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Do Safety Explanations Increase Perceived Safety, Trust, and Route Acceptance in Navigation Systems? Evidence from Libyan Pedestrians

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ABSTRACT

Pedestrian navigation systems increasingly recommend safer but longer routes, yet little is known about how explaining these recommendations affects user acceptance. This study investigated whether safety-based explanations may increase perceived safety, trust, and route acceptance among Libyan pedestrians. Sixty-three participants were randomly assigned to either a high-transparency condition (receiving a safety explanation for a longer route recommendation) or a low-transparency condition (receiving no explanation). The findings suggest that participants who received safety explanations reported higher perceived safety ($M = 4.10$ vs. 2.79, $p < .001$), greater trust in the navigation system ($M = 4.14$ vs. 2.87, $p < .001$), and greater willingness to accept the longer route ($M = 4.69$ vs. 3.13, $p < .001$). Perceived safety appeared to be strongly correlated with both trust ($r = 0.93$, $p < .001$) and route acceptance ($r = 0.85$, $p < .001$). These findings suggest that transparent safety explanations may effectively promote trust and acceptance of safety-oriented navigation recommendations, with potential implications for pedestrian navigation system design in contexts where safety concerns shape walking decisions.

Keywords: *Pedestrian navigation, explainable AI, perceived safety, trust, route acceptance, human-computer interaction.*

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I. INTRODUCTION

Navigation systems have become an integral part of daily life, guiding users through familiar and unfamiliar environments alike. While substantial research has examined driver acceptance of vehicle navigation systems, pedestrian navigation has received comparatively less attention. This gap may be significant because pedestrians face different constraints and risks than drivers: they may be more exposed to environmental hazards, more vulnerable to traffic incidents, and more sensitive to factors such as lighting, social context, and infrastructure quality.

Research on pedestrian route choice consistently identifies safety and security as primary concerns, particularly during nighttime walking. Basu et al. [1] found that pedestrians tend to prefer well-lit routes and avoid areas with vacant land, especially at night. Female pedestrians, in particular, appear to avoid routes that are not well-lit and pleasant during nighttime hours. These findings suggest that walking decisions are shaped not only by efficiency but also by perceptions of safety and security—factors that are often unaccounted for in standard navigation systems that optimize for shortest distance or fastest time.

The emergence of responsible navigation systems that recommend safer routes presents an opportunity to address pedestrian safety concerns. However, recommending a longer route for safety reasons may introduce a tension: users must choose between efficiency and safety, and they may not understand why a longer route is being suggested. This is where explanation may become critical. Explainable AI (XAI) research has demonstrated that providing users with understandable explanations for system decisions may enhance trust, transparency, and acceptance. For instance, studies on explainable activity recognition in smart environments have shown that users are more likely to trust and adopt systems that clearly communicate the rationale behind their decisions [2]. In the context of autonomous vehicles, for example, explanations appear to help users understand vehicle behavior and calibrate their trust appropriately [3]. Similarly, in pedestrian navigation, explanations for why a particular route was chosen—especially when it deviates from the shortest path—may help users accept recommendations that prioritize safety over efficiency.

Yet the relationship between explanations, trust, and acceptance in pedestrian navigation remains underexplored. Studies on conversational navigation have identified risks associated with opaque explanations, including misplaced trust and potential manipulation [4], suggesting that clarity and transparency may be essential for trustworthy systems. Recent research on explainable AI (XAI) for robot navigation has highlighted the critical importance of transparency in AI-driven navigation systems. A user study evaluating semantic XAI visualizations for robot navigation demonstrated that users who safety concerns influence walking provided with semantic projections of attribution scores showed significantly improved understanding and perceived predictability of the robot's decisions [5]. The study emphasized that integrating XAI visualizations with sensor information is essential for transparent human-robot interaction, as it helps users understand why certain navigation decisions were made. Furthermore, the findings suggest that explanations must be both informative and accessible to build user trust, particularly in complex navigation scenarios where cognitive load may be elevated [5].

