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Mobility Patterns and Spatial Behavior of Cruise Passengers Visiting Barcelona

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Abstract: Cruise ship tourism in port cities, while offering opportunities, has brought its own challenges, including overcrowding, disruption to local community mobility, and growing resident concerns, which recently escalated to anti-tourism activities. This article aims to understand the mobility patterns, transportation preferences, and spatial behaviors of cruise ship passengers within the City of Barcelona (Spain). The study is based on a survey conducted with cruise ship tourists visiting the city (n = 793). The key findings reveal the concentration of tourist activity in the old part of the city, and the similarity in spatial behaviors within the city, while the primary mode of exploration is walking, supported by motorized modes of transfer to access distant attractions. Socio-demographic factors and visit characteristics, such as age, group composition, and expenditure levels, are associated with mobility and spatial behavior. This article adds new evidence on the mobility patterns and spatial behaviors of cruise ship tourists visiting a major tourist city. With better knowledge of where cruise ship passengers concentrate, what activity patterns they show, and their preferred modes of transport, policymakers can manage more effectively the influx during peak times and in high-density areas. Strategies to distribute visitors more evenly across the city could be devised to alleviate pressure on heavily frequented zones.

Keywords: cruise ship tourism; cruise ship mobility; urban mobility; overcrowding; Barcelona

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1. Introduction

Cruise ship tourism has emerged as one of the fastest-growing segments of the global tourism market (Papathanassis, 2020). Despite the disruptions caused by the COVID-19 pandemic (2020–2023), cruise ship tourism is recovering at a faster pace than international tourism as a whole (CLIA, 2024). However, this rapid expansion poses significant challenges for European port cities, including overcrowding, price inflation, and increased pressure on infrastructure, transportation systems, and public spaces (Andrade et al., 2021). The Mediterranean, which accounts for over 16% of global cruise capacity (Notteboom et al., 2022), is particularly affected, with Barcelona being one of its busiest ports. Addressing these challenges requires a nuanced understanding of cruise ship passengers' mobility patterns, including their transportation choices, spatial behavior, and interactions with the city's infrastructure and public spaces.

In this context, in recent years, academic interest in studying the behavior of cruise passengers during their stay in port cities has grown. Their short stay in the city results in a particular spatial and visitation behavior. Therefore, various studies have analyzed

their visitation patterns (Paananen & Minoia, 2019; Navarro-Ruiz et al., 2020), the determinants of their expenditure levels (Casado-Díaz et al., 2021; Domènech & Gutiérrez, 2020; S. Larsen et al., 2013), and their satisfaction with the destination (Brida et al., 2012). With the rapid growth of urban tourism and the pressure it exerts on the tourist centers of major cities, the debate on the impacts of tourism has also focused on cruise tourism. Studies have addressed the negative externalities of the industry, such as pollution, environmental degradation, and public health risks (Carić & Mackelworth, 2014; Lloret et al., 2021; MacNeill & Wozniak, 2018), alongside research examining resident perceptions of cruise tourism expansion (Jordan & Vogt, 2017). In regard to mobility, this is exemplified by growing concerns about overtourism (Milano et al., 2019), particularly in major port cities where the abrupt arrival of thousands of cruise passengers within a limited timeframe intensifies crowding, strains local infrastructure (Baumann, 2021), and generates friction with residents (Brandajs & Russo, 2019).

The relationship between cruise ship tourism and urban mobility is complex and is shaped by tourists' limited time at a destination, their transportation preferences, and the built environment. In several port cities, cruise tourism has contributed to gentrification and displacement. For example, Lisbon's waterfront (Portugal) has experienced a decline in permanent residents as housing units have been converted into short-term vacation rentals catering to tourists (Castela, 2018). Similarly, the historic center of Palma (on the Spanish island of Mallorca) has transformed into a tourism enclave, driving up property prices and segregating local communities (González-Pérez, 2020). Cruise tourism also contributes to urban congestion. A study using big data and econometric modeling in five Caribbean port cities found that each docked cruise ship increases local traffic congestion by nearly 12% in areas near port terminals (Calatayud et al., 2022). Understanding cruise ship tourists' movement patterns is therefore essential for developing strategies to mitigate these impacts. Factors such as transportation availability, city layout, port location, and the socio-economic profile of travelers all influence their spatial behavior (Navarro-Ruiz et al., 2019).

Barcelona's compact urban layout (Marquet & Miralles-Guasch, 2015) places major attractions, commercial areas, and dining establishments in close proximity to the port, making it convenient for cruise ship passengers with limited time. However, this spatial concentration leads to severe overcrowding, particularly in high-traffic areas such as the Old City district (situated west of Les Rambles, a popular and emblematic wide and long street), located in the old part of the city (Ciutat Vella in Catalan) and close to the port area. The heavy use of public spaces by cruise ship tourists often leads to conflicts with local residents, disrupting the traditional functions of these areas and prompting some locals to avoid them altogether (Brandajs & Russo, 2019). Moreover, the influx of short-stay visitors can strain urban infrastructure, increasing traffic congestion and reducing the quality of life for residents (Albalate & Bel, 2010). Heightened traffic from tourist flows can lead to transport inefficiencies and even infrastructure breakdowns (Baumann, 2021). In recent years, Barcelona has witnessed growing anti-tourism protests, driven by concerns over rising housing costs and neighborhood transformations. In July 2024, approximately 3000 protesters marched through the city, voicing frustrations over mass tourism's impact on their daily lives (Euronews, 2024). Demonstrators carried banners with slogans, such as "Tourists go home" and "Barcelona is not for sale", and some even targeted visitors and sprayed them with water using toy plastic water pistols in popular areas like Les Rambles (CNN, 2024). These protests are part of a broader movement across Spain, with similar demonstrations occurring in Málaga, Palma, and the Canary Islands, and which includes publicly visible anti-tourist graffiti at the national level in Spain.

Analyzing cruise tourists' mobility patterns has the potential to provide valuable insights for urban planners and policymakers. By understanding how cruise passengers navigate the city, targeted interventions—such as improved transport options or spatial redistribution strategies—can help alleviate overcrowding and reduce conflicts with residents. Moreover, this knowledge benefits stakeholders such as tour operators and local businesses, enabling them to optimize services while maintaining visitor satisfaction. In this context, the main purpose of this article is to investigate the mobility patterns, transportation choices, and spatial behaviors of independent cruise passengers in Barcelona, in order to identify key implications for urban management. Specifically, the article seeks to answer the following research questions (RQs). RQ1: How do independent cruise ship passengers travel from the port to the city and, especially, how do they navigate within it? RQ2: What individual and trip-related factors influence their mobility and exploration behavior? RQ3: To what extent do their spatial behaviors reflect the influence of Barcelona's main tourist hotspots? Based on previous studies, we hypothesize that cruise passengers explore the city on foot primarily, remaining concentrated in nearby areas, while relying on motorized transportation mainly to access the city from the port as well as to reach more distant attractions. Additionally, we expect that socio-demographic and trip-related factors significantly influence both the choice of transportation modes and the extent of spatial exploration among independent cruise ship passengers in Barcelona. By addressing these questions, this research contributes to a deeper understanding of cruise tourism's impact on urban mobility and offers insights for more sustainable tourism management in Barcelona and other port cities worldwide.

