The impact of rail-based stations on passengers' safety perceptions. **A systematic review of international evidence**

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ABSTRACT

Feeling safe in public transport is essential for mobility, and fear of crime can be a larger problem for the individual than crime itself. The aim of the present paper is to systematically review the international evidence in rail-bound environments regarding (a) characteristics impacting safety perceptions and (b) behavioural consequences of unsafety, using the databases ScienceDirect, Scopus, PsycInfo, and Google Scholar. From a selection of 3226 publications, 52 were selected. The sample sizes range from 16 to 137 513 rail users or potential users. A social-ecological framework was adopted to categorize the findings in which place, social, individual, and temporal characteristics were identified along with short-term and long-term behavioural consequences of unsafety. Among the most important characteristics affecting passengers' safety are lighting, surveillance, other persons' behaviour, time of day, and one's own gender. Future studies should further explore the complexity in interactions between characteristics connected to perceived safety.

1. Introduction

For many people, fear of crime is a larger problem than crime itself (Bannister & Fyfe, 2001). Fear of crime is more prevalent than actual victimization and affects people's behaviour by restricting their mobility (Hale, 1996). The characteristics of the environment that reduce crime are not necessarily the same as those reducing fear of crime (Foster et al., 2010) and the most criminogenic places are not necessarily places where people feel most unsafe. For example, a large railway station with many travellers may have more crime than a small isolated station although the former may be perceived as safer when waiting for the train. According to the Swedish National Council for Crime Prevention (2019), 42% of young women in Sweden change their route or their travel means because of fear of being victimized by crime. Thus, since safety perceptions affect travel behaviour, people's safety needs to be addressed for people to be mobile.

The few literature reviews on perceived safety in these environments have mostly focused on specific countries such as Germany (Masoumi & Fastenmeier, 2016) or Great Britain (Lorenc et al., 2013a; 2013b), on guidelines and strategies (Martin, 2011), or on other specifics such as gender and harassment (Gardner et al., 2017). The aim of the present paper is therefore to systematically review and synthesize international evidence from quantitative and qualitative studies regarding:

(a) characteristics that impact users' perceived safety in rail-bound stations and

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(b) behavioural consequences for users, of perceived unsafety in these environments.

We choose to include both quantitative and qualitative publications since together they may give a fuller picture and complement each other in understanding what characteristics are important for users and how these characteristics are experienced and understood (Oliver, 2015).

This article is structured as follows. First, a theoretical background of perceived safety and fear in public environments is presented, as well as its behavioural consequences. This is followed by a method section explaining how the review has been conducted. Next, the results are presented, first with an overview of the publications and then by their main findings. This is followed by a discussion of the findings and conclusions. The article discusses in detail the theoretical findings but it is limited in providing suggestions as to potential changes in practice. Interventions may not be generalizable to all stations or for all groups of users, therefore before making these practical suggestions, it is essential to consider the local context and the mechanisms that make people feel unsafe, who feels unsafe and why, and how behaviour is constrained.

1.1. Definitions and theoretic background

The research field "fear of crime" in criminology has a history since the 1960s. Ferraro (1995, p.8) defined it as: "an emotional response of dread or anxiety to crime or symbols that a person associates with crime". Another way of mapping it is that it consists of affect (feeling afraid), cognition (thinking that something is about to happen), and behaviour (behaving fearfully) (Gabriel & Greve, 2003). For the present paper, we want to capture a wider range of publications than those using the exact expression "fear of crime": the purpose is to collect as broadly as possible situations of not feeling safe in the station environments, and its consequences. We will use the wider expression "perceived safety" to include publications that have used other expressions than fear of crime.

There are a number of theories on determinants of perceived safety in relation to crime. Prospect-refuge theory (Appleton, 1975) highlights the need for overview (prospect) and protection (refuge) for perceived safety, as well as the possibility to escape (Fisher & Nasar, 1992). Incivilities theory/social disorder theory (Lorenc et al., 2012) indicates that signs of physical and social incivilities, such as graffiti or drug usage, can induce unsafety (e.g. Schafer et al., 2006). CPTED (Crime Prevention Through Environmental Design) (Jeffery, 1971; Newman, 1972) states that natural surveillance, visual guidelines, spatial qualities, maintenance, and lighting are important for crime reduction. These factors have also shown to increase perceived safety (Iqbal & Ceccato, 2016).

Individual level theories, such as physical vulnerability (Skogan & Maxfield, 1981) explain unsafety as due to being physically weaker (as in the case of women and the elderly). Social vulnerability indicates social characteristics of individuals: income, education, unemployment (Hale, 1996). The shadow of sexual assault identifies fear of crime as fear of sexual assault for women (Ferraro, 1996). On the individual level, perceived likelihood, control, and consequences predict worry about crime (Jackson, 2011). Fear of being harassed or attacked can lead to restricted behaviours (Atkins, 1990); however, many travellers, especially women, are "transit captives", and are reliant on public transit (Ceccato & Loukaitou-Sideris, 2020).

For the present paper, a social-ecological framework has been adopted to structure the findings. It emphasizes interactions among physical and social characteristics in the environment that affect the well-being of individuals (Stokols, 1992). Social-ecological models have been used in research on perceived safety, for example, in neighbourhoods (Foster et al., 2010) and urban green spaces, and can highlight the complexity of interactions between characteristics that impact a person's perceived safety (Sreetheran & van den Bosch, 2014).

2. Methods

2.1. Search strategy

A literature search was conducted from January to March 2021 using the electronic databases ScienceDirect, Scopus, PsycInfo, and Google Scholar. In Google Scholar, the 50 first hits were chosen in each search. The search was limited to journals, books, book chapters, and reports published from 1990 to 2021 in English. No geographical boundaries were used; thus, publications from all over the world were searched for. Safety-related search terms such as fear of crime, fear of victimization, and perceived safety were combined with public transport search terms such as railway station, train station and, station environment. For a conclusive list of search terms for each database and number of resulting publications, see Appendix. As "railway station" was thought to be too narrow, public transport was also included as a search term. The search continued until a saturation was reached and six additional publications were retrieved by hand search from reference lists in, and citations of, the articles found through the search engines.

2.2. Study selection

We adopted the systematic review protocol of type PRISMA-P (Moher et al., 2009). A publication was included if it met the following criteria: (1) the area investigated included rail-bound stations and their surroundings; (2) it focused on perceived safety from a user perspective. The populations were thus users and potential users of rail-bound stations; (3) it discussed characteristics that impact perceived safety or consequences of perceived safety for users in these environments. Regarding *samples*, only publications studying the users' perspectives were thus included, meaning that studies were excluded if they were conducted from the perspective of operators or other stakeholders. Regarding *study environments*, publications were excluded that solely studied on-board travel environments and thus not stations, or those that did not study rail-based travel. The reason for focusing on rail-based stations only was to

delimit the area. If public transport in general had been included, a great diversity, from large stations to bus stops would have made comparisons difficult. Even among rail-based stations, there is a large variation, since everything from stations serving long-distance trains to commuter trains, metro and tram are included. We also excluded publications on actual crime, accidents, or suicide rather than perceived safety. Only empirical journal articles and books, book chapters, and reports were included. Thus, conference papers or publications that had no clear publication type were excluded as well as literature reviews, editorials, and theoretical articles. Reasons for including books, book chapters, and reports was to minimize the risk of missing out on applied research that could be valuable, in the light of scarcity of research. Precedence was given to publications with local relevance.

2.3. Data extraction

Through the database search, 6314 publications were exported to EndNote; 4453 from ScienceDirect, 1353 from Google Scholar, 489 from Scopus, and 19 from PsycInfo. After duplicates were removed, one researcher screened the remaining 3220 publications from
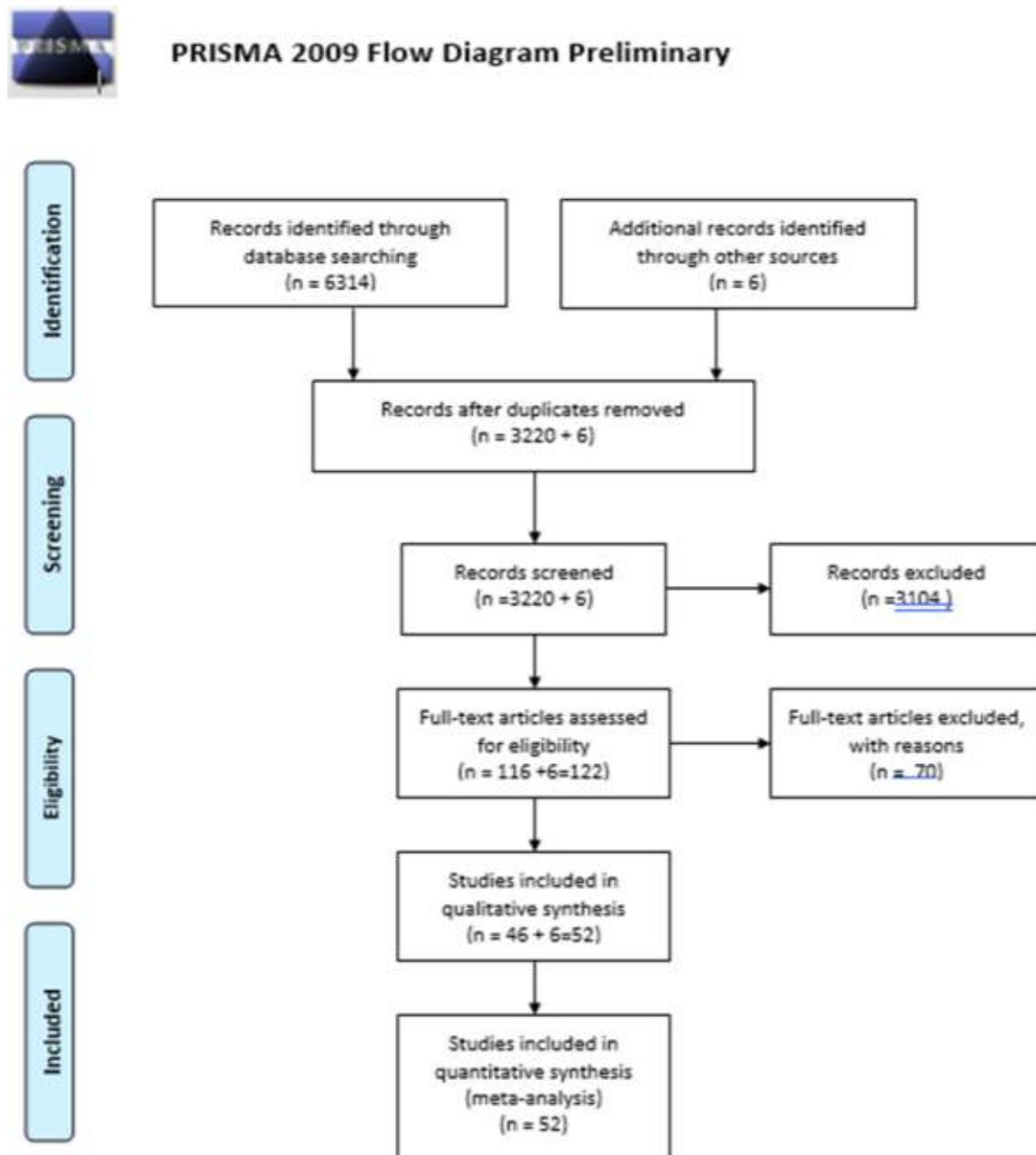