Moreover, most existing research on trust in navigation systems has been conducted in Western contexts, with little attention to how users in different cultural and infrastructural contexts respond to such systems. Libya presents a unique case: pedestrian infrastructure is often underdeveloped, and safety concerns—ranging from traffic hazards to inadequate lighting—may significantly shape walking behavior [6], [7]. Understanding how Libyan pedestrians respond to safety explanations in navigation systems may provide insights that are both locally relevant and broadly applicable to other contexts where safety concerns influence walking decisions.

This study addresses these gaps by investigating whether safety explanations may increase perceived safety, trust in navigation recommendations, and willingness to accept longer but safer routes among Libyan pedestrians. The study also examines whether perceived safety is associated with trust and route acceptance, testing a mechanism through which explanations may influence behavior.

Research Questions:

RQ1: Do safety-based explanations increase perceived safety?
RQ2: Do safety-based explanations increase trust in navigation recommendations?
RQ3: Do safety-based explanations increase willingness to accept a longer route?
RQ4: Is perceived safety associated with trust?
RQ5: Is perceived safety associated with route acceptance?

II. BACKGROUND AND RELATED WORK

A. Pedestrian Route Choice and Safety Perceptions

Pedestrian route choice appears to be influenced by multiple factors beyond travel time. Research consistently identifies safety and security as primary determinants of walking behavior, particularly in contexts where pedestrians may feel vulnerable. The built environment—including street lighting, land use, and traffic conditions—appears to shape perceptions of safety and, consequently, route preferences. At night, pedestrians may become more sensitive to these factors, avoiding poorly lit areas and routes with vacant land [1]. For vulnerable road users such as older adults and children, safety considerations may outweigh efficiency concerns, leading to route choices that prioritize perceived security over shortest distance. Research on pedestrian route choice behavior has shown that pedestrians exhibit systematic preferences for specific street environment attributes. Studies using GPS trajectory data have revealed that pedestrians generally prefer routes with more amenities, parks, and sky visibility while avoiding routes with many turns and steep slopes. Furthermore, distinct preferences and aversions to street features have been observed across different demographic groups—including gender, age, and income—highlighting the importance of understanding diverse user behaviors in route choice modeling [8]. Fulman et al. [9] further suggest that older pedestrians prioritize safety and comfort over efficiency, indicating that navigation systems designed for diverse populations may need to account for varying safety priorities.

Studies on pedestrian route choice behavior have revealed that psychological factors, including perceived risk, environmental familiarity, and social context, may significantly influence decision-making. These findings suggest that route choice is not purely rational but may be shaped by subjective perceptions of safety and comfort [10]. Understanding these perceptual factors may be critical for designing navigation systems that can effectively influence user behavior.

In Libya, walkability research has highlighted significant challenges related to pedestrian safety. Studies on public spaces in Tripoli identify safety and security as key barriers to walking, with inadequate infrastructure, unregulated traffic, and lack of pedestrian facilities limiting walkability [6], [7]. These findings underscore the importance of designing pedestrian navigation systems that account for safety concerns and help users make informed routing decisions.

B. Trust in Intelligent Systems and the Role of Transparency

Trust in automated systems appears to be essential for their acceptance and effective use. In the context of navigation, trust may shape whether users follow system recommendations and continue using the system over time. Recent frameworks for understanding trust in automation have identified key factors including system performance, transparency, and user characteristics. In particular, trust-aware control systems that adapt to user confidence levels have shown promise in improving human-automation interaction in dynamic environments [11]. Research on automated driving has established that perceived safety, trust, and usefulness may be key predictors of acceptance and behavioral intention [10]. These factors appear to be interrelated: when users perceive a system as safe, they may trust it more, and this trust, in turn, may increase their willingness to follow its recommendations.

