model on transit that establishes response times, geographical ownership, and integration with the Calgary Police Service. The success of these initiatives will be measured through response times to safety incidents, crime and social disorder events, the utilization of transit centers by vulnerable persons for shelter, and proactive officer-generated interactions.

Conclusions

This research illuminates the dynamics between transit safety measures, gender-specific perceptions, and overall safety in public transportation. The survey exposed gender-based disparities and the perception of safety issues and measures. The analysis concluded that perceptions of safety do influence ridership trends and that Edmonton riders are largely unaware of current safety measures, which results in an overall negative feeling of safety on public transit. An in-depth literature and content review explored the effectiveness of hypothetical and current safety measures, such as faregates, Crime Prevention Through Environmental Design (CPTED), and the presence of security, and how these influenced the perception of safety and ridership trends. Longitudinal studies tracking changes in safety perceptions over time and assessing responses to implemented measures contribute to the ongoing development of sustainable, inclusive transit safety strategies. Overall, our findings suggest that negative perceptions of safety

can hinder a rider's mood toward transit or even their use of public transportation. There is a disparity of safety perceptions between genders, creating the need for a deeper understanding of gender-specific safety measures.

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