Fig. 1. Flowchart of literature retrieval as outlined by Moher et al. (2009).

titles and/or abstracts for relevance. To test interrater reliability, a second researcher independently selected a sample of 100 publications. All publications in the sample were found to also have been selected by the first researcher; the interrater reliability was then r = 1.0 for this sample. In the next step, the first researcher again sorted the studies, reading them more thoroughly, excluding those that were found irrelevant. In this stage, 116 publications remained relevant. After that, publications meeting the inclusion criteria were retrieved and read in full text to extract findings and other key data. Again, publications found not to meet the criteria were excluded, resulting in 46 relevant articles. In the search process, six additional publications were identified, finally resulting in 52 publications. Data was extracted using a standardized form including main findings, author(s), year of publication, title of publication, name of journal/book, region, sample characteristics, and methods. All design types were accepted except for literature reviews - as research regarding perceived safety in railway station environments specifically is scarce, all available designs were included. As large heterogeneity of publications was accepted, in regard to objectives, variables, methods, settings, samples, and outcomes, a *meta*-analysis was not possible to conduct. The flowchart of literature retrieval is presented in Fig. 1.

3. Results

Of the 52 original publications generated in the search, 46 were journal articles, five were books or book chapters and one was a report. The journals with most publications were Transport Policy, Crime Prevention and Community Safety and Security Journal (Table 1). Most studies, 23, have been conducted in Europe (44%), followed by ten from North and South America (19%), and nine publications from Oceania (17%). Great Britain was the single country with the most publications, nine (17%), followed by seven publications from the United States (13%) and six from Australia (12%). Table 2 shows the geographical distribution of all publications. In the four international publications, several countries were included. The number of publications had increased over the years and most, 62%, were published recently, 2016–2021. No publication was older than from 2002. Table 3 shows each publication with basic data and main findings. Most publications divide participants according to gender. However, some focus exclusively on women (Chowdhury & van Wee, 2020; de Jubainville & Vanier, 2017; Gopal & Shin, 2019; Jaitman, 2020; Kim, 2021; Solymosi, Cella, &

Table 1
Distribution of publications.

Journal	No of publications
Transport Policy	6
Crime Prevention and Community Safety	4
Security Journal	4
Journal of Public Transportation	3
Journal of Transport Geography	2
Transportation	2
Transportation Research Part F	2
Transportation Research Record	2
Case Studies on Transport Policy	1
Cities	1
Cognition, Technology and Work	1
Disability and Society	1
Editorial Board	1
Facilities	1
International Journal of Transport Management	1
Journal of Economics, Race, and Policy	1
Journal of the Royal Statistical Society Series A	1
Journal of Transport and Land Use	1
Journal of Urbanism International Research on Placemaking and Urban Sustainability	1
Mobile Media and Communication	1
Psigologia	1
Nordic Journal of Criminology	1
Road and Transport Research	1
Transportation Research Part A	1
Transportation Research Part D	1
Urban Studies	1
Violence Against Women	1
WIT Transactions on the Built Environment	1
WIT Transactions on Ecology and The Environment	1
Journal articles total	**46**
Book/book chapter	
Transit crime and Sexual Violence in cities (ISBN 9780429290244)	3 chapters
ICT for Transport: Opportunities and Threats (ISBN 9781783471287)	1
Moving safely: crime and perceived safety in Stockholm's subway stations	1
Books/book chapters total	**5**
Report	
Personal security in public transport travel in New Zealand: problems, issues & solutions	1
Reports total	**1**
Publications total	**52**

Table 2
Geographical distribution of publications.

Country	No of publications
Great Britain	9
United States	7
Australia	6
International	4
Sweden	4
India	3
New Zealand	3
Denmark	2
France	2
Italy	2
Mexico	2
Austria	1
Germany	1
Ireland	1
Japan	1
Paraguay and Peru	1
Spain	1
Taiwan	1
Turkey	1
Total	**52**

Newton, 2018; Stark & Meschik, 2018; Vanier & de Jubainville, 2017). Loukaitou-Sideris (2014) interviewed representatives of women's interest groups and in Lubitow et al. (2020) the sample consists of transgender and gender non-conforming persons. One publication focuses on male respondents only: Wiebe et al. (2014) interviewed boys aged 10–18.

Research findings were categorized into four types of characteristics impacting the perceived safety: place, social, individual, and temporal characteristics. A fifth category; behavioural consequences of unsafety was also identified. The categorisation was conducted within a socio-ecological framework, which emphasises the complex interactions between individuals and their physical and social environments (Stokols, 1992). The approach also emphasises the dynamic and thus temporal nature of these interactions. Fig. 2 shows the conceptual framework for the analysis of perceived safety in station environments based on the socio-ecological approach and gives a summary of the main characteristics found. Note that the themes "Place characteristics" (Section 3.1) and "Individual characteristics" (Section 3.3) are considerably longer than the other themes. The reason is simply because these themes were more frequently mentioned as important findings in the publications. Therefore, the size of the shapes in Fig. 2 also differ. They are intended to provide an indication of the relative number of findings for each type of characteristic.

3.1. Place characteristics

Lighting in stations is found in several studies to be important for the perception of safety (Ceccato, 2013; Chowdhury & van Wee, 2020; Cozens, Neale, Whitaker, & Hillier, 2003a,b, 2004; Deníz, 2019; Kennedy, 2008; Kim, 2021; Libardo & Nocera, 2012; Loukaitou-Sideris, 2014; Stark & Meschik, 2018; Sundling, 2020; Vanier & de Jubainville, 2017) and is often found to be one of the most essential characteristics affecting safety in the stations. This also concerns the area around the station (Bivina et al., 2019; Ceccato, 2013; Kennedy, 2008) such as car parks (Libardo & Nocera, 2012; Loukaitou-Sideris, 2014; Thomas et al., 2006). Vanier and de Jubainville (2017) found that especially young women felt unsafe in environments with poor lighting. However, lighting also interacts with other factors. Travelling at night means that there are fewer people around, and involves more risk of encountering people that are intoxicated or in other ways behaving in an uncivil manner (see 3.2) (Kennedy, 2008).

Open environments and high visibility of and by others is important in several studies (Cozens et al., 2002,2003a, 2003b, 2004; Loukaitou-Sideris, 2014). Isolated stations are considered unsafe (Louaitou-Sideris, 2014; Ceccato et al., 2021). *Transparent shelters* and *cutting back vegetation* can increase visibility (Cozens, 2003a, 2003b, 2004). Stations that are integrated or *overlooked by other activities* (Cozens et al., 2002, 2003a, 2003b, 2004) are repeatedly found to be perceived as safer than others. Ceccato (2013) found that metro stations perceived as safer could be reached through walking paths with high visibility from homes. The presence of activities such as an open café, kiosk, or shop to keep these areas busy and to create visibility and natural surveillance is considered to increase perceived safety (Coppola & Silvestri, 2020; Deníz, 2019; Kennedy, 2008; Libardo & Nocera, 2012). Kennedy (2008) notes that one advantage of cafés/kiosks is that people will experience a presence without the tensions associated with more authoritative figures. Measured in walk time, women had lower disutility of walking in open environments where the chance was higher of detecting potential threats, being seen by others, and being able to escape, than in more closed environments (Börjesson, 2012). An interviewee (Kim, 2021) notes: when the light is dim and things are not seen clearly, and you are afraid, it is possible to imagine things, increasing fear; light therefore impacts people's sense of control. However overwhelmingly positive visibility is problematic when visible only to certain others, for example in enclosed brick shelters (Cozens et al., 2003a; 2003b). Also, transgender persons felt vulnerable when waiting for the train because of the captured nature of physical spaces (Lubitow et al., 2020), being on display and vulnerable to negative looks and comments on open lit platforms that are highly visible to passers-by, especially during long waits.

Generally, confined spaces are perceived to contribute to a lack of safety (Loukaitou-Sideris, 2014). Railway *underpasses* are

Table 3

Summary of the 52 reviewed publications.

Author	Region	Respondents	Gender	Data collection methods	Sampling method	Sample size (N)	Data analysis	Type of rail-bound station	Findings
Bivina et al. (2019)	India	Public transport users accessing metro station by walking.	F + M	Interviews	Convenience	600.	SEM	Metro and 800 m around	Safety (traffic signals & signs) most impact for pedestrian accessibility to station.
Börjesson (2012)	Sweden	Public transport users	F + M	Questionnairestated choice experiment.	Convenience (but temporal & geographic distribution)	1314	Discrete choice, regression	Bus and train	Walk time in open environments and daylight induces less disutility than in closed environments and darkness.
Ceccato & Loukaitou-Sideris (2021)	International	Students	F + M + other	Questionnaire	Convenience	Not defined, at least 13,323	Descriptive statistical analysis	All kinds	Avoidance strategies include travel at certain times, routes, and settings.
Ceccato (2013)	Sweden	General public	F + M	Questionnaire interviews	Random	More than23,000	Regression, cluster analysis	Metro	Relationship between unsafe metro stations, unsafe surrounding areas, and criminogenic neighbourhoods
Ceccato et al. (2021)	Sweden	Students	F + M + other	Questionnaire	Convenience	1122	Regression	All kinds	Safety perceptions affected by experience of sexual crimes but not by overall victimization.
Cheng (2010)	Taiwan	Public transport users	F + M	Questionnaire,	Systematic	412	Rasch	Railway	Crowding most important reason for passenger anxiety.
Chowd-hury & van Wee (2020)	New Zealand	Female or gender diverse public transport users.	F	Questionnaire	Stratified	448	Mann-Whitney *U* test, factor analysis.	Train	Women use mobile phones and headphones because of apprehension, remain alert of surroundings, pretend to be confident while waiting.
Chowd-hury (2019)	New Zealand	Car drivers and public transport users	F + M	Questionnaire	Stratified	2173. Data analysis for 1883	Regression	Train	With security guards, female car drivers three times more likely to ride a route with transfer, males two times more likely.
Coppola & Silvestri (2020)	Italy	Public transport users, station operators, management staff	F + M	Interviews focus group	Convenience (interviews). Purposive (focus groups)	170	Regression		Thefts, harassments, aggressions, underpasses negatively affecting safety and security in station areas. Presence of commercial activities increase safety and security.
Cozens & van der Linde (2015)	Australia	Public transport users. Security experts	F + M	Interviews questionnaire audit of land uses	Quota	5 (PT security experts), 100 (users)	Descriptive qualitative and statistical analysis.	Railway stations.	Station not designed using CPTED marginally safer and slightly higher levels of CPTED qualities. Effectiveness of CPTED mediated by local environment and its image.
Cozens (2002)	Great Britain	Public transport users	F + M	Interview	Not specified	1000	Descriptive statistical analysis	Railway stations	Stations safer if well-used, integrated or overlooked by other activities, CCTV, real-time info. Station-specific approach necessary.
Cozens et al. (2003a)	Great Britain	Public transport users	F + M	Focus groups VR interview questionnaire	Purposive	47	Descriptive statistical analysis	Railway station	Women more fearful than men. Visibility of and by others, lighting, CCTV, staff, transparent shelters, clean stations important.
Cozens et al. (2003b)	Great Britain	Public transport users.	F + M	Focus groups VR interview questionnaire	Purposive	47	Descriptive statistical analysis	Railway stations	Women more safety concerns than males. Platform highest percentage