2. Literature Review

2.1. Cruise Passengers Spatiotemporal Behavior in Port Cities

Several factors influence the extent of cruise ship passengers' exploration, including the duration of their stay, the proximity of attractions, and the ease of access to key sites in port cities. Research on cruise tourism has provided insights into visit durations and tourists' mobility, consistently reporting a typical exploration window of approximately four to five hours across various port cities worldwide. For example, a survey in Palermo (Italy) indicates that the average cruise ship passenger duration in the city is approximately 4 h (De Cantis et al., 2016), the same as Copenhagen (Denmark) (Sciortino et al., 2022), and in Valencia (Spain) and Tarragona (Spain), it is approximately 5 h, thus indicating significant engagement with the destinations and their attractions (Casado-Díaz et al., 2021; Domènech et al., 2020a). However, a study in Zihuatanejo (Mexico) indicated that tourists have an average stay of 1 h and 50 min (Jaakson, 2004).

This short time window limits the distance of inland travel and exploration in the destination city. Consequently, there is a clear impact of cruise passengers' presence on urban mobility, particularly in terms of congestion and pedestrian flow in city centers, notably in cities with port terminals located near historical centers (Baumann, 2021). In a study in Hamburg (Germany), a strong spatial concentration was found in the city center (Reif & Gross, 2024). Similarly, passengers in Palermo primarily stay within central areas that are close to the port (De Cantis et al., 2016), and in Valencia, spatial patterns indicate that the highest visitor concentrations occur in the historical center of the city (Navarro-Ruiz et al., 2020). Along the same line, findings from the study in Zihuatanejo (Mexico) revealed a preference for minimal pedestrian exploration, with the majority of tourists unwilling to go beyond a 200 m radius from the beachfront (Jaakson, 2004), indicating a tendency to stay within a familiar and comfortable zone that is close to the beach. While other studies with cruise ship passengers having more inland time explored the city more in-depth, as in Valencia and Copenhagen, passengers who were more time-enabled went

beyond the immediate vicinity of the city center, with an average distance of 1.39 km and 3 km, respectively; passengers exploring beyond the city center indicate varied interests and engagement levels (Casado-Díaz et al., 2021; Sciortino et al., 2022). In Palermo, the tours extended to nearly 18 km (De Cantis et al., 2016) and in Copenhagen to 12 km; in Tarragona, the average travel distance is 25.8 km, which includes a 10 km round trip to the city center (Domènech et al., 2020b).

The distance and layout of attractions at the destination influence the distance cruise ship passengers travel. A study focusing on Mediterranean port cities highlights that several Mediterranean ports have systematic development in proximity to the port, as with Barcelona or Málaga; these areas cluster the cities' main attractions, stores, bars, and cafes within a manageable walking distance from the cruise ship terminals. This proximity facilitates easy access to main tourist attractions on foot, but it can lead to overcrowding during peak periods, as seen in Barcelona, Palma, and Málaga (Grindlay & Martínez-Hornos, 2021). A study by Paananen and Minoia (2019) highlights the impact of walkability on the movement patterns of cruise passengers in Helsinki (Finland) and points out factors such as wayfinding tools, unexpected obstacles, lack of rest spots, and overall walkability. Those authors note that these elements, along with social interactions, significantly influence how passengers move and interact within the city.

The mobility of cruise passengers often involves a preference for convenient and rapid access to attraction options such as hop-on/hop-off buses (Domènech et al., 2023), particularly evident at docking points like Copenhagen's Langelinie. Buses offer easy travel and quick access to attractions, aligning with passengers' desires for efficient exploration (J. Larsen et al., 2021). Another study highlights the competitive potential of public transport in Mediterranean cruise ship destinations, noting that while sightseeing buses and cars provide fast access to major sites, public transport is a viable option for shorter distances, suggesting a potential opportunity to enhance the role of public transportation in supporting sustainable tourism mobility (Perea-Medina et al., 2019).

As cruise passengers mostly go for the main attractions, it is up to managers of the public transport system to answer this demand and provide specific routes linking the most visited places to the port area, in order to reduce conflict with the local residents. The mode of transport between attractions significantly enhances the overall experience at the destination (Ghanem & Shaaban, 2022). The ease with which tourists can access different city destinations plays a crucial role in their spatial behaviors. Some areas are challenging to access; therefore, tourists may opt to visit more accessible regions (Dileep & Pagliara, 2023). Another study, based in Valencia, shows that cruise passengers prefer moving to multiple nodes to engage in general sightseeing, thus indicating a preference for exploring multiple areas, rather than concentrating on a single location (Navarro-Ruiz et al., 2020).

2.2. Cruise Passengers' Profile and Their Mobility Behavior

Understanding cruise ship movements requires examining the relationship between passenger profiles and their spatiotemporal behaviors. Previous studies have explored both sociodemographic characteristics and visit-related factors to analyze these patterns.

In terms of sociodemographic features, age has been identified as an important determinant in the spatiotemporal behavior of cruise ship tourists. As found in the study in Palermo, older and younger passengers tend to spend less time at the destination, in order to return to the cruise ship sooner compared to other age groups (De Cantis et al., 2016). Similar results are seen in Tarragona, where passengers aged between 36 and 55 have been associated with more extensive engagement with the destination (Domènech et al., 2020a). Similarly, income level is another influential factor. For example, the study by De Cantis et al. (2016) focused on Palermo and showed that higher income levels correlate with longer tours

and more time spent at destinations. In Valencia, higher income levels potentially lead to more exclusive or varied experiences. Along this line, many studies have also explored the relationship between education level and spatial behavior, revealing varied findings. Some investigations found no direct impact of education on spatial behavior; a study in Costa Rica showed no significance of age in the mobility behavior of cruisers (Brida & Risso, 2010). However, a study by Parola et al. (2014) identified an indirect influence of education on spatial behavior, mediated through word-of-mouth communication. Research on the port of the Caribbean island of Curaçao suggested that education level might affect tourists' future decisions to return to the location (Carolina & Pau, 2010). The study in Palermo revealed that tourists with higher education levels engaged in longer and more extensive tours (De Cantis et al., 2016).

In terms of visit characteristics, first-time and repeat visitors may also show different behaviors. A study in Tarragona showed that repeat visitors, unlike those with better knowledge of the destination, fall into lower expenditure groups (Domènech et al., 2020b). In broader studies in Hong Kong, which examined independent tourists' first and repeat visitor behavior using GPS tracking, first-time visitors often engaged in one extended daytime excursion, exploring a wide range of geographically dispersed activities, whereas repeat visitors preferred multiple short visits throughout the day, with intermittent return visits to their hotel (McKercher et al., 2012). However, in a study focused on independent cruise ship passengers, no significant relationship was identified between these two groups (De Cantis et al., 2016). Group size can be another influential factor. A study undertaken in Valencia and Barcelona showed that group size positively impacts expenditure (Casado-Díaz et al., 2021). However, a study undertaken in Palermo found that group composition, such as traveling with a spouse, family, or friends, did not show a significant association with tour mobility behavior (De Cantis et al., 2016). Cruise ship travel provides opportunities for families with children; however, at the destination, children may prefer leisure activities over cultural sites, creating potential conflicts within the group, and different paces among the group may complicate group mobility (Paananen & Minoia, 2019). The mode of transportation could also be affected by the presence of young children, which encourages car use (McCarthy et al., 2017) that, at the destination, could translate into the use of taxis or other ride-hailing services.