Explainable AI (XAI) has emerged as a crucial component in designing trustworthy intelligent systems. By providing users with understandable explanations for system decisions, XAI aims to make system behavior transparent and support appropriate trust calibration. Previous studies have found that explanations in intelligent systems appeared to increase user trust and satisfaction, particularly when they provided specific, actionable information [2]. In autonomous driving, explanations delivered through human-machine interfaces may help users understand vehicle decisions, potentially improving situation awareness and trust [3]. Similarly, in navigation contexts, explanations may help users understand why a particular route was selected, especially when it deviates from their expectations. Research on indoor navigation has explored the use of public displays as dynamic signage to support wayfinding in complex environments. Kray et al. [12] proposed a location model incorporating directional, connectional, and mereological relations to represent spatial entities such as rooms, floors, and corridors. Their work demonstrated that public displays can serve as landmarks when generating directions, as their location, orientation, and visibility can be reasoned about within the model.

However, explanations may also have unintended consequences. Ilyankov et al. [4] identified "explainability pitfalls" where systems may unintentionally create false confidence or undermine user vigilance through misleading explanations. This highlights the importance of designing explanations that are accurate, transparent, and appropriately calibrated to user needs. Research on semantic XAI visualizations for robot navigation has shown that presenting users with interpretable explanations—such as attribution scores projected onto objects in the environment—can significantly enhance user trust and predictability perception, even for black-box deep learning policies [5]. This balance is particularly critical in safety-critical applications such as pedestrian navigation, where cognitive load can affect decision-making under time pressure.

C. Safety-Aware Navigation and Explanation Effects

Safety-aware navigation systems that recommend longer but safer routes present a unique challenge: they ask users to trade efficiency for safety. Without explanation, users may perceive such recommendations as arbitrary or inefficient, leading to rejection of the system's advice. Transparency about why a longer route is being recommended—for example, because of reported safety incidents or poor lighting on the shorter route—may help users understand the rationale and accept the recommendation.

Research on senior-friendly pedestrian routing has shown that explanations grounded in identifiable landmarks and contextual hazards may enhance route acceptance [9]. Users may be more likely to accept a route recommendation when they understand the reasoning behind it and when the explanation is presented in a way that connects to their lived experience. These findings suggest that safety explanations may be particularly effective when they provide specific, actionable information about the risks being avoided.

Recent approaches to socially-acceptable navigation have integrated social dynamics and user expectations into navigation algorithms. For instance, combining non-cooperative game theory with social force models has shown promise in enabling robots and autonomous systems to navigate in a socially-aware manner that aligns with human expectations and comfort. This approach recognizes that user acceptance and perceived safety are influenced not only by path efficiency but also by how well the system's behavior conforms to social norms and interpersonal distance expectations [13].

Despite these insights, limited research has directly tested the effects of safety explanations on perceived safety, trust, and route acceptance in pedestrian navigation. Comprehensive reviews of pedestrian navigation systems have noted that usability and trust remain underexplored dimensions, particularly in the context of safety-aware routing [13]. This gap highlights the need for empirical studies that investigate how users respond to different types of navigation recommendations. Research on navigation support for large crowds has explored the use of augmented signage as an alternative to mobile devices, which may be impractical in crowded environments. Hamhoum and Kray [14] conducted a comparative study of three augmented signage designs—baseline arrows, coloured circles, and coloured symbols. Their results showed that colour-supported signage improved navigation performance and reduced cognitive load, suggesting the effectiveness of visual cues for guiding large crowds. This study addresses this gap through an experimental comparison of high- and low-transparency conditions.