Table 3 (*continued*)

Author	Region	Respondents	Gender	Data collection methods	Sampling method	Sample size (N)	Data analysis	Type of rail-bound station	Findings
									fear, followed by approaching station, security of vehicles in car park.
Cozens et al. (2004)	Great Britain	Public transport users	F + M	Focus groups VR interview questionnaire	Purposive	47	Descriptive qualitative & statistical analysis	Railway stations	Visibility at stations crucial factor for fear of crime. Enclosed shelters problematic, CCTV can't se inside brick shelters.
Currie et al. (2013)	Australia	Public transport users	F + M	Questionnaire.	Convenience	239	MANOVA	Train	Feeling comfortable with people you don't know influence safety perceptions. Gender and actual experience of a safety incident only a small effect.
de Jubainville & Vanier (2017)	France	Public transport users	F	Interviews	From randomized sample: purposive subsample.	3188	Regression	Not specified	Higher education, older age, previous victimisation associated with avoidance.
Delbosc & Currie (2012)	Australia	Households. People facing soc and econ disadvantages	F + M	Interviews	Purposive	784	SEM	Not specified	Strongest direct predictor to feelings of safety on public transport: feeling safe in one's home & on the street at night. Living in a better neighbourhood: lower feelings of safety on public transport. Trust in others positively linked to safety.
Deníz (2019)	Turkey	Public transport users	F + M	Questionnaireobservation	Not defined	351	Descriptive statistical analysis	Metro, suburban	Respondents prefer using public transportation in time period when crime or anti-social behaviours are less likely to occur. Location of station and surroundings also crucial.
Fan et al. (2016)	USA	Public transport users	F + M	Questionnaire observation audit of stations/stops.	Convenience	702	Regression	Light rail, commu-ter rail	Women waiting in insecure surroundings report waits as longer than they are, and longer than do men in the same situation. Bench and shelter associated with reduced reported waiting time.
Gopal & Shin (2019)	India	Public transport users	F	Observation interview	Convenience	51	Qualitative content analysis	Metro	Women adopt behavioural strategies to avoid risk/handle harassment: dress in special way, choose time of day, cover bodies.
Hsu et al. (2019)	USA	Households lo-cated near & far from stations	F + M	Questionnairequasi-experiment	Purposive	202	Regression	Light rail	Women higher safety/security concerns and intentions to reduce transit due to safety concerns compared to men. They increased trips less than males because of safety concerns.
Jaitman (2020)	Peru & Paraguay	Public transport users & nonusers	F	Questionnaire	Stratified	1200	Regression	Train. Metro.	Confidence in the police associated with security on public transport especially for women who are not users. Changed travel mode to feel safer, not travel at night, travel with someone.

Table 3 (*continued*)

Author	Region	Respondents	Gender	Data collection methods	Sampling method	Sample size (N)	Data analysis	Type of rail-bound station	Findings
Kennedy (2008)	New Zealand	Subsample train users included in present review	F + M	Online survey	Stratified	152	Descriptive statistical analysis	Not specified	Support for security guard patrols during less busy times, emergency alarms or 'panic buttons', open cafés/kiosks at stations, security cameras.
Kim (2019)	Great Britain	Public transport users	F	Interviews	Convenience	31	Grounded theory	Metro.	Available help, visibility, accessibility to service staff & police affect fear appraisal. Possibility to escape, technical accessibility to other people, spatial visibility open to potential danger: outside platform at night (poor lighting, empty).
Libardo & Nocera (2011)	Italy	Students	F + M	Questionnaire	Not defined	347	Descriptive statistical analysis	Train, local train	Preferred: staffed stations, other customers and spaces in which they feel that others could observe them. Solitude the main enemy.
Lois et al. (2018)	Spain	Public transport users	F + M	Interview	Convenience	740	Path analysis, regression	Inter-change for metro + bus	Time spent queuing at the interchange is negatively correlated with information and safety & security. Women more insecure.
Loukaitou-Sideris (2014)	USA	Representatives of national women's interest groups	F	Interviews	Purposive	16	Descriptive qualitative analysis	All kinds	Unsafety linked to for example dimly lit parking lots, walkways, unstaffed stations. Safety linked to cleanliness, good visibility, presence of staff, police, other passengers.
Lubitow et al. (2020)	USA	Public transport users	Trans-gender & gender noncon-forming	Interview	Purposive	25	Descriptive qualitative analysis (theme develop-ment)	Light rail, commuter rail	Highly visible places linked to perceived vulnerability when being stationary, yet visible. More comfortable where likely to see other people of colour.
McCarthy et al. (2016)	Ireland	General public	F + M	Questionnaire	Convenience	469	Cluster analysis. Regression	All kinds	The majority stated they would consider downloading a personal safety app.
Newton et al. (2020)	Interna-tional	Students from 5 cities	F + M + other	Questionnaire	Convenience	Not defined	Descriptive statistical analysis, regression	All kinds	Frequent rail users had more avoidance behaviour because of perceived unsafety than non-frequent users.
Ouali et al. (2020)	Interna-tional	Public transport users from 25 countries	F + M	Questionnaire	Not specified	Metro users 137,513	Regression	Metro	Women more likely than men to feel unsafe. Perceived safety decreases with age. Travelling for shopping & leisure purposes: higher safety than travelling to work or school.
Power et al. (2016)	Great Britain	Public transport users & police	F + M	Questionnaire	Convenience	235	Correlation, *t*-test	All kinds	Armed police perceived by users to be the most effective security measure for deterring terrorism.
Reichow & Friemel (2020)	Germany	Public transport users, nonusers, mobile phone users	F + M	Interviews questionnaire	Quota	1291 (study 1) 86 (study 2)	Regression	All kinds	Passengers with lower perceived security more frequently seek social presence via mobile communication.
Santoro et al. (2020)	Interna-tional	Students	F + M.	Questionnaire	Convenience	2138	Descriptive statistical analysis	All kinds	Female students less safe than males.

Table 3 (*continued*)

Author	Region	Respondents	Gender	Data collection methods	Sampling method	Sample size (N)	Data analysis	Type of rail-bound station	Findings
Shibata et al. (2014)	Japan	Public transport users	F + M	Questionnaire	Convenience	2130	Regression	Railway	For rare events, unpleasantness higher for expected than for experienced. Unpleasantness increased with frequency of experiencing the event.
Shirgaokar (2019)	India	Mobile group.	F + M	Focus groups questionnaire	Purposive	154	Word-cloud based	Heavy-rail, metro, mono rail	Women mentioned ideas related to safety ninety-eight times, while men mentioned these ideas sixty-four times. For example risks of traveling after dark.
Shiwakoti et al. (2019)	Australia	Public transport users	F + M + (*trans*-gender or intersex).	Questionnaire	Convenience & random	979	Mixed methods	Train, tram, bus	As walk time to nearest public transport increased, the proportion of respondents who feel safe on tram decreased.
Solymosi et al. (2018)	Great Britain	Public transport users	F + M	Interview questionnaire police-report data	Not defined	Questionnaire (450) interviews (not defined)	Decriptive statistical analysis	All kinds	No measurable increases in fear of crime in people travelling on public transport in London following campaigns.
Stark & Meschik (2018)	Austria	Women in general, those affected by frightening situations	F	Interview	Convenience, snowball, random	Study 1: 60, Study 2: 402.	Chi-square	Metro, railway, tram. Surroundings	Effects of victimization on women's travel behaviour linked to avoidance of routes, travel modes, carrying repellents. Women arm themselves, even when not affected.
Strandby-gaard et al. (2020a)	Denmark	Public transport users	Not defined	Questionnaire/interviews	Convenience	125,449 responses from 9 years of surveys	Probability distribution (kernel density estimate KDE)	S-train (urban rail system)	Dense Urban Area and Coherent Suburb are perceived as the safest and Fragmented Suburb the least safe.
Strandby-gaard et al. (2020b)	Denmark	Public transport users	Not defined	Questionnaire/interviews	Convenience	125,449	Correlation, regression	S-train (urban rail system)	Stations in Dense Urban Area and Coherent Suburb similar income patterns but Coherent Suburb perceived as safest. Tendency towards lower fear of crime in higher income areas within each type.
Sundling (2020)	Sweden	Students	F + M + other	Questionnaire	Convenience	309	Descriptive statistical analysis	All kinds	CCTV, lighting, and police patrolling are wanted improvements.
Thomas et al. (2006)	Great Britain	Stakeholders, public transport users	Not defined	Mixed methods	Convenience, quota sampling	266 + 286	ANOVA	Railway	Availability of staff, to monitor either in person or via CCTV, key priority for passengers.
Thompson et al. (2012)	Australia	Public transport users	F + M	Mixed methods	Not defined	179	Theme development, auto-ethno-graphy, regression	All kinds	Safety strategies: wearing headphones to appear occupied, pretending to be on a mobile phone or making mobile phone calls.
Tilahun et al. (2016)	USA	Public transport users	F + M.	Data through different sources/data bases.	Various	Not defined	Regression	All kinds	Violent crime reduces odds of using non-motorized alternatives as well as use of transit that involves walking or driving last-mile options to access a station.
Uzzell & Brown (2007)	Grat Britain	Public transport users, potential rail travellers	Not defined	Questionnaire card sorting.	Purposive	Study 1: 116. Study 2: 14 participants	Various quantitative analyses	Railway	Most concern: no one able to help if in danger, no adequate up-to-the-minute information, travelling at night.
	France	Public transport users	F	Interviews		5214	Desriptive statistical analysis	Metro, tram, train	Women not uniform group of passengers. Inactive users, who are