3. Materials and Methods

3.1. Study Area

With a population of 1.6 million within the city limits, Barcelona is one of the leading cruise point destinations in the Mediterranean cluster of cruise ship ports. In the year 2022, between June and the end of August, nearly 3 million tourists visited Barcelona, which was 15% fewer than in the summer of 2019, yet the average stay of tourists increased to 5.3 nights (Ajuntament de Barcelona, 2023), resulting in approximately 172,000 tourists present each day during these months. In addition to that, the Port of Barcelona reported more than 3.5 million cruise ship passengers by the end of 2023 (Port de Barcelona, 2024). Barcelona's cruise ship port is designed to accommodate a significant volume of passengers, handling over 3 million annually with seven international cruise terminals for cruise ships. The port offers comprehensive facilities and services, including dining, shopping, and tourist information, to ensure a smooth transit for passengers from arrival to, and departure from, Barcelona via cruise ship (Port de Barcelona, 2024).

Barcelona exemplifies a typical Mediterranean city and is well known for its modernist architecture and Catalan gastronomy, with the aforementioned Old City (Gothic Quarter) characterized by narrow medieval streets of Roman and medieval architecture, and famous and iconic attractions such as the Passeig de Gràcia, Sagrada Familia, Park Güell, or the FC Barcelona stadium, all of which show a high concentration of tourist supply and demand (Goodwin, 2019) (Figure 1).

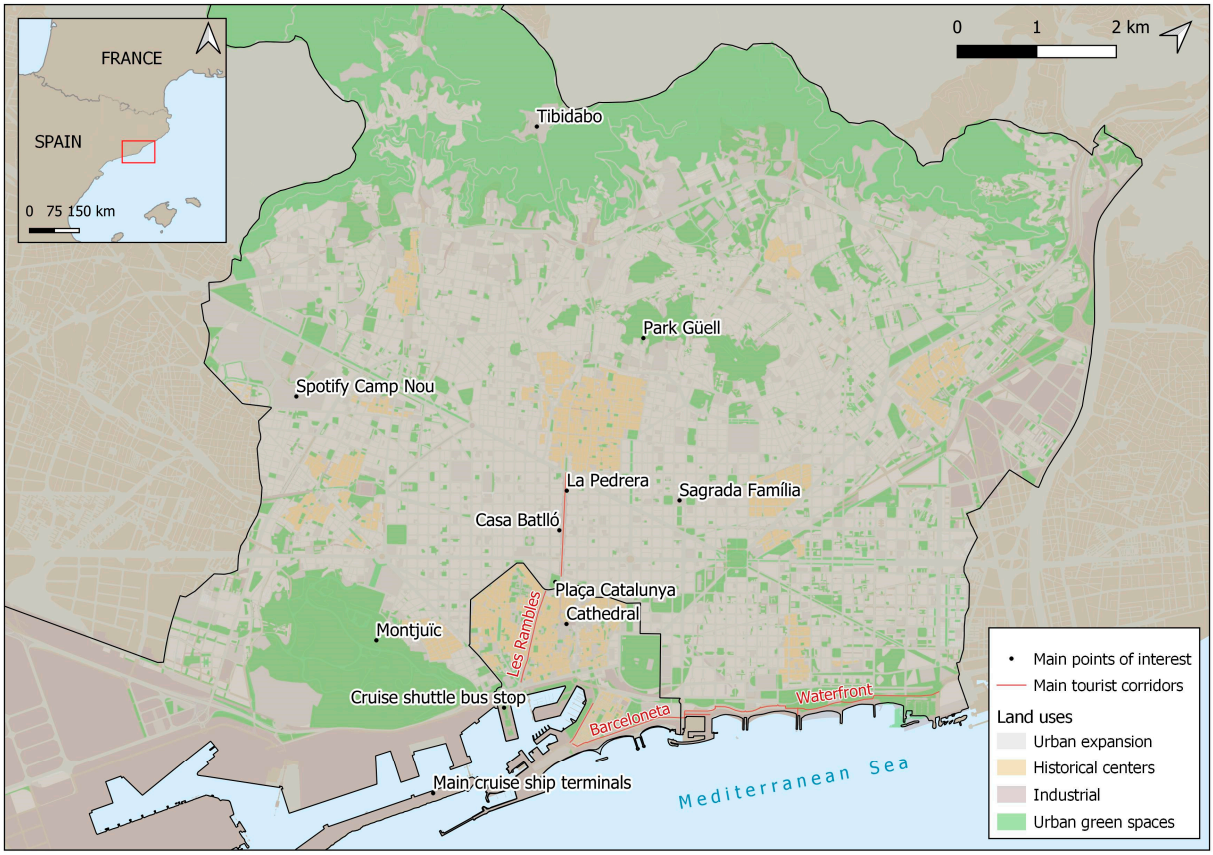

Figure 1. City of Barcelona and its main points and corridors of tourist interest.

Barcelona is walkable and the city's high population density supports its walkability by providing a context in which many amenities and services are located close to residential areas (Marquet & Miralles-Guasch, 2015). The spatial development of Barcelona has created a very compact city. Barcelona exhibits a robust spatial concentration of tourist activities, indicating that visitors are particularly drawn to specific popular areas within the city (García-Palomares et al., 2015). Thus, the historic heart of Barcelona, Ciutat Vella, is experiencing significant strain due to the impacts of tourism and the property market, and visitors rarely choose to explore beyond these areas. Tourism in Barcelona's Gothic neighborhood is likely to have caused gentrification, displacing long-term residents. Visitors and migrants have transformed the area into "foreigner-only enclaves", prioritizing short-term rentals, leading to socio-spatial exclusion, cultural disparities, and rising rents, fostering tensions as locals feel alienated from neighborhoods (Cocola-Gant & Lopez-Gay, 2020).

3.2. Data

Cruise ship passengers can be classified into independent visitors, who choose to see the city independently, and guided visitors, who take one of the tours offered by the cruise ship company, such as shore excursions during port visits (Casado-Díaz et al., 2021). The present study focuses on independent cruise ship passengers, defined as those who

navigate Barcelona autonomously rather than following planned or structured itineraries. This group is particularly relevant for analysis, as group freedom in selecting transport modes, routes, and points of interest offers valuable insights for designing more effective urban mobility management strategies. For that purpose, we collected data at the Port of Barcelona during the high-frequency arrival of cruise ships, in periods July 11 to July 31 and August 20 to October 31 of 2022, covering both the peak and transitional shoulder seasons of Port of Barcelona cruise ship tourism. This timeframe was deliberately chosen as it represents the most challenging period in terms of cruise ship passenger influx, congestion, and tourism pressure. With the approval of the Port Authority of Barcelona, the field research team was positioned between the boarding and disembarking points, thus providing logistical feasibility and easier portable GPS device collection. While strict random sampling was not feasible, efforts were made to obtain a representative sample across different nationalities and travel groups. Quotas were not formally set but diversity in travel party composition was considered. Fieldwork was carried out with independent cruise passengers from cruise ships operated by AIDA Cruises, Costa Cruises, Marella Cruises, TUI Cruises, and MSC Cruises, as well as one ship from the Norwegian Cruise Line and one from the Fred. Olsen Cruise Lines. These operators represent the most frequent cruise ship visitors to the City of Barcelona. Additional information regarding the analyzed cruise ships is available in Supplementary File S1.

Following their exploration of the City of Barcelona, cruise ship passengers were approached and invited to participate in a post-visit survey. The survey was conducted using a structured questionnaire, administered through Computer-Assisted Personal Interviews (CAPIs), which took approximately 10 min to complete. A team of three trained surveyors carried out smartphone-assisted online questionnaires in English, French, Italian, and Spanish. To ensure diversity while minimizing response bias, only one respondent per travel group (e.g., family, friends) was selected for participation.