III. METHODOLOGY

A. Participants

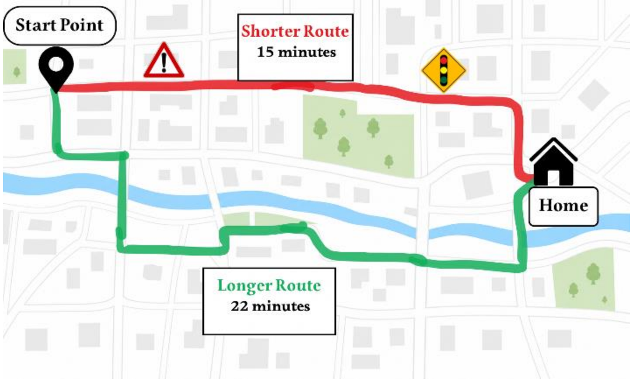
A total of 63 participants (32 in the high-transparency group, 31 in the low-transparency group) completed the study. Participants were recruited through convenience sampling via WhatsApp, Telegram, and Facebook groups. All participants were Libyan residents, with ages ranging from 17 to 54 years. Participation was voluntary, and all responses were anonymous.

B. Survey Design

Two versions of an online survey were created using Google Forms. Both versions presented the same scenario and route image but differed in the explanation provided for the longer route recommendation.

Scenario: Participants were asked to imagine walking home alone at 9 PM from a university campus, shopping area, or bus stop. They were told that their navigation app suggested a route that was 7 minutes longer than the fastest route.

Fig. 1. Route diagram presented to participants. The red line represents the shorter route (15 minutes), while the green line represents the longer but safer route (22 minutes) recommended by the navigation system. The shorter route was marked with safety concern indicators to communicate the rationale for the recommendation.



High-Transparency Condition (Group A): Participants received the following explanation: "This route is 7 minutes longer than the fastest route. Why? The app identified several reported safety incidents along the shorter route—such as poor lighting and prior safety-related reports—and therefore recommends a safer alternative."

Low-Transparency Condition (Group B): Participants received only: "This route is 7 minutes longer than the fastest route," without any additional explanation.

C. Measures

Trust: Five items measured trust in the navigation system ($\alpha = 0.97$), including "I trust this navigation app" and "I would use this app again in the future." Responses were on a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree). This scale was adapted from established trust measures in human-computer interaction research.

Perceived Safety: Three items measured perceived safety of the recommended route ($\alpha = 0.94$), including "I believe this route is safe" and "This route reduces my risk of encountering problems."

Route Acceptance: One item measured willingness to accept the longer route: "I am willing to spend an additional 7 minutes if the route is safer."

D. Procedure

The survey was distributed via shortened links. Participants were randomly assigned to one of the two conditions through the link they received. After providing informed consent and demographic information, participants read the scenario, viewed the route image, read the explanation (or not, depending on condition), and completed the trust, safety, and acceptance measures. An attention check item ("According to the scenario, what time was it?") was included to ensure participants had read the scenario carefully. Responses from participants who failed the attention check were excluded from analysis.

E. Data Analysis

Descriptive statistics were calculated for all variables. Independent samples t-tests compared the high- and low-transparency groups on trust, perceived safety, and route acceptance. Pearson correlations examined relationships among the three variables. Cronbach's alpha assessed the reliability of the trust and safety scales. Effect sizes (Cohen's d) were calculated to determine the magnitude of group differences.

IV. RESULTS

A. Reliability Analysis

Cronbach's alpha was excellent for both the trust scale (α = 0.97, 95% CI [0.95, 0.98]) and the perceived safety scale (α = 0.94, 95% CI [0.92, 0.97]), indicating strong internal consistency. Table I presents the reliability statistics for both scales.

TABLE I: RELIABILITY ANALYSIS (CRONBACH'S ALPHA)

Scale	Number of Items	Cronbach's α	95% CI
Trust	5	0.97	[0.95, 0.98]
Perceived Safety	3	0.94	[0.92, 0.97]

B. Descriptive Statistics

Table II presents the descriptive statistics for each group across all three variables.