Table 3 (*continued*)

| Author	Region	Respondents	Gender	Data collection methods	Sampling method	Sample size (N)	Data analysis	Type of rail-bound station	Findings
Vanier & de Jubainville (2017)					Not defined. Weighted to be representative				relatively older, feel safer. Casual users least safe. Most unsafe situations: when other passengers perceived to be uncivil.
Vilalta (2011)	Mexico	Urban residents	F + M	Interviews	Not defined	1478 households.	Chi-square, Tukey's post hoc.	Metro	Fear of crime increases with duration of journey which may serve as proxy for social class (peripheral location). Lowest odds for fear of crime: not been victimized previously.
Wayland et al. (2020)	Australia	Young adults with disabilities	F + M	Interviews	Purposive	26	Inductive and deductive coding	All kinds	Security cameras increase safety if working.
Wiebe et al. (2014)	USA	Children 10–18 years	M	Interview incl. questionnaire street map	Random	153	Regression	Metro	Safety lower among those being in a gang. Highest safety: traveling with another child, lowest: travelling alone.
Yavuz & Welch (2010)	USA	Public transport users	F + M	Interviews	Random	1172	Regression	Train	Concern of disorderly behaviour rather than of actual crime. Ethnic minorities and people with disabilities more likely to perceive lower safety.
Zegras et al. (2015)	Mexico,	Public transport users	F + M	App survey interviews	Convenience	1528	Regression	Metro and BRT stations CET-RAM	Traveling with five or more companions associated with feeling less secure. Younger passengers: higher levels of security, well educated lower.
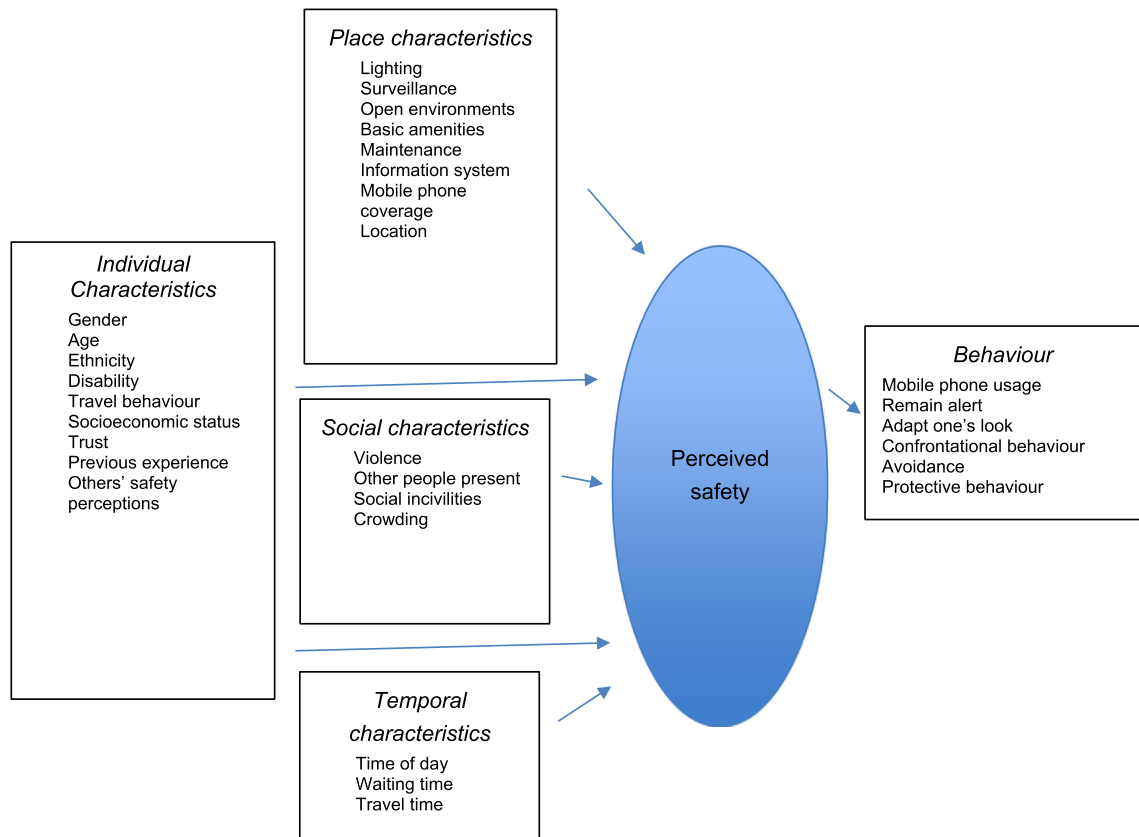
Fig. 2. Conceptual framework, based on a social-ecological framework, for categorizing perceived safety in station environments. The difference in size of shapes indicate differences in number of findings.

repeatedly viewed as unsafe (Coppola & Silvestri, 2020; Cozens et al., 2003a; 2003b). Women experience more fear than men while having to use underpasses (Libardo & Nocera, 2012). Physical environmental features that create limited possibilities to escape invoke fear and block flight responses (Kim, 2021).

Lack of *basic amenities*, such as benches and shelters at the station, is associated with higher reported waiting time, especially for women and if the surroundings are perceived as insecure. The basic amenities are more important for longer waits than shorter (Fan et al., 2016). *Cleanliness* (Cozens et al., 2002; 2003a; 2003b; Loukaitou-Sideris, 2014) contributes to a feeling of safety; *degraded places* make travellers feel unsafe. Vanier and de Jubainville (2017) found that especially casual users felt unsafe in such environments.

Surveillance by some kind of professional also constitutes one of the most important factors when it comes to perceived safety in rail-bound settings (Ceccato, 2013; Ceccato et al., 2021); thus, *the presence of staff* is cited in several studies (Cozens et al., 2002; 2003a; 2003b; 2004; Libardo & Nocera, 2012; Loukaitou-Sideris, 2014). Ouali et al. (2020) observed that it was only for women that the presence of staff in metros significantly increased feelings of safety. But, being able to trust staff when needed is a prerequisite for safety. Interviews with travellers with disabilities (Wayland et al., 2020) showed that, for example, repeatedly being left on the platform alone in the dark after other passengers have boarded the train induced unsafety and fear, especially on finding out that the CCTV was out of order, as one interviewee reported. Shibata et al. (2014) also touched upon the responsibility of the staff. Security problems that the travellers considered to be the responsibility of the station staff (such as vandalism, graffiti, or homeless people) were perceived as more unpleasant than problems attributed to the travellers themselves, such as travelling alone or at night. Therefore, the authors argue that such security issues should be dealt with as quickly as possible. Thomas et al. (2006) found the availability of staff to be the most valued safety improvement in stations and platforms, whether it was in the actual presence of staff or by *surveillance cameras (CCTV)*. CCTV is also a desired device in several other publications (Ceccato, 2013; Cozens et al., 2002; 2003a; 2003b; 2004; Kennedy, 2008; Sundling, 2020; Yavuz & Welch, 2010). Those who want CCTV are to a great extent those who have felt unsafe when travelling (Ceccato et al., 2021). However, Coppola and Silvestri (2020) found CCTV to be a significant safety variable only for males. Likewise, CCTV and help-points were perceived as unhelpful by female users when in immediate danger (Kim 2021). One reason for the mixed results seems to be whether participants trust there is immediate help available. Thomas et al. (2006) found CCTV cameras in and around car parks a highly valued option to improve safety, if they were monitored by a member of staff. The monitoring was essential; otherwise they would be much less valued. "No one to help if you were in danger" induced the highest concern (Uzzell & Brown, 2007).

Security guards increase safety and are a desired improvement (Ceccato, 2013; Chowdhury, 2019; Libardo & Nocera, 2012;

Kennedy, 2008; Yavuz & Welch, 2010) as are *police patrols* (Bivina et al., 2019; Loukaitou-Sideris, 2014; Sundling, 2020; Yavuz & Welch, 2010). People in authority affect women's feelings of safety by reassuring them of potential help and by deterring potential criminal activities (Kim, 2021). However, as with CCTV, the feeling of safety is contingent on their availability in actual fear-evoking situations. And in interviews, some transgender persons felt unsafe in the presence of transit police officers, because of earlier experiences (Lubitow et al., 2020). Also, when studied in a large international project by Ouali et al. (2020), more staff, whether regular staff or police force, did not have a significant effect on perceived safety on the sample as a whole. However, for women the surveillance had a positive effect on safety. As with CCTV, those who wanted increased police patrolling were also more likely to feel unsafe going to or from the station (Ceccato et al., 2021). In most of the studies, the type of crime feared is not specified. However, when asking specifically about terrorism, Power et al. (2016) reported the most reassuring and effective security measure to be police dogs and armed police. However, as people believed they would feel fearful if they saw armed police without knowing why there was an increase in force, it was considered important to know the reason. *Help buttons* or *emergency alarms* are also viewed as helpful (Kennedy, 2008; Libardo & Nocera, 2012; Sundling, 2020). In Ireland the willingness to download personal *safety apps* was tested (McCarthy et al., 2016). Most respondents would consider downloading an app for a small cost, in which they could report personal safety and potential experience of crime in public transport. Most respondents were also willing to use an app to report anti-social behaviour and vandalism with their location data included. Police monitoring of the app was thought to have a positive impact on safety. Systems (audio and visual) are wanted improvements according to other studies as well (Cozens et al.,

Not knowing when the train would arrive was a safety issue for a smaller proportion, 17%, of the participants in a study by Kennedy in 2008. However, reliable and real-time *information* 2002; Uzzell & Brown, 2007) and are now installed in many countries. Perhaps surprisingly, Yavuz and Welch (2010) found that, although important for both men and women, it was more important for men's safety than for women to know when the next train arrived as well as having a frequent and on-time service. In a study by Kim (2021), appropriate information was important, for example when vehicles suddenly stopped, because many interviewees in London's underground were afraid of terror attacks. Good signage in general is also wanted (Deníz, 2019). Also, if *mobile phone coverage* is limited, and people are not able to get in touch with others, they may experience being isolated from potential help (Kim, 2021).