The questionnaire comprised 24 questions covering key aspects such as sociodemographic characteristics, main activities undertaken during the visit, transportation modes used to access and navigate the city, visited locations, participation in specific activities, and perceptions of the overall experience. The full questionnaire is available in Supplementary File S2. In total, 1009 cruise passengers were approached, of whom 981 completed the questionnaire. After data validation for completeness and reliability, a final sample of 793 responses was retained for analysis.

As shown in Table 1, the majority of the questionnaire respondents were aged between 40 and 59 years (44.8%), followed by ages between 18 and 39 years (35.4%), and 60+ years (19.8%). The majority of respondents were from Italy (27.5%), the UK (22.2%), Germany (16.9%), and France (11.9%), while 19.2% came from other countries. Over half of the respondents (53.8%) had a university education, and 43.7% had completed secondary or technical education. Household income varied, with 35.7% earning between EUR 3000 and EUR 6000, 28.1% earning less than EUR 3000, and 25.2% earning more than EUR 6000. Slightly more than half (52.3%) had visited Barcelona previously. Most respondents traveled in couples (44.9%) or with family including children (45.4%), while 16% were accompanied by children under 10 years of age. Regarding visit duration, 44.6% stayed between 4 and 6 h, while 30.9% stayed under 4 h. Spending patterns, divided based on rounded expenditure quartiles, significantly varied, with 24.5% classified as high spenders (EUR 35–50) and 20.1% as very high spenders (over EUR 50), while 23.3% reported very low expenditure (<EUR 17).

Table 1. Characteristics of analyzed cruise passengers.

	n	%
Total	793	100
Age of respondent		
18–39	279	35.4
40–59	353	44.8
60+	156	19.8
Country of residence		
UK	176	22.2
USA	19	2.4
Italy	218	27.5
Germany	134	16.9
France	94	11.9
Other countries	152	19.2
Education level of respondent		
Primary or less	20	2.6
Secondary or technical	341	43.7
University	420	53.8
Household monthly income level		
Less than EUR 3000	223	28.1
Between EUR 3000 to and EUR 6000	283	35.7
More than EUR 6000	200	25.2
Not answered	74	9.9
First time in Barcelona		
Yes	376	47.6
No	413	52.3
Group type		
Alone	14	1.8
Couples	353	44.9
Families	357	45.4
With friends	58	7.4
Others	5	0.6
Groups with children under 10 y.o		
Yes	127	16.0
No	666	84.0
Visit time		
Under 4 h	245	30.9
Between 4 h and 6 h	354	44.6
6 h or more	193	24.3
Expenditure per person		
Very low Expenditure (<EUR 17)	185	23.3
Low Expenditure (EUR 17–35)	192	24.2
High Expenditure (EUR 35–50)	194	24.5
Very High Expenditure (EUR 50 <)	159	20.1
Not answered	63	7.9

3.3. Methods

Following our research questions, we employ a descriptive statistical approach to analyze the mobility patterns of cruise passengers. We first examine the use of different transportation modes to access and navigate the city. Secondly, we assess the role of walking as a primary means of exploration. Lastly, we analyze spatial behavior patterns, including the extent of movement and the most visited places.

Given that our primary objective is to provide structured insights into the associations between socio-demographic factors and mobility behaviors, we employ chi-square test of independence. The chi-square test is particularly well-suited for analyzing relationships between categorical variables in contingency tables, as it does not assume normality and allows for the identification of non-random associations between variables, as used in studies with similar data structures (Martins et al., 2025; Munanura et al., 2021). In line with best practices in categorical data analysis, we include both *p*-values and effect sizes to provide a comprehensive assessment of the observed relationships. To assess the strength of associations, we report Cramér's V as an effect size measure, which quantifies the degree of association between categorical variables beyond statistical significance. Effect sizes help interpret whether significant findings reflect substantive relationships or are simply a result of a large sample size.

Data were processed and analyzed using SPSS Statistics for Windows, Version 21.0 (IBM Corp., Armonk, NY, USA).

4. Results

4.1. Transportation Mode to Access the City

The first interest of the present study is to identify transportation modes to access the city. By examining the available transportation options from the Port of Barcelona to the City of Barcelona, we identified three modes: a shuttle bus from the cruise ship terminal to the city center, hailing a taxi, or a forty-minute walk. As detailed in Table 2, the data reveal that the majority of participants prefer to use the shuttle bus (72%); taxis are the second most favored option (20.6%), while walking is the least chosen mode (7.6%). This supports a key hypothesis of the study, which anticipated that cruise passengers would depend on motorized transport to reach the city due to the Port's location.

Table 2 also shows factors that are associated with the selection of access mode. Several socio-demographic factors show a significant association with access mode: age is one of them (χ^2 = 18.99, p = 0.001), with older people preferring to use the shuttle, while younger passengers are more likely to opt for a taxi. This is clearly related with group composition (χ^2 = 34.791, p = 0.000); couples are more likely to use the shuttle, families tend to prefer taxis, and families with children are even more inclined toward preference for a taxi (χ^2 = 15.048, p = 0.000). It seems that the few people who walked from the port to the city were more frequently lower-income groups, and they were more likely to have previously visited the City of Barcelona, although overall these variables did not show statistical significance. While total visit time was not associated with access mode choice, visit expenditure was associated (χ^2 = 34.352, p = 0.000). Passengers with higher expenditures were associated with a higher use of taxis. Low-expenditure passengers, while not significantly impacting the choice of the shuttle bus, were more likely to walk more and less likely to take a taxi compared to other groups.

Table 2. Mode of transport used to access the city from the port among cruise ship passengers in Barcelona, and bivariate associations with their personal and visit characteristics.

	Shuttle	Taxi	Walking	*p*-Value	X^2	Cramer's V
Total sample	71.9	20.6	7.6			
Age				0.001	18.994	0.111
18–39	65.8% *	25.4% **	8.80%			
40–59	71.10%	22.30%	6.60%			
60+	83.9% **	9% *	7.10%			
Education level				0.911	0.991	0.025
Primary or less	82.35%	11.76%	5.88%			
Secondary or technical	71.86%	20.96%	7.19%			
University	71.81%	20.72%	7.47%			
Household monthly income ievel				0.27	5.176	0.061
Less than EUR 3000	69.50%	20.50%	10.0% **			
Between EUR 3000 to EUR 6000	74.60%	18.90%	6.40%			
More than EUR 6000	72.20%	22.70%	5.10%			
First time in Barcelona				0.32	4.694	0.055
Yes	74.00%	20.50%	5.50% *			
No	69.90%	20.80%	9.30% **			
Group type				0	34.791	0.150
Alone	64.30%	21.40%	14.30%			
As a couple	77.9% **	12.1% *	10.10%			
Families	66.8% *	28.4% **	4.90%			
Friends	69.60%	25.00%	5.40%			
Others	60.00%	20.00%	20.00%			
Families with children under 10 years old				0.002	12.385	0.126
Others	73.7% **	18.5% *	8.20%			
Family with children under 10	64.2% *	31.7% **	4.10%			
Visit time				0.058	9.128	0.077
Under 4 h	68.80%	25.00%	6.30%			
Between 4 h and 6 h	70.80%	21.40%	7.80%			
6 h or more	77.5% **	13.6% *	8.90%			
Expenditure per person				0	34.352	0.155
Very low (<EUR 17)	76.20%	11.00% *	12.7% **			
Low (EUR 17–35)	74.70%	18.40%	6.80%			
High (EUR 35–50)	73.30%	20.90%	5.80%			
Very high (EUR 50<)	61.50%*	34.0% **	4.50%			

Notes: * Values significantly lower than expected. ** Values significantly higher than expected.