TABLE II: DESCRIPTIVE STATISTICS BY GROUP

Variable	High Transparency (n=32)	Low Transparency (n=31)
	Mean (SD)	Mean (SD)
Perceived Safety	4.10 (0.62)	2.79 (1.21)
Trust	4.14 (0.70)	2.87 (1.25)
Route Acceptance	4.69 (0.47)	3.13 (1.36)

Note: All scales ranged from 1 (strongly disagree) to 5 (strongly agree).

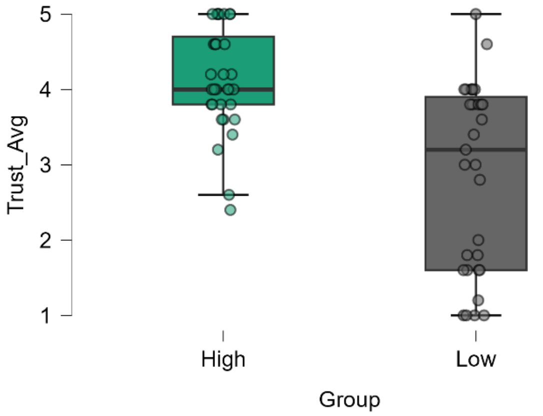


Fig. 2. Boxplot of Trust_Avg scores by group. The high-transparency group appears to show a higher median with a narrower interquartile range compared to the low-transparency group,

which appears to have a lower median and wider variability. This may indicate that providing safety explanations led to more consistent and higher trust responses.

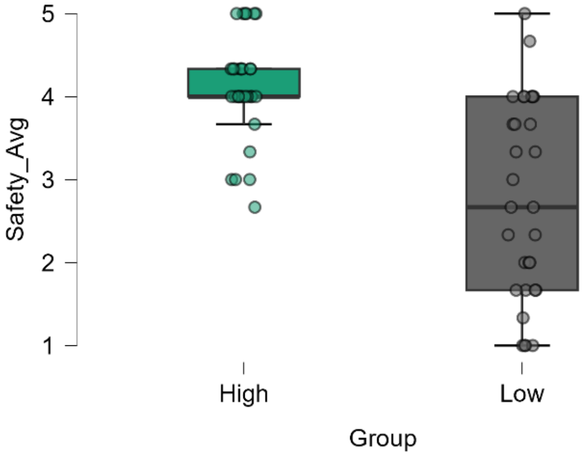


Fig. 3. Boxplot of Safety_Avg scores by group. The high-transparency group appears to demonstrate a higher median and less variability compared to the low-transparency group. The low-transparency group appears to show greater dispersion, suggesting that participants who received no explanation may have been more divided in their safety perceptions.

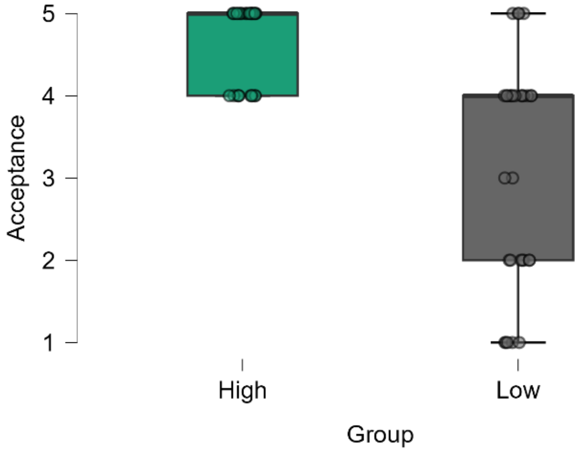


Fig. 4. Boxplot of Acceptance scores by group. The high-transparency group appears to show a median of 5.0 (maximum possible score), with most responses concentrated at the upper end of the scale. The low-transparency group appears to display a median of 3.0 and substantially greater variability, suggesting that participants who received no explanation may have been less willing to accept the longer route and more divided in their responses.

C. Hypothesis Testing

H1: Safety explanations increase perceived safety. An independent samples t-test revealed that participants in the high-transparency condition reported significantly higher perceived safety (M = 4.10, SD = 0.62) than those in the low-transparency condition (M = 2.79, SD = 1.21), t(61) = 5.48, p < .001, d = 1.38. This provides strong support for H1.