When comparing different parts of the station area, Cozens et al. (2003b) found the *platforms* to be the most feared place, followed by the pathway to the station, and the car parks after dark. Lubitow et al. (2020) who interviewed transgender persons, also found waiting at the platform to be one of the most challenging parts of the journey because visibility increased vulnerability. In Stockholm, smaller metro stations with fewer platforms and exits were perceived to be safer than larger stations (Ceccato, 2013). Deníz (2019) found that *entrances and exits* were perceived as the most unsafe parts followed by staircases and escalators, and metro platforms. Compared to overpasses, *underpasses* were perceived less safe (Libardo & Nocera, 2012). Loukaitou-Sideris (2014) found that car parks and walkways connecting station platforms to park-and-ride facilities were perceived as unsafe.

3.1.1. Neighbourhood and city context

The *location of the station* impacts perceived safety (Deníz, 2019). *Lonely isolated streets, alleyways and secluded pathways* have no natural surveillance and are perceived as unsafe (Kennedy, 2008). *Streets without pavements* may also be perceived as unsafe by older persons due to the risk of falling (Loukaitou-Sideris, 2014), as well as *benches too close to the curb, escalators not well marked for ingress and egress,* and crosswalks with *short signal timing*. In India, safety in the form of *traffic signals and signs* were perceived to be the most important variables for accessing metro stations for pedestrians (Bivina et al., 2019). Stations perceived to be safer were often located in *higher income residential areas* with *small-scale building structures* and easy access to the station with *fewer wide roads to cross* (Ceccato, 2013).

Strandbygaard, Jensen, et al. (2020) and Strandbygaard, Jones, et al. (2020) compared neighbourhoods around train stations based on CPTED. A "fragmented suburb" was perceived to be least safe, a "coherent suburb" most safe and a "dense urban area" in between. *The coherent suburb* consisted of one- to two-storey single-family housing with small building footprints and homogeneously designed with lines and blocks in a consistent manner with streets connected in "X" intersections, partly being remains from old village structures. The dense urban area had natural surveillance because of activity in the street and windows facing the street, enclosure and visual diversity. Typical features of the fragmented suburb, which was perceived as least safe, were a low urban density and low walkability with broad roads and large parking spaces around the station. There was also low urban activity, low enclosure, low natural surveillance, and few active ground floors. When adjusting for income levels, the fear of crime was still higher in the fragmented suburb than the low-income levels would indicate. Thus, CPTED-built neighbourhoods were perceived as safer. However, when Cozens and van der Linde (2015) compared perceived safety at a station designed according to CPTED with one that was not, they found the station *not* designed using CPTED to be perceived as marginally safer. But it in fact also exhibited somewhat higher levels of CPTED qualities than the station designed according to those principles. Also, the effectiveness of CPTED was thought to have been mediated by the surrounding environment and its image.

3.2. Social characteristics

A higher *violent-crime rate* in stations generally decreases feelings of safety (Ceccato, 2013), especially for women (Ouali et al., 2020). Violent crime can reduce the odds of accessing a station (Tilahun et al., 2016). Shibata et al. (2014) found that the unpleasantness of a security problem increased with the frequency of the event. Among the top ten metro stations by crime rate in Sweden, there is a relationship between unsafe subway stations, unsafe surrounding areas, and criminogenic neighbourhoods (Ceccato, 2013). On a larger scale, students in cities with high levels of sexual harassment, like Mexico City, Sao Paulo, or Lagos, also feel less safe than students in other cities (Ceccato & Loukaitou-Sideris, 2021). However, in interviews with adolescent boys (Wiebe et al., 2014), the

respondents did not report higher unsafety in environments with more crime. In this case, a possible reason is that the locations were familiar to the children and perceived safety also varied depending on the company. Comparing different kinds of crime and incivilities, Coppola and Silvestri (2020) found thefts, harassments, and aggressions to be the variables most negatively impacting safety and security in station areas. Chowdhury & van Wee, 2020 found women to be most afraid of harassment, being followed, and theft, in that order. But when Shibata et al. (2014) compared expected and experienced unpleasantness, the expected unpleasantness for rare events, (fire incident, being attacked) was significantly higher than the actual experienced unpleasantness of the same event.

Other people present is a recurring theme for safety. As staff and other professionals increase perceived safety (see 3.1), other passengers being present is also repeatedly perceived as safer than being alone (Ouali et al., 2020; Cozens et al., 2002; Libardo & Nocera, 2012; Loukaitou-Sideris, 2014; Stark & Meschik, 2018; Shirgaokar, 2019; Thompson et al., 2012; Vanier & de Jubainville, 2017). Wiebe et al. (2014) found that among children, those who were travelling alone felt, not surprisingly, most unsafe. Travelling with an adult made them feel safer, but their highest safety was experienced when they travelled with another child. However, in Mexico City Zegras et al. (2015) found that women travelling with a group of companions felt less safe. Proposed reasons were that unsafe travellers may travel in larger groups, or that feeling less secure may lead to the number of travelling companions being misinterpreted as a safety precaution.

While "well-behaved" others are a source of safety, *social incivility* is not (Ceccato, 2013). "Deviant people" were perceived as unsafe by most female respondents (Vanier & de Jubainville, 2017). However, both men and women reported more occurrences of lack of safety from other's uncivil behaviour than problems about safety from actual crime (Yavuz & Welch, 2010). If people are *intoxicated* (Kennedy, 2008; Stark & Meschik, 2018, Wayland et al., 2020) or *hanging around in groups or gangs* (Kennedy, 2008), they may induce unsafety. But also adolescents who themselves are members of gangs (Wiehe et al. 2014) report higher unsafety than other adolescents. For persons with disabilities, other travellers staring and making aggressive comments were a source of insecurity that could linger: "It would pretty much last the entire train trip, until certain people got off the train, until I got home, until I felt safe again" (Wayland et al., 2020, p. 14). *Social problems in the neighbourhood* and *people moving in and out of the area* are also features of unsafe stations (Ceccato, 2013).

Crowding, i.e., too many people, also induces anxiety in travellers (Cheng, 2010; Vanier & de Jubainville, 2017) because potential offenders may act anonymously (Stark & Meschik, 2018). In a study by Thompson et al., (2012) women found crowded carriages unsafe as there could be men who covertly tried to get close to them, and men were anxious not to be perceived as intentionally getting close to women.

3.3. Individual characteristics

Most studies focusing on individual characteristics measure *gender* differences where women are found to feel more unsafe than men (Ceccato, 2013; Ceccato et al., 2021; Ceccato & Loukaitou-Sideris, 2021; Coppola & Silvestri, 2020; Cozens et al., 2003a, 2003b; Kennedy, 2008, 2010; Lois et al., 2018; Libardo & Nocera, 2012; Ouali et al., 2020; Reichow & Friemel, 2020; Santoro et al., 2020; Shirgaokar, 2019; Vilalta, 2011; Zegras et al., 2015). However, for Yavuz and Welch (2010) the difference was not significant. Hsu et al. (2019) studied intentions and actual travel behaviour before and after a new light rail service opened. Here, women's unsafety was higher than men's and restricted both intentions and behaviour more. Therefore, women in particular prioritized safety concerns before environmental concerns. People also differ in what they are afraid of; men are prepared for theft or violence, while women fear sexual attacks (Ceccato & Loukaitou-Sideris, 2021). Women's explanations for fear are, for instance, that they are not built to be as strong as most men, by whom they are afraid of being attacked, that women are easier targets, they carry easy-to-grab purses, and they run the risk of sexual assault. Also, they are less likely to have a car, and might work late, thus relying on public transportation (Loukaitou-Sideris, 2014). The perceived vulnerability because of weaker physical strength was also mentioned in interviews by Kim (2021) with dependence on other people's potential help and the accuracy of service acting together to affect the level of controllability and certainty for women.

The environment has generally been found to be more important to women than to men. The physical environment is more strongly linked to perceived unsafety for women than for men (Börjesson, 2012). Also, Fan et al., (2016) showed women to be more sensitive than men when fear was measured as estimated waiting time when waiting in insecure surroundings. Measured as walk time, men's walk time was relatively independent of the environment, which was not the case for women (Börjesson, 2012). Reichow and Friemel (2020) found that travellers who feel unsafe seek social presence more frequently via mobile communication, and this was especially true for women.

Evidence regarding age and perceived safety is mixed. Ouali et al. (2020) found that safety decreased with *age* as did Zegras et al. (2015), and Wiebe et al. (2014). However, the participants in this latter study were all young: 10–18 years old. Likewise, Reichow and Friemel (2020), whose participants ranged from 16 to 87 years old, found that older people felt less safe than younger. But for Ceccato (2013) those aged 26–65 felt less safe than both the youngest and the oldest. In some studies, however, the youngest feel most unsafe, for example in Kennedy (2008), (15–24 years old); however this was followed by the oldest group (55 +). Here, the older group constituted only 5% of the sample. Lois et al. (2018) also found the youngest women (18–25) to be the most unsafe group. However, for age alone there was no significant difference between groups, but when age and gender were combined, young women felt significantly less safe. Vanier and de Jubainville (2017) found young women to be most unsafe (at night and weekends). Vilalta (2011) found that those over 50 were the safest. Yavuz and Welch (2010) found that age was not significantly related to perceived safety. Thus, in the studies included, there is no consensus regarding age and perceived safety.

Yavuz and Welch (2010) found that people with higher *incomes* felt safer. But those with higher *education* felt less safe than others, although this group was small (Zegras et al., 2015). *People with children* were also more worried at metro stations than others (Ceccato,

2013) and those living in high-crime *neighbourhoods* felt less safe on the way to the station (Ceccato et al., 2021). But those living in a better neighbourhood felt more unsafe in public transport. This was thought to result from seeing public transport situations as more dangerous than the safety of their home (Delbosc & Currie, 2012). Also, those living farther away from the city centre felt less safe on public transport (Delbosc & Currie, 2012) Persons with disabilities felt less safe than others (Yavuz & Welch, 2010) and discrimination, vulnerability, and exposedness induced unsafety in relation to both staff and other passengers (Wailand et al., 2020). With regard to travel purpose, Ouali et al. (2020) found that those who were travelling for shopping or other leisure purposes felt safer than those going to school or work. A possible explanation was that the former can pick their destinations, routes, dates, times, and travel companions. However, school trips were associated with higher safety than other travel purposes such as work or shopping, for females in Mexico City (Zegras et al. (2015).