4.2. The Relevance of Walking as a Means of Exploring the City

In terms of the mobility of cruise passengers within the city, our results first suggest that walking was the most significant mode of transport during the visit among cruise ship passengers in Barcelona, as shown in Table 3 and as hypothesized based on previous research. Almost all independent cruise ship passengers walked at some stage during their visit; virtually, walking must have occurred at some stage for every cruise passenger, considering that it is a requirement to walk, to some extent, in order to move from the port terminal to the shuttle stop or taxi rank, and to access the main points of interest in the city. A substantial 82% of cruise ship passengers reported walking as one of their means of city exploration, a value that shows almost no statistically significant differences in terms of sociodemographic or visit characteristics, except for first-time visitation and overall visit time (which could be expected). Moreover, although it is not displayed in Table 3, our analysis revealed that more than one-third of passengers relied exclusively on walking during their visit; that is to say, without using any motorized modes of transportation.

The right-hand side of Table 3 shows the distribution of walking time during the visit. It highlights that only 12% of the sample walked for less than one hour in Barcelona. Conversely, 21.9% walked between 1 and 2 h, 21.9% walked between 2 and 3 h, and 44.2% of the sample walked for more than three hours. The age of the respondents shows a

significant association with this variable ($\chi^2 = 17.427$, $p < 0.008$): Older passengers (60+ years of age) were more likely to walk for less than one hour, while younger passengers walked longer distances. In terms of group characteristics, while not showing overall significant associations, specific subcategories show differences; for example, solo travelers were more likely to walk for less than 1 h, and families with children were less likely to have engaged in walks longer than 3 h. Lastly, longer walking times were also associated with extended visit durations between 2 and 3 h, and with participants falling in the very low expenditure group.

Table 3. Walk share and walking time during the visit among cruise ship passengers in Barcelona, and associations with individual and visit-related characteristics.

	Walk (Yes) [a]	*p*-Value	X^2	Cramer's V	Walking Time				*p*-Value	X^2	Cramer's V
					<1 h	1–2 h	2–3 h	3 h<			
Total sample	82.00%				12.0%	21.9%	21.9%	44.2%			
Age		0.122	4.211	0.073					0.008	17.427	0.105
18–39	85.30%				7.2% *	21.60%	22.30%	48.9% **			
40–59	79.00%				12.80%	20.52%	22.20%	44.60%			
60+	82.70%				18.7% **	25.80%	20.60%	15.4% *			
Education level		0.256	2.726	0.059					0.679	3.981	0.051
Primary or less	75.00%				10.00%	25.00%	30.00%	35.00%			
Second. or tech.	84.46%				10.00%	23.53%	22.35%	44.12%			
University	80.48%				13.64%	20.57%	21.53%	44.26%			
Income		0.298	2.422	0.059					0.887	2.331	0.041
Less than EUR 3000	80.70%				12.11%	21.08%	22.42%	44.39%			
EUR 3000–EUR 6000	85.20%				11.74%	23.13%	19.93%	45.20%			
More than EUR 6000	80.50%				12.56%	21.61%	25.13%	40.70%			
First time		0.037	6.594	0.091					0.953	1.593	0.032
Yes	79.80%				12.03%	21.93%	21.12%	44.92%			
No	83.80%				12.65%	21.65%	22.38%	43.31%			
Group type		0.122	7.266	0.096					0.490	11.456	0.070
Alone	78.57%				28.6% **	21.43%	7.14%	42.86%			
Couples	85.55% **				9.7% *	22.16%	21.60%	46.59%			
Family	79.27%				13.52%	21.97%	22.25%	42.25%			
Friends	77.59%				18.97%	18.97%	20.69%	41.38%			
Others	60.00%				0.00%	20.00%	40.00%	40.00%			
Children < 10 y.o.		0.148	2.095	0.051					0.081	6.743	0.092
No	82.60%				11.46%	21.27%	21.42%	45.85% **			
Yes	77.20%				16.67%	25.40%	23.81%	34.12% *			
Visit time		0.007	9.958	0.112					0.069	11.687	0.086
Under 4 h	88.2% **				11.84%	23.67%	27.53% **	37.14% *			
4–6 h	78.2% *				13.64%	21.88%	18.2%*	46.31%			
6 h or more	80.30%				9.95%	19.90%	21.47%	48.69%			
Expenditure		0.115	5.935	0.090					0.399	9.424	0.066
Very low (<EUR 17)	87.00%				9.80%	16.39% *	23.50%	50.27% **			
Low (EUR 17–35)	85.40%				13.50%	22.40%	22.92%	41.15%			
High (EUR 35–50)	78.4% *				13.99%	24.87%	19.17%	41.97%			
Very high (EUR 50<)	83.60%				10.06%	25.16%	21.38%	43.40%			

Notes: [a] The values presented in this table correspond to the 'Yes' category. The statistical tests (Chi-square and *p*-values) were conducted based on the full contingency table, including both 'Yes' and 'No' responses. * Values significantly lower than expected. ** Values significantly higher than expected.

4.3. The Use of Motorized Means of Transportation Within the City

Aside from the prevalence of walking as the main means to navigate and explore the City of Barcelona, cruise passengers also relied on different motorized means of transportation within the city, albeit to a lower extent. According to Table 4, approximately two-thirds of cruise ship passengers used motorized transport during their visit, with sightseeing buses being the most popular choice (32.6%), followed by taxis (18.7%), and

the underground railway (16.8%; metro in Spanish and Catalan; hereinafter, subway). The use of these transport options varied significantly based on individual characteristics and visit-related factors.

Table 4. Share of motorized means of transportation used during the visit among cruise ship passengers in Barcelona, and associations with individual and visit-related characteristics.

	Tourist Bus (Yes) [a]	*p*-Value	X^2	Cramer's V	Metro (Yes)	*p*-Value	X^2	Cramer's V	Taxi (Yes)	*p*-Value	X^2	Cramer's V
Total sample	32.60%				16.80%				18.80%			
Age		0.278	2.559	0.057		0	19.12	0.156		0.061	5.97	0.084
18–39	29.00%				24.0% **				20.07%			
40–59	34.80%				15.00%				20.68%			
60+	34.00%				8.3% *				12.2% **			
Education level		0.11	4.423	0.075		0.22	7.631	0.099		0.901	0.209	0.016
Primary or less	20.00%				25.00%				15.0%			
Second. or tech.	29.30%				12.9% *				19.1%			
University	35.20%				20.0% **				19.0%			
Income		0.788	0.476	0.026		0.952	0.97	0.012		0.709	0.687	0.031
Less than EUR 3000	31.80%				16.60%				19.70%			
EUR 3000–EUR 6000	33.20%				15.90%				18.00%			
EUR 6000<	35.00%				15.50%				21.00%			
First time		0.111	4.393	0.075		0.614	0.977	0.035		0.729	0.623	0.028
Yes	35.10%				18.10%				19.70%			
No	30.00%				15.70%				17.90%			
Group type		0.98	7.834	0.100		0.522	3.22	0.064		0.003	16.284	0.144
Alone	42.90%				28.60%				14.29%			
Couples	27.8% *				14.70%				12.7% *			
Family	35.90%				18.50%				24.1% **			
Friends	39.70%				17.20%				24.10%			
Others	20.00%				20.00%				20.00%			
Children < 10 y.o.		0.85	2.974	0.061		0.059	3.579	0.067		0.01	6.549	0.091
No	31.50%				17.9% **				17.1% *			
Yes	39.40%				11% *				26.8% **			
Visit time		0	107.46	0.368		0.140	3.936	0.071		0.351	2.093	0.051
Under 4 h	9.8% *				20.41%				17.10%			
4–6 h	35.90%				16.10%				20.90%			
6 h or more	56.0% **				13.47%				16.60%			
Expenditure		0	35.805	0.221		0.795	1.025	0.037		0	32.119	0.21
Very low (<EUR 17)	16.2% *				16.76%				8.11% *			
Low (EUR 17–35)	30.70%				15.10%				18.23%			
High (EUR 35–50)	44.3% **				18.04%				19.07%			
Very high (EUR 50<)	35.20%				18.87%				32.1% **			