H2: Safety explanations increase trust in navigation recommendations. Participants in the high-transparency condition reported significantly higher trust (M = 4.14, SD = 0.70) than those in the low-transparency condition (M = 2.87, SD = 1.25), t(61) = 5.04, p < .001, d = 1.27. This supports H2.

H3: Safety explanations increase route acceptance. Participants in the high-transparency condition reported significantly higher willingness to accept the longer route (M = 4.69, SD = 0.47) than those in the low-transparency condition (M = 3.13, SD = 1.36), t(61) = 6.12, p < .001, d = 1.54. This supports H3.

H4: Perceived safety is positively associated with trust. A Pearson correlation revealed a strong positive relationship between perceived safety and trust, r(63) = 0.93, p < .001. This supports H4.

H5: Perceived safety is positively associated with route acceptance. A Pearson correlation revealed a strong positive relationship between perceived safety and route acceptance, r(63) = 0.85, p < .001. This supports H5.

TABLE III: INDEPENDENT SAMPLES T-TEST RESULTS

Variable	t	df	p	Mean Difference	Cohen's d
Perceived Safety	5.48	61	< .001	1.32	1.38
Trust	5.04	61	< .001	1.28	1.27
Route Acceptance	6.12	61	< .001	1.56	1.54

TABLE IV: PEARSON CORRELATIONS

Relationship	n	Pearson's r	p
Safety -Trust	63	0.93	< .001
Safety - Acceptance	63	0.85	< .001
Trust - Acceptance	63	0.86	< .001

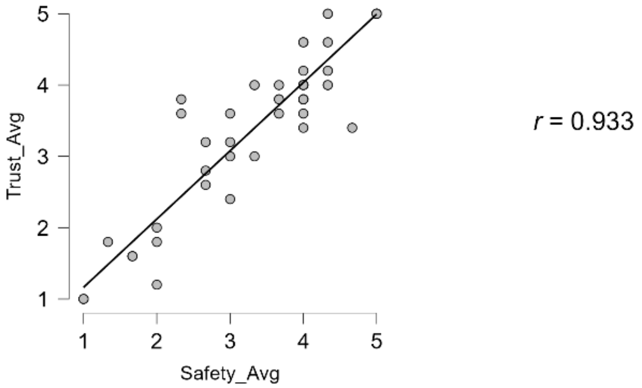


Fig. 5. Scatter plot of Safety_Avg versus Trust_Avg (r = 0.933, p < .001, n = 63). Each point represents one participant. The strong positive relationship may indicate that participants who perceived the route as safer also reported higher trust in the navigation system.

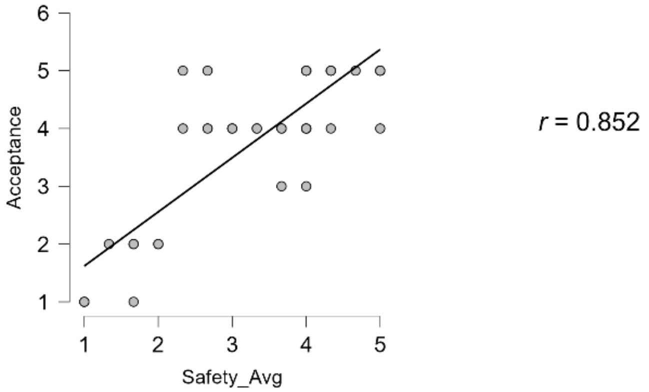


Fig. 6. Scatter plot of Safety_Avg versus Acceptance ($r = 0.852$, $p < .001$, $n = 63$). Higher perceived safety appears to be associated with greater willingness to accept the longer route. Participants with safety scores above 3.0 generally reported acceptance scores of 4.0 or higher.