The role of *ethnicity* varies in the publications. Women with other ethnicities than New Zealand European felt less safe during the day (Chowdhury & van Wee, 2020). Likewise, Yavuz and Welch (2010), found in the USA that ethnic minorities had lower perceived safety. It was suggested that this was related to ethnic minorities living in areas with higher crime rates. However, the effect was significant only for males. Ceccato and Loukaitou-Sideris (2021) contrarily found that in the USA and Brazil, non-white students expressed more fear than white students. No such difference was found in Sweden, although the sample of people born abroad was small (Santoro et al., 2020). In another study in the same city, with a larger sample, those born abroad felt less safe than those born in Sweden (Ceccato, 2013). In an interview study by Lubitow et al. (2020) people of colour were more comfortable in areas where there were other *people of colour.*

More *years of ridership* were associated with feeling safer. Yavuz and Welch (2010), suggested that this was due to higher familiarization over time. Delbosc and Currie (2012) found a small but significant positive relationship between perceived safety and *travel frequency.* But for Ouali et al. (2020), those who travelled on the extremes of the scale, very often or very rarely, felt more unsafe. Contrary to this, Vanier and de Jubainville (2017) found that infrequent users felt most safe while those who travelled more often (but less than once a week) felt least safe. Yavuz and Welch (2010) and Currie et al., (2013) found no relationship between travel frequency and perceived safety at all. Thus, there was no consensus on travel frequency and safety perceptions.

Some publications address how attitudes or perceived safety in other situations than travelling link to perceived safety in public transport. Safety on public transport was positively associated with *feeling safe in one's home and street at night* (Delbosc & Currie, 2012) as well as having more *trust in other people.* Here, both age and gender were only indirectly linked to perceived safety. Along the same lines, Vilalta (2011) found that those who were not feeling safe in their neighbourhood and had low *trust in the police* did not feel safe when travelling either. Likewise, Jaitman (2020) identified confidence in the police to be associated with perceived safety, but in this case, it regarded especially women who did not actually use public transport. Reichow and Friemel (2020) also found a positive association between personal trust and perceived safety. Currie et al. (2013) found that *anxiety and discomfort associated with travelling with people you do not know* was the most influential factor driving negative feelings of personal safety on public transport. But gender and actual experience of previous unsafe incidents (e.g. seeing someone being threatened, oneself being attacked) were not as important, although they did influence fear of crime.

Stark and Meschik, (2018) found that negative travel experiences were associated with reduced perceived safety. Yavuz and Welch (2010) also found that, although significant for both women and men, having experienced such events was what impacted women's perceived safety the most, while for men it was the reliability of service that had the most impact. Thus, the negative incidents had a stronger effect on women than on men. Also in Vilalta (2011) and Ceccato (2013), fear of crime was higher among those who had been victimized. However, Ceccato et al. (2021) found that previous victimization had a negative effect on safety only when it had been a sexual crime. Also, when perceived safety was measured as avoidance (in time and space), previous *victimization* had an impact (de Jubainville & Vanier, 2017). The probability that a woman previously victimized would avoid certain times of the day was 39% higher than for non-victims. Stark and Meschik (2018) found that 96% of the women who had experienced a frightening situation took precautions. However as many as 78% of the women not having such an experience did the same, indicating that women not personally exposed also have a constrained travel behaviour. Victimization had a significant positive relation to seeking *social presence* by using one's mobile phone to handle perceived unsafety (Reichow and Friemel, 2020). Also, other people's views have shown to impact perceived safety Chowdhury & van Wee, 2020 found that *social perceptions of safety from family and friends* had an influence on how women perceived their personal safety while waiting at terminals.

3.4. Temporal characteristics

Daytime is generally perceived as safer than nighttime (Börjesson, 2012; Libardo & Nocera, 2012; Ceccato et al: 2021; Ceccato & Loukaitou-Sideris, 2021; Deníz, 2019; Shirgaokar, 2019; Uzzell & Brown, 2007; Wiebe et al., 2014; Vanier & de Jubainville, 2017). In Deníz (2019) 73% of the respondents said they prefer using public transport in a time period when crime or anti-social behaviour is less likely. This was perceived to be more important than, for instance, the location of the station and its surroundings. Time of day is especially important for women (Libardo & Nocera, 2012; Deníz, 2019) and older persons (Deníz, 2019). At night and at *weekends,* the younger women were the most unsafe (Vanier & de Jubainville, 2017). Daily workers felt unsafe early in the morning and on *weekdays* compared to others. Interviews with persons with disabilities suggested that *peak hours* could be avoided because of unsafety (Wailand et al., 2020). However, for Yavuz and Welch (2010) peak-hour travelling implied higher safety, but only for males.

Regarding *waiting time,* women waiting for more than 10 min in perceived insecure surroundings reported waits as dramatically longer than they really were, and longer than men did in the same situation (Fan et al., 2016). Lois et al. (2018) found that time spent queuing inside an interchange station was negatively correlated with perceived safety: the longer the wait, the lower the perceived safety. Regarding *travel time,* fear of crime increased with duration of the trip particularly after the first 30 min (Vilalta, 2011).

However, this was thought to be a matter of socioeconomic differences with lower housing costs in peripheral locations. Ceccato et al. (2021) found the same in Stockholm for metro, tram, or commuter trains: if the journey was longer than 30 min, travellers were 1.6 times more likely to feel unsafe. *Living distance from the metro station* and safety were not strongly correlated in a study by Ceccato (2013). By contrast, Shiwakoti et al. (2019) found that as *walk time* to public transport from home increased, the proportion of respondents' feeling unsafe also increased. Of those who felt safe, the majority had less than 5 min walk. Thus, although not conclusive, there is a tendency towards lower perceived safety the more time is spent travelling, viewed from a "whole-journey perspective".

In one study, perceived safety risks were measured at the beginning and the end of an interview about safety. Respondents were then found to perceive less risk at the end of the interview compared to before the interview. This was hypothesized to be the result of becoming aware, *during the interview*, of the controlled public transport environment (Coppola & Silvestri, 2020). When an information campaign in London public transport was carried out to "Report it to stop it" to tackle unwanted sexual behaviour, fear of crime was thought to potentially increase. However, when measured before and after there was no change in passengers' fear of crime (Solymosi et al., 2018).

3.5. Behaviour as a consequence of perceived unsafety

Stark and Meschik (2018) showed that most women took precautions to avoid frightening and unpleasant situations when travelling. A short-term coping strategy for women in station environments is to rely on *mobile phones* and headphones during waiting times (Ceccato & Loukaitou-Sideris, 2021; Chowdhury & van Wee, 2020). The mobile phone can be a way of seeking emotional stability by connecting to friends and family (Kim, 2021). Likewise, travellers who felt less safe more frequently sought social presence via mobile communication while travelling (Reichow & Friemel, 2020). Younger travellers, even though they perceived themselves to be safer than older travellers, used this coping strategy more often when travelling. This was assumed to be because smartphone use is more common among younger people. Thompson et al. (2012) found that some female participants wore headphones even without the device being in operation, as a personal safety strategy just to appear occupied and to discourage others from initiating contact. The phone could also be used by pretending to make a call (Thompson et al., 2012; Stark & Meschik, 2018).

Female travellers often try to make sure they *remain alert* and aware of their surroundings (Ceccato & Loukaitou-Sideris, 2021; Chowdhury & van Wee, 2020; Jaitman, 2020). For a transgender person (Lubitow et al., 2020), seeing confusion in other travellers may be, if not immediately threatening, a prompt to remain alert and pay attention to how that confusion would manifest itself. Travellers also try to adapt their look, for example *pretend to be confident* while waiting (Chowdhury & van Wee, 2020; Gopal & Shin, 2019) and to talk loudly and obnoxiously on the phone (Gopal & Shin, 2019). A small number of these interviewees also more directly confronted the risks by *reporting incidents, shaming the perpetrator* verbally, *staring back*, and using the *women's compartment* available in India, where the study was conducted. However, reporting incidents made some transgender persons feel unprotected when the staff did not understand (Lubitow et al., 2020). Other coping strategies were to *conceal one's body* by choosing a seat next to a wall (Gopal & Shin 2019) or next to a trustworthy person (Stark & Meschik, 2018), to cover one's body with bags (Gopal & Shin 2019), to use a backpack as a shield (Ceccato & Loukaitou-Sideris, 2021), or to have one's *arms outstretched* so no one could come close (Gopal & Shin 2019).

Several publications address avoidance behaviours as long-term consequences of perceived unsafety. There is an association between perceived unsafety and *lower public transport use* (Delbosc & Currie, 2012; Loukaitou-Sideris, 2014; Jaitman, 2020). Ouali et al. (2020) found, however, that those who travelled either very rarely or very often felt more unsafe than those whose travel frequency was in between. Newton et al. (2020) identified frequent rail users as having more avoidance behaviour because of perceived unsafety than non-frequent users. Likewise, Shiwakoti et al. (2019) found a significant relationship between unsafety on trams and not using public transport and those who felt safe were also twice as likely to support a future tramline extension compared to those who felt unsafe. Their expected usage frequency was also higher. Hsu et al. (2019) studied intentions and actual travel behaviour before and after a new light rail service opened in Los Angeles, USA. They found that women's intentions to reduce travelling because of safety concerns were higher than for men. The actual behaviour also differed; they increased trips less than males although living close, because of safety concerns.

Because of perceived risks, especially at night, public transport may be used only at *certain times of the day* (Ceccato & Loukaitou-Sideris, 2021). de Jubainville and Vanier (2017) showed that older women (over 66) to a larger extent avoided travelling at certain times. The same was true for women with higher education. Travellers also avoided *certain routes or places* (Ceccato & Loukaitou-Sideris, 2021; Loukaitou-Sideris, 2014; Stark & Meschik, 2018; Sundling, 2020) or *certain travel modes* (Stark & Meschik, 2018; Jaitman, 2020). However, Stark & Meschik (2018) noted that most of those who avoided a specific travel mode avoided public transport in general. Those who found safety to be important in their choice of travel mode also perceived a higher safety (Zegras et al., 2015). This was suggested to reflect travel choices being made to fulfil these preferences.