Notes: [a] The values presented in this table correspond to the 'Yes' category. The statistical tests (Chi-square and *p*-values) were conducted based on the full contingency table, including both 'Yes' and 'No' responses. * Values significantly lower than expected. ** Values significantly higher than expected.

The use of sightseeing buses was not significantly associated with sociodemographic characteristics or group type. However, visit duration was strongly related to sightseeing bus use ($\chi^2 = 107.460$, $p = 0.000$), with 56.0% of visitors staying more than six hours opting for this mode, compared to only 9.8% of visitors staying under four hours. Expenditure level also showed a significant association ($\chi^2 = 35.805$, $p = 0.000$), as passengers with higher spending levels were significantly more likely to use sightseeing buses, with 44.3% of those choosing this option spending EUR 35–50 per person. Taxis were the second most used motorized transport mode, selected by 18.7% of cruise ship passengers. In this case, group composition ($\chi^2 = 16.284$, $p = 0.003$), traveling with children ($\chi^2 = 6.549$, $p = 0.01$), and expenditure levels ($\chi^2 = 32.119$, $p = 0.000$), showed a statistically significant association with taxi use. Families, in general, and families with children, in particular, were the most frequent taxi users, as well as those who ended up spending over EUR 50 per person. The subway, used by 16.8% of respondents, was the least common motorized transport mode among cruise passengers, among these three options. Subway use was significantly

associated with age (χ^2 = 19.12, p = 0.000), and was also slightly more common among families without children present.

4.4. Spatial Behavior Within the City

The last of our research questions for this study focused on the spatial behavior of cruise ship passengers and its relationship with the main activities and tourist hotspots in the city. To understand the spatial behavior of cruise ship passengers, it is necessary to first understand the main activities they undertake in the city. Table 5 highlights that sightseeing is the most frequently reported passenger activity (77.6%), followed by walking around (45.8%), and shopping (36.7%). Dining at restaurants or bars is also a common activity (34.6%), whereas only a small proportion of passengers engage in passive activities, such as resting in parks or public squares (6.6%), or going to the beach (4.8%). Regarding the planning of their visit, nearly half of the respondents (47.4%) reported not making specific plans, and they wandered around the city instead. A smaller group (30.0%) organized their own itinerary, while a minority group booked guided tours in advance (4.2%), at the port terminal (3.9%), or upon arrival in the city (13.4%).

Table 5. Main spatial behavior characteristics of cruise passengers in Barcelona.

	n	%
Main activities reported [a]		
Sightseeing	615	77.6
Walk around	363	45.8
Shopping	291	36.7
Restaurant and/or bar	274	34.6
Rest in a park and/or public square	52	6.6
Beach	38	4.8
Guided visits		
Booked guided tour before the visit	33	4.2
Booked guided tour at the Port terminal	31	3.9
Booked guided tour when arrived at the city	106	13.4
I planned my own visit	238	30.0
I didn't make any plans, just wandered around	376	47.4
Others	9	1.1
Number of points of interest visited		
No places	30	3.8
1 or 2 places	297	37.5
3 or 4 places	305	38.5
5 or more places	161	20.3
Main points of interest visited [a]		
La Ramblas	554	69.9
Sagrada Familia	410	51.7
Cathedral	197	24.8
Park Guell	134	16.9
Camp Nou	95	12.0
Visited any places outside the Old City (Ciutat Vella)?		
No	230	29.0
Yes	563	71.0

Notes: [a]. Note that the proportions do not necessarily add up to 100%, since one passenger may have reported more than one activity or point of interest.

The number of tourist attractions visited varies among cruise ship passengers. Most respondents reported having visited multiple locations, with 37.5% reporting one or two stops, and 38.5% visiting three or four places. A smaller but notable share of respondents

(20.3%) explored five or more sites, while only 3.8% did not visit any sites. The most visited locations were *La Rambla* (69.9%) and the *Sagrada Familia* (51.7%), followed by the *Cathedral* (24.8%), *Park Güell* (16.9%), and *Camp Nou* (12.0%). Both *La Rambla* and the *Cathedral* are located within the Old City, which is per se one of the main areas or neighborhoods of tourist interest.

In line with these findings and confirming one of the key hypotheses of our study, cruise ship passengers tend to concentrate near the port, particularly in the Old City (Ciutat Vella), where nearly all surveyed visitors reported spending time. Notably, 29.0% remained exclusively within this district during their visit. This behavior reflects the significance of the Old City as a key tourist hub, as well as the influence of time constraints on movement patterns. Figure 2 further illustrates this spatial concentration, showing the distribution of visitors across key tourist areas and highlighting the dominance of central locations near the port. The prevalence of walking and wandering suggests that accessibility and proximity to major attractions play a crucial role in shaping the experiences of cruise ship passengers in Barcelona.

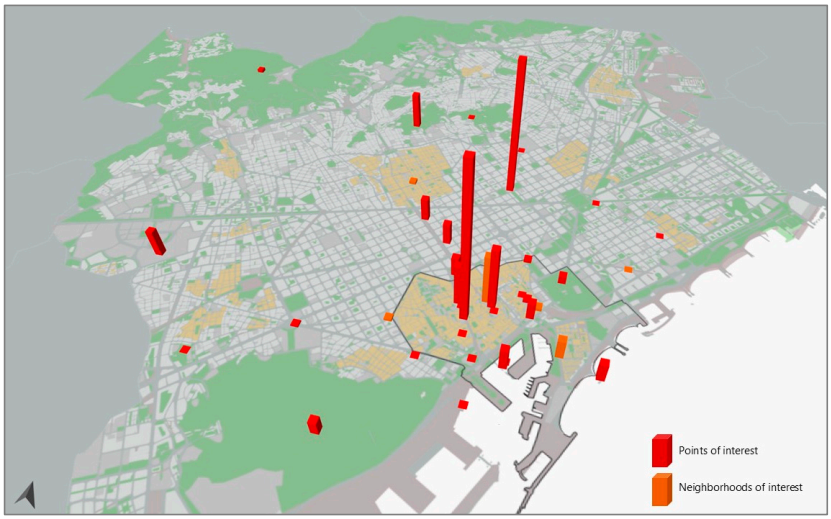

Figure 2. The 3D representation of the share of cruise ship passengers who report visiting each of the key tourist points and neighborhoods of interest.