The main reasons for avoiding rail-bound transport in Sweden (Sundling, 2020) were the presence of inebriated people and the risk of sexual harassment; 25% of the women and 5% of the men used public transport less than desired because of sexual harassment. However, not everyone has the same opportunities to avoid travelling (de Jubainville & Vanier, 2017). This may differ depending on age: those who were older (66 +) had more possibility to change routines, while those 14–25 had less opportunity to do so. Here, time-based avoidance was more frequent than space-based avoidance. Gopal and Shin (2019) found that women tried to choose the time of day *to travel, when there is a sufficient crowd* but it is not overcrowded *or not late at night when there are no or few other women out in Delhi, India.* Also, Kennedy (2008), Loukaitou-Sideris (2014), and Jaitman (2020) found that travellers choose not to travel at night. Women especially also adapt their behaviour in other ways to avoid risk. They *dress* in a special way (Ceccato & Loukaitou-Sideris, 2021; Gopal & Shin, 2019; Loukaitou-Sideris, 2014; Sundling, 2020) *avoid being alone*; (Loukaitou-Sideris, 2014; Jaitman, 2020; Shirgaokar, 2019;

Stark & Meschik, 2018), or avoid wearing or carrying anything of value (Jaitman, 2020).

Protective behaviour, such as *carrying specific items* was noted in some of the publications, for example pepper spray, (Gopal & Shin, 2019; Stark & Meschik, 2018), keys, or an alarm (Stark & Meschik, 2018). These were carried especially after dark; in Vienna, Austria a fourth (24%) of the women, when they were out in the evening (Stark & Meschik, 2018) and in Los Angeles, a fifth of the female students carried protective items (Ceccato & Loukaitou-Sideris, 2021).

4. Discussion

The aim of the present paper was to review international evidence on characteristics impacting perceived safety in and around rail-bound stations and behavioural consequences of perceived unsafety in these environments. The characteristics were categorized as place, social, individual, and temporal.

The reviewed publications support a link between certain characteristics in the physical environment and perceived safety. Good lighting as an important characteristic is well known from a large body of previous research, in station environments and in other environments (e.g. Pain, 2000; Sreetheran & van den Bosch, 2014). Lighting can impact safety, for instance, by increasing visibility, reducing potential hiding places for perpetrators, and giving a more welcoming impression (Lorenc et al., 2013a). The reviewed publications also show that lighting works in interaction with other characteristics, for instance, individual, which is in line with previous research. For example, Johansson et al. (2011) show that a footpath with the same lighting is perceived as more dangerous by women than by men. Also, when perceived safety is not threatened, people can accept lower street lighting levels (Boomsma & Steg, 2014). In this case, safety was in turn dependent on the possibility to escape, level of lighting, and gender (women felt more unsafe). However, apart from brightness, an even lighting is needed to counteract a fishbowl effect in which a person is being seen but cannot see others, which may increase unsafety (van Rijswijk & Haans, 2018). An increasingly important question is also how to balance lighting with climate aspects. For example, how much light is needed when a station is empty?

In the reviewed publications, visibility is considered important for safety. Visibility can be achieved through lighting or through other means. Visibility being important for safety is in accordance with CPTED and defensible-space theory (Newman, 1972) in which natural surveillance is empathized (Jacobs, 1961) (the ability to see other people and to be seen). Underpasses are examples of built-in features that are planned to increase safety by separating pedestrians from vehicular traffic but can be perceived as unsafe when it comes to crime, since they lack visibility from others and possibilities of escape. Visibility of staff and other professionals based at the station as well as fellow passengers or other people in the vicinity increase safety. This has been shown in many other environments; activities generating pedestrian traffic are generally considered to improve safety (Foster et al., 2010; Lorenc et al., 2013a). Isolated stations are therefore perceived unsafe as well as confined spaces.

However, being exposed to other people, for example when standing alone on a platform, can also increase unsafety, because of lack of refuge from potential predators, in line with prospect-refuge theory (Appleton, 1975), which emphasizes the ability to have an overview without oneself being seen. The presence of others can either decrease or increase unsafety, depending on the behaviour of others. Social incivilities as a major source of unsafety has support in the present study and is in line with previous research (Foster et al., 2010; Lorenc et al, 2012). A person behaving in a norm-violating way, for example disregarding social or moral rules, may be perceived as threatening (Gabriel & Greve, 2003). Perceived social incivilities may signal unpredictability and thus lower personal control whether it concerns noisy behaviour or drug dealing. The feeling of being in control is central to safety (Sundling, 2015) and lack of control is linked to helplessness and psychological distress (Evans, 2003). However, it should be remembered that what is perceived as incivility by one user might not be experienced the same way by another. For example, Cobbina et al. (2008) found that what was used as a risk-management strategy for young men - hanging around in groups - was the behaviour that made young women feel more unsafe. Also, there is no perfect number of other people present. In the reviewed publications, crowding was found to induce unsafety. Earlier research has, however, received ambiguous results (Foster et al., 2010). One reason may be the social integration into the area. For example, Hunter and Baumer (1982) showed that the same number of persons in an environment induced different levels of fear of crime depending on the respondents' connection to the neighbourhood. It is not clear if that was a variable in the present paper.

Most of the reviewed studies consider gender. Women are, almost without exception, found to feel more unsafe in the transit environment (Peters 2013; Smith 2008). This is despite reporting victimization less often than men (BRÅ, 2020). However, men also tend to underreport feelings (e.g. Clancy & Gove, 1974). This may be explained by stereotypes of masculinity in which there is a stigma against showing emotions such as fear (Sutton et al., 2011; Berntson et al., 2016). However, crime and harassment against women is also underreported. In an international study, only 3% (Milan) to 17% (Tokyo) of those who had experienced harassment or assault had reported it to the police or transit authority (Whitzman et al., 2020). Women's fear also tends to be different from men's as women to a greater extent are victims of sexual crime but also of recurrent sexual harassment which in turn may arouse apprehension of more serious crime (Lorenc et al., 2013b). Women are more afraid of sexual harassment and sexual crimes (Lorenc et al., 2013b; Mellgren & Ivert, 2019). Dread of sexual violence can induce more fear than fear of other crimes and be more pervasive and inescapable (Lorenc et al., 2013a). That is important to note because fear of crime is sometimes claimed to be "irrational" although looking at the reality women face, it is highly rational (Mellgren & Ivert, 2019). Also, because of the severe consequences, the risk of rape might be appraised more affectively while, for example, a car crime may be appraised more cognitively and thus not induce as much fear (Jackson, 2006). The reaction and interventions needed may therefore differ depending on fear of crimes such as car theft, pickpocketing, or rape.

The way people answer questions about safety may differ depending on how the questions are posed (Farrall et al., 2006). In many of the present studies, participants are not asked to specify what they are afraid of in the transit environment. This means that different participants may have fears of very diverse crimes in mind when answering the questions and thus have different views of what would

make them feel safer. For example, when fear of terrorism was specifically asked for, the interventions proposed were armed police and police dogs although these interventions were not often mentioned in other studies. Offence-specific questions in future studies can help specify more closely what the unsafety consists of (Hale, 1996). Likewise, a situation-specific unsafety is waiting in crowded places, when groping can be feared. Thus, in order to pinpoint what specific offences are feared and in what situation, detail such as precise location in the station, for instance, may give a better understanding (Gabriel & Greve, 2003). Thus, more detailed investigations are needed to assess the psychological mechanisms underlying judgement about, and affective reactions to, the environment (Lorenc et al., 2012) and to integrate individual and contextual level explanations into a multilevel view (Henson & Reyns, 2015)

Most but not all reviewed publications focusing on victimization and perceived safety find that those who have experienced victimization also feel less safe. This is in line with much of the earlier research (Skogan & Maxfield, 1981). However, as in the reviewed papers, earlier research has also been mixed; some have only found weak or no associations between fear and experienced victimization (Hale, 1996; Farrall et al., 2007), at least if victimization is seen as the sole explanation. Also, the type of victimization may matter. For example, in the reviewed papers, it was found that specifically sexual victimization was linked to less safety. This is in line with a larger body of previous research showing that different kinds of victimization lead to different fears. Thus, victimization from violent crime leads to fear of violence and indirectly to fear of burglary but victimization from burglary only leads to fear of burglary (Rountree, 1998). In the reviewed publications, victimization is measured in different ways; in future studies, a more specified measurement of the kind of victimization would be helpful. Also, a difference has previously been found between daytime and night-time fear in relation to prior victimization. Fox et al. (2009) found that daytime fear was associated with a range of experiences (stalking, sexual assault, theft etc.) while night-time fear was associated with only sexual assault, thus suggesting that daytime and night-time fear have different causal processes. In this case, however, victims of theft and stalking were also more fearful than victims of sexual assault. The inconsistencies can be due to the complexity of the links. Thus, the interaction effects of victimization is an area that needs further research.

There is no consensus on differences in perceived safety due to age in the reviewed publications. One of the potential reasons is that the studies use different age spans. Historically, safety has been suggested to decrease with age. Over time, however, this has been questioned. Gainey et al. (2011) point out that there are variations in vulnerability among the elderly as for people of other ages, due to parameters such as neighbourhood. Perceived safety in relation to age is thus often influenced by other factors (Henson & Reyns, 2015). This was seen in some of the present publications. For example, in one study there was no effect of age only, but in interaction with gender, young women were identified to be least safe. Likewise, older respondents who also were inactive users, felt safer to a higher degree.

A few reviewed studies consider ethnicity. Some previous research has found ethnic differences, such as whites being more fearful than others (Gainey et al., 2011). In recent studies, non-white respondents often report more fear. These differences are, again, often found to be influenced by other factors (Henson & Reyns, 2015). In the reviewed studies, the results are mixed, although they seem to indicate that belonging to an ethnic minority in that specific area often means feeling less safe than with others of the same ethnicity. There might also be actual differences in risk for different ethnic groups in the various reviewed study environments because of factors such as racism or crime rate. Also, the general tendency to fear "others" categorized as belonging to an "out-group" (you) instead of "in-group" (we) could be of impact (Tajfel & Wilkes, 1963). In the present case, there may also be methodological reasons because of small group sizes.

Only one of the publications focused specifically on people with disabilities, and more studies are needed in this area as it is a vulnerable group in public transport. In previous research, Ceccato (2015) has shown that people in Sweden with disabilities are more afraid to go out after dark than others because of fear of being exposed to crime. In another study in Sweden, addressing older people, fear of being harassed and of other passengers' attitudes were among the most important barriers to travelling more often for infrequent travellers, who were also those with the most severe disabilities (Sundling et al., 2014).