Notwithstanding, there are still some significant differences in the spatial concentration around the Old City, as shown in Table 6. Age appears to play a significant role (χ^2 = 33.753, p = 0.000), as younger passengers (18–39 and 40–59 years of age) were more likely to explore beyond Ciutat Vella, while older passengers (60+ years of age) had a higher tendency to remain within the district. First-time visitors were also more likely to move beyond the Old City (χ^2 = 10.866, p = 0.004), whereas those who had visited Barcelona previously tended to stay within its historic core. In terms of group type (χ^2 = 13.827, p = 0.008), couples were more likely to stay within Ciutat Vella, while families—particularly those with children under 10 years of age—were significantly more inclined to explore other areas of the city. Exploring the city beyond the Old City was also associated, as expected, with both the overall duration of the visit (χ^2 = 84.236, p = 0.008) and with walking time (χ^2 = 20.165, p = 0.000). Cruise ship passengers reporting shorter visits (under four hours duration) were much more likely to have also remained within the Old City, while those passengers visiting other areas showed a higher likelihood of staying for a longer period. Nearly 89% of passengers with six or more hours in the city had explored beyond the Old City, compared to just 50.2% of passengers with less than four hours in the city. Relatedly, passengers who left the Old City were much more likely to have used motorized means of transportation, mainly sightseeing buses, subway, and taxis (all showing statistically

significant and strong associations with having visited the City of Barcelona beyond the Old City). As we had hypothesized, the use of motorized means of transport seems to be used to reach more distant locations in the city.

Table 6. Associations between having visited outside the Old City (Ciutat Vella) and sociodemographic and visit characteristics of cruise passengers in Barcelona.

	Visited Outside Ciutat Vella		*p*-Value	X^2	Cramer's V
	No	Yes			
Total sample	29.00%	71.00%			
Age			0	33.753	0.207
18–39	24.80% *	75.20% **			
40–59	25.10% *	74.90% **			
60+	44.70% **	55.30% *			
Education level			0.112	4.373	0.075
Primary or less	25.00%	75.00%			
Second. or tech.	32.90% **	67.10% *			
University	25.40% *	74.60% **			
Income			0.244	2.82	0.063
Less than EUR 3000	24.70%	75.30%			
EUR 3000–EUR 6000	31.40%	68.60%			
EUR 6000<	28.50%	71.50%			
First time			0.004	10.866	0.117
Yes	23.70% *	76.30% **			
No	34.10% **	65.90% *			
Group type			0.008	13.827	0.133
Alone	50.00%	50.00%			
Couples	34.30% **	65.70% *			
Family	23.20% *	76.80% **			
Friends	27.60%	72.40%			
Others	40.00%	60.00%			
Children < 10 y.o.			0.059	3.554	0.067
No	30.30%	69.70%			
Yes	22.00%	78.00%			
Visit time			0	84.236	0.326
Under 4 h	49.8% **	50.2% *			
4–6 h	24.3% *	75.7% **			
6 h or more	11.4% *	88.6% **			
Walking time			0.889	0.631	0.028
Under 1 h	26.80%	73.20%			
1–2 h	30.10%	69.90%			
2–3 h	27.33%	72.67%			
3 h or more	29.70%	70.30%			
Use of motorized means of transport [a]					
Tourist Bus (Yes)	11.90% *	88.10% **	0	54.808	0.263
Taxi (Yes)	18.2% *	81.8% **	0.001	10.232	0.114
Metro (Yes)	6.8% *	93.2% **	0	38.374	0.220
Number of points of interest visited			0	198.599	0.500
No places	100% **	0% *			
1 or 2 places	48.1% **	51.9% *			
3 or 4 places	16.7% *	83.3% **			
5 or more places	3.7% *	96.3% **			
Expenditure			0	19.672	0.164
Very low (<EUR 17)	40.50% **	59.50% *			
Low (EUR 17–35)	29.70%	70.30%			
High (EUR 35–50)	21.60% *	78.40% **			
Very high (EUR 50<)	23.30%	76.70%			

Notes: [a] The values presented in this table correspond to the 'Yes' category. The statistical tests (Chi-square and corresponding *p*-values and Cramer's V) were conducted based on the full contingency table, including both 'Yes' and 'No' responses. * Values significantly lower than expected. ** Values significantly higher than expected.

Further, both the number of attractions visited (χ^2 = 198.599, p = 0.000) and overall expenditure levels (χ^2 = 19.672, p = 0.008) were strongly associated with leaving the Old City. Among the passengers who visited five or more places, 96.3% explored beyond the Old City, whereas those who only visited one or two locations were much more likely to remain in the district. Notably, all respondents who did not visit any tourist sites stayed exclusively within the Old City. Finally, expenditure levels were also associated with spatial behavior. Passengers with higher spending levels were significantly more likely to explore beyond the Old City, with 78.4% of high spenders (EUR 35–50) and 76.7% of very high spenders (over EUR 50) venturing beyond its perimeter. In contrast, passengers with very low expenditures (<EUR 17) were much more likely to stay within the Old City.

5. Discussion

Our study provides new insights into the mobility patterns of independent cruise ship passengers in Barcelona, focusing on how sociodemographic and visit-related characteristics shape their spatial behavior. Building on prior research that examined various aspects of cruise passengers' behavior in port cities, this study sought to offer a comprehensive analysis of their overall mobility patterns, the transportation modes they use, and the spatial dynamics of their movements within the city. The findings highlight that walking is the predominant mode of transport, as well as the main means with which to explore the city, facilitated by Barcelona's walkability, and the concentration of attractions near the Port of Barcelona. However, this preference for walking also contributes to the spatial clustering of cruise passengers in the Old City, which could potentially lead to overcrowding and increased pressure on public spaces. The study also underscores how key transport supply may allow cruise passengers to explore beyond the vicinity of the port, given the inherent temporal constraints of their visit, as well as the key role of socio-demographic factors, visit duration, and expenditure levels in influencing how far passengers explore beyond the historic core.

Our results highlight clearly the predominance of walking as the main mode of transport among independent cruise ship passengers in Barcelona. The city's compact urban layout and high walkability encourage visitors to explore on foot, particularly since major attractions are located within a short distance of the port. The preference for walking aligns with previous research showing that tourists are more likely to engage in pedestrian exploration in dense historic cities where cultural and commercial hubs are within walking distance (Kim & Michael Hall, 2023). Similarly, well-designed walkways significantly improve tourists' engagement with a destination's cultural and aesthetic aspects (Ujang & Muslim, 2015). It is particularly relevant in Mediterranean port cities, such as Barcelona, where historical sites are densely located near the port exit (Grindlay & Martínez-Hornos, 2021), eliminating the need for extensive exploration beyond this area. While walking, people may be less interested in specific attractions (Domènech et al., 2023), and they prefer to wander around and stop at cafés and restaurants.

However, while walking facilitates an immersive experience, this activity may also contribute to the clustering of cruise ship passengers in the Old City (Ciutat Vella), increasing congestion and placing pressure on public spaces (Brandajs & Russo, 2019). Given the limited time span most cruise ship passengers have in the city, walking also restricts their spatial reach, reinforcing patterns of tourism concentration. Encouraging alternative transport modes could possibly help alleviate overcrowding while promoting a more distributed visitor experience. In this sense, our findings reinforce the well-documented trend of cruise tourists clustering around historical city centers (Navarro-Ruiz et al., 2020; Domènech et al., 2023), with 29% of passengers never leaving the Old City in the City of Barcelona. However, our study extends previous research by quantifying the impact of

certain visit-related characteristics on transportation mode selection and their spatial reach, providing a more nuanced understanding of intra-destination behavior.

In terms of motorized transportation, mostly used to explore the city beyond the Old City, one finding to highlight is the fact that one-third of the independent cruise ship passengers in our study opted for sightseeing bus tours, valuing the convenience and number of key attractions that passengers can visit in a narrow time window, thus defining other forms of motorized transport such as the metro or the taxi as less popular options. This choice aligns with the limited time available to cruise ship passengers, making sightseeing tour buses a popular option for maximizing city exploration within a short visit duration (J. Larsen et al., 2021). The relationship between transport mode choice and visitor characteristics provides further insights into cruise passengers' mobility patterns. Age was a key factor influencing transport preferences, with older passengers being less likely to use public transport or venture beyond the Old City. In contrast, younger and higher-educated visitors were more inclined to use the subway, likely due to greater familiarity with navigation tools, and a willingness to explore further. Another example is group composition, with couples being more likely to stay within the Old City, and families—particularly those with young children—opting for taxis, most likely due to the convenience factor. Importantly, passengers who used motorized transport within the city were significantly more likely to explore beyond the Old City, highlighting the role of public transportation infrastructure in shaping visitor movement. These findings suggest that improving accessibility and providing targeted mobility solutions for different tourist profiles—such as clear multilingual transit information or shuttle services to less-visited areas—could encourage more dispersed travel patterns. At the same time, if the arrival of tourists aligns with the busiest times in the public transportation system, the increased demand from tourism can lead to negative impacts on local commuters, affecting their comfort and causing saturation in space (Albalate & Bel, 2010).

Unlike the well-documented environmental impact of cruise ships (Carić & Mackelworth, 2014; MacNeill & Wozniak, 2018), our findings suggest that once ashore, cruise ship passengers follow a sustainable mobility pattern. In fact, cruise ship passengers demonstrate walking time comparable to or even higher than the walking time of Barcelona residents, who complete a significant part of their daily trips on foot (Ajuntament de Barcelona, 2022; Marquet & Miralles-Guasch, 2015) and mostly use collective and public forms of motorized transportation to reach farther points of interest. Consequently, any potential environmental and social impacts should be assessed in relation to the intensity, spatial concentration, and frequency of pedestrian movement along heavily trafficked routes. The tendency of many cruise ship passengers to remain within Ciutat Vella raises important implications for urban tourism management. Certain visitor characteristics in the present study were strongly associated with this pattern. Older passengers and passengers with secondary education were more likely to stay within the Old City, while higher education levels, longer visit durations, and higher expenditure levels were linked to a greater likelihood of passengers exploring beyond the Old City district. In this sense, compared to earlier studies that examined cruise passengers' spatial flows (De Cantis et al., 2016; Sciortino et al., 2022), our research shows that high-spending cruise ship tourists visit more attractions and are more likely to explore beyond central tourist hubs, a pattern that was not observed in previous studies in Mediterranean port cities (Navarro-Ruiz et al., 2020). Additionally, in our research, passengers who used taxis, sightseeing buses, or the subway were significantly more likely to visit multiple locations outside the Old City, whereas passengers who relied exclusively on walking had a higher tendency to remain within the historic core of that district. To our understanding, sightseeing buses seem to currently serve as a crucial enabler for cruise ship passengers' broader city exploration, whereas solely walking tends

to restrict movement to highly congested areas. This contrasts with studies in other cities, such as Zihuatanejo (Mexico) (Jaakson, 2004), where passengers barely moved beyond a 200 m radius from the port. These findings highlight the importance of promoting transport options that facilitate city-wide exploration. Strategies such as offering combined transit passes for cruise ship visitors, incentivizing visits to less congested areas, or providing guided tour options to more distant neighborhoods could help distribute visitor flows more evenly and alleviate the pressure on the Old City.

Our study has several strengths. The focus on independent cruise ship passengers provides a detailed understanding of a specific tourist segment that is often overlooked in broader cruise ship tourism analyses. The use of post-visit surveys allows for insights into actual behavior rather than planned intentions. Additionally, the study contributes to the growing body of research on cruise ship tourism's urban impacts by identifying key factors influencing visitor mobility patterns. However, some limitations in our study must be acknowledged. The reliance on self-reported data may introduce recall bias, particularly regarding the number of places visited and time spent at different locations. The study is also limited to the City of Barcelona, meaning that findings may not be directly generalizable to other cruise destinations with different urban layouts and transport infrastructures.

Future research could expand on our findings by incorporating GPS tracking to capture real-time movement patterns or by conducting comparative studies in multiple port cities to examine variations in cruise passenger behavior across different contexts. Similarly, while our study focuses on descriptive statistical methods to examine associations between mobility behaviors and individual characteristics, future research could benefit from incorporating advanced approaches, such as clustering, to identify latent behavioral patterns and explore more complex relationships within the data. Another line of research could delve into the qualitative aspects behind cruise ship passengers' behavior, for example, by using in-depth interviews or open-ended responses.

6. Conclusions

This study provides valuable insights into the mobility patterns of independent cruise ship passengers in Barcelona. Based on our research questions, first, we found that the majority of cruise ship passengers use bus shuttle services to travel from the Port of Barcelona into the City of Barcelona. However, once the visitors were inside the city, walking emerged as the dominant mode of transport, reinforcing the role of Barcelona's walkability and the spatial concentration of attractions near the port. This preference for walking also contributes to the clustering of cruise passengers in the Old City, raising concerns about congestion and the overuse of public spaces. Regarding the question of socio-demographic and trip-related factors shaping cruise passengers' mobility behavior, we found that age, education, visit duration, and expenditure levels significantly influence how far passengers explore beyond the perimeter of the Old City. Also, we found that younger and higher-educated passengers were more likely to visit multiple attractions and use public transport, while older visitors and visitors with shorter stay duration remained closer to the port. The use of motorized transport—particularly sightseeing buses and the metro—played a key role in enabling broader city exploration. Lastly, regarding cruise passengers' spatial behaviors and how these are shaped by the main tourist attractions, our study confirms that Barcelona's iconic sites strongly influence visitor distribution, with cruise ship passengers predominantly clustering around La Rambla and Sagrada Familia.

We consider this research provides valuable insights for policymakers by offering data-driven evidence on the mobility patterns of independent cruise ship passengers in Barcelona. Understanding where and when tourists concentrate—particularly in the Old City district and around major attractions like La Rambla—can help City of Barcelona officials develop

targeted strategies to alleviate congestion and promote a more even distribution of visitors. Additionally, identifying the transport preferences of different traveler profiles enables more effective public transport planning and infrastructure improvements, supporting a more sustainable urban tourism experience. By leveraging these insights, policymakers can enhance overcrowding management, optimize transportation planning, and mitigate mobility-related tourism impacts. A clearer understanding of traveler flow patterns could allow for proactive measures to spread visitor density, ensuring a more balanced coexistence between tourists and local residents. More specifically, these results underscore the need for urban tourism strategies that encourage the dispersion of cruise ship passengers beyond the Old City district. Enhancing transport connections, promoting alternative routes, and tailoring services to different visitor profiles can help create a more balanced tourism mobility dynamic in Barcelona.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/tourhosp6020059/s1, File S1. Details of the analyzed cruise ships. File S2. Questionnaire.

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