General trust as a predictor of fear is in line with earlier studies. For example, Gainey et al. (2011) found trust in one's neighbours to be directly linked to lower fear of crime. In one of the present publications, trust in other people and attitudes to travelling with people you do not know had even more impact on perceived safety than gender and of victimization. Strangers can be interpreted as a source of danger, found in defensible space (Newman, 1972) or as a source of safety, illustrating why open environments are perceived to be safer (Hillier, 2004). It is plausible that there are individual differences in the trust of other people, for example depending on earlier experiences, but also due to different environments. Future studies should look deeper into trust and also how it is connected to avoidance behaviour, since it can become internalized and normalized as an attitude of vigilance (Lorenc et al., 2012). The link between psychological variables (such as attitudes or trait emotions) and perceived safety has rarely been addressed in research (Guedes et al., 2018). Samples are often segmented according to more apparent groups, such as gender or age. Segmenting according to attitudes could be used more in future studies.

Constrained behaviours because of unsafety are seen in the present publications, both in the short and long term. This is in line with earlier research (Lorenc et al, 2013a). The reviewed studies are, however, mostly cross-sectional; it is not possible to state the causal relationship. According to Rader et al. (2007) there is a reciprocal relationship between fear of crime and constrained (avoidance and defensive) behaviour and between fear of crime and perceived risk. Constrained behaviour can increase fear, for instance, by focusing on the risks of travelling or missing out on positive experiences by avoidance (Liska et al., 1988; Bandura, 1978). More longitudinal studies could examine these relationships and the mechanisms involved.

To our knowledge, this is the first review synthesizing international evidence on perceived safety and its behavioural consequences in station environments. There is a possibility of publication bias, in that relevant publications may have been excluded. Also, a *meta*-analysis was not possible to conduct because of the heterogeneous studies identified in the search process. There were different

objectives, variables, methods, settings, samples, and outcomes. Therefore, a more qualitative and descriptive analysis was undertaken. Also, some of the publications build on the same data sets. Note that data in Santoro et al. (2020); Newton et al. (2020); Sundling (2020); Ceccato et al. (2021), Ceccato & Loukaitou-Sideris (2021) is taken from the same international study but from partly different samples around the world. Cozens et al. (2003a, 2003b; & 2004) build on the same data and partly also (Strandbygaard, Jensen, et al., 2020, Strandbygaard, Jones, et al., 2020). They were included as the focus differs and they thus complement each other.

The participants in the reviewed publications are public transport users, potential users, or representatives of user groups. The large, diverse, and global pool of respondents gives a representation of large user groups, which increases generalizability. The reviewed studies are spread over 18 countries and in addition, a few are international studies; thus, large parts of the world are covered. However, most publications were conducted in industrialized countries. Therefore, some findings might not be transferable. Also, most studies were conducted in urban environments, many in metropolitan areas such as London, Delhi, and Madrid. However, a few studies were conducted in smaller towns such as Frosinone in Italy. Future studies should focus on smaller towns, where the problem of isolated and empty stations might be more prominent. Even if many characteristics are comparable geographically, some safety issues may be viewed differently in different locations. Each unique station may have specific concerns. Thus, solutions cannot always be generalized even between stations in the same area.

Most publications use non-probability sampling rather than random sampling and a single method to collect data, primarily questionnaires or interviews. Some also use focus groups or other methods, such as VR walk-through scenes, walk-through focus groups, observations, experience sampling, and experiment. For future research, quantitative and qualitative methods in combination can complement each other and explain inconsistencies (Onwuegbuzie & Leech, 2005). Participants exposed to real environments and in real time could provide ecological validity.

Regarding policies that could improve safety, principles found in research should be used. A dialogue between planners and researchers is essential. Interactions between different characteristics should be considered. The night-time environment should always be considered in the planning process, and vulnerable groups should be included. Generally, it is essential for users not to be left alone if they feel unsafe, and this can be handled in different ways in cases when staff or other forms of natural surveillance is impracticable, for example, by facilitating for users to report problems in real time with help buttons, emergency alarms, or safety apps. For travellers, knowing it is possible, and easy, to call for help if needed can increase safety. It can also be a way for stakeholders to map unsafe places.

5. Conclusions

This paper reviewed (a) characteristics impacting perceived safety in stations and (b) behavioural consequences of unsafety. Among the important characteristics for perceived safety were lighting, surveillance, other people's behaviour, time of day, and one's own gender. Among the behavioural consequences of perceived unsafety were avoidance and protective behaviours of different kinds, such as avoiding travelling at certain times of the day or by certain travel modes and bringing protective items. However, safety is a complex phenomenon and often dependent on interactions between several characteristics. These complex interactions should be further explored in future research. A social-ecological model has proved to be useful here in mapping these associations and could be built on to further map associations among characteristics and thus further develop and deepen the understanding of these complex interactions. Before any intervention is suggested, it is essential to systematically, and in detail map out where and when people feel unsafe, who feels unsafe and why, and how behaviour is constrained. Many of these modifications are not generic and may not be generalizable to all stations or for all groups of users. More use of longitudinal methods could give new answers as it is difficult to draw causal conclusions from cross-sectional data. Natural experiments in which perceived safety is measured before and after modifications would increase ecological validity.

Appendix. - log of search process: Search terms, number of resulting searches and date of the search

Database	Search terms	No. of studies	Last search
Science Direct	Fear of crime AND railway station	488 to EndNote	Jan 2021
Scopus		297 to EndNote	Jan 2021
PubMed		0	Feb 2021
Google Scholar		50 first to EndNote	Feb 2021
PsycInfo		2 (1 duplicate, 1 not relevant) = 0 to EndNote	Feb 2021
Science Direct	Fear of victimization AND railway station	100 to EndNote	Feb 2021
Google Scholar		50 first to EndNote	Feb 2021
Scopus		81 to EndNote	Feb 2021
PsycInfo		0	Feb 2021
Science Direct	Fear of crime AND station environment AND public transport	574 to EndNote	Feb 2021
Google Scholar		50 first to EndNote	Feb 2021
PsycInfo		0	Feb 2021
Scopus		1 (duplicate). 0 to EndNote	Feb 2021
Science Direct	Comfort AND safety AND crime AND public transport AND station	433 to EndNote	Feb 2021
PsycInfo		0	Feb 2021
Scopus		2 to EndNote	Feb 2021
Google Scholar		50 first to EndNote	
Science Direct	Fear of crime AND good example AND public transport (AND) station	713 to EndNote	Feb 2021
PsycInfo		0	Feb 2021
Scopus		0	Feb 2021
Google Scholar		50 first to EndNote	Feb 2021
Psycinfo	Fear of crime AND public transport	19 to EndNote	Feb 2021
Scopus		20 to EndNote	Feb 2021
Science Direct		249 to EndNote	Feb 2021
Google Scholar		50 first to EndNote	Feb 2021
Science Direct	"Crime" AND "emotional re-sponse" AND "public trans-port"	37 to EndNote	Feb 2021
Scopus		0	Feb 2021
Google Scholar		50 first to EndNote	Feb 2021
PsycInfo		0	Feb 2021
Google Scholar	"Crime" AND "behavioural re-sponse" AND "public trans-port"	50 first to EndNote	Feb 2021
Science Direct	"Feeling of safety" AND "crime" AND "public transport"	45 to EndNote	Feb 2021
Scopus		6 to EndNote	Feb 2021
PsycInfo		1 (duplicate) = 0	Feb 2021
Google Scholar		50 first to EndNote	Feb 2021
Science Direct	"Anxiety" AND "crime" AND "station" AND "public transport"	120 to EndNote	Feb 2021
Scopus		0	Feb 2021
PsycInfo		0	Feb 2021
Google Scholar		50 first to EndNote	Feb 2021
Science Direct	Barriers AND perceived safety AND public transport	215 to EndNote	Feb 2021
Scopus		1 (duplicate) = 0	Feb 2021
PsycInfo		0	Feb 2021
Google Scholar		50 first to EndNote	Feb 2021
Science Direct	Perceived safety AND crime AND railway station	321 to EndNote	Feb 2021
PsycInfo		0	Feb 2021
Scopus		1 (duplicate) = 0	Feb 2021
Google Scholar		50 first to EndNote	Feb 2021
Science Direct	Perceived risk AND crime AND railway station	330 to EndNote	Feb 2021
PsycInfo		0	Feb 2021
Scopus		0	Feb 2021
Google Scholar		50 first to EndNote	Feb 2021
Science Direct	Perceived threat AND crime AND railway station	224 to EndNote	Feb 2021
PsycInfo		1 (duplicate = 0)	Feb 2021
Scopus		0	Feb 2021
Google Scholar		50 first to EndNote	Feb 2021
Google Scholar	Fear of criminal victimization AND railway station	3 to EndNote	Feb 2021
Science Direct	Facilitator AND "fear of crime" AND "Public transport"	135 to EndNote	Feb 2021
Scopus		0	Feb 2021
Google Scholar		50 first to EndNote	Feb 2021
Google Scholar	Facilitator AND fear of crime AND railway station	50 first to EndNote	Feb 2021
Scopus		0 – already searched	Feb 2021
Science Direct		Already searched	
Google Scholar	Fear of crime AND public transit	50 first to EndNote	Feb 2021
Science Direct		90 to EndNote	Feb 2021
Scopus		6 to EndNote	Feb 2021
PsycInfo		2, both duplicates = 0	Feb 2021

(continued)

Database	Search terms	No. of studies	Last search
Science Direct	Fear of crime AND Travel behavior AND station	54 to EndNote	Feb 2021
Scopus		0	Feb 2021
PsycInfo		0	Feb 2021
Google Scholar		50 first to EndNote	Feb 2021
Science Direct	Vulnerability AND Crime AND railway station	121	Feb 2021
Scopus		0	Feb 2021
Google Scholar		50 first to EndNote	Feb 2021
Science Direct	"Place characteristics" AND safety AND "public transport "	17 to EndNote	Feb 2021
Scopus		21 to EndNote	Feb 2021
Google Scholar		50 first to EndNote	Feb 2021
Science Direct	"Social characteristics" AND "crime" AND "public transport"	2 to EndNote	Feb 2021
Google Scholar		50 first to EndNote	Feb 2021
Scopus		11 to EndNote	Feb 2021
Google Scholar	Social characteristics AND safety AND public transport	50 first to EndNote	Feb 2021
Scopus		45 to EndNote	Feb 2021
Science Direct		135 to EndNote	Feb 2021
Scopus	Fear of crime AND Train station	3 (duplicates)	Feb 2021
Science Direct		50 to EndNote	Feb 2021
Google Scholar		50 first to EndNote	Feb 2021
Google Scholar	"public transport nodes" AND perceived risk	50 first to EndNote	Mar 2021
Google Scholar	fear of crime AND interventions AND railway station	50 first to EndNote	Mar 2021
Google Scholar	Perceived risk AND railway station	50 first to EndNote	Mar 2021
Google Scholar	Crime AND Emotion AND Train station	50 first to EndNote	Mar 2021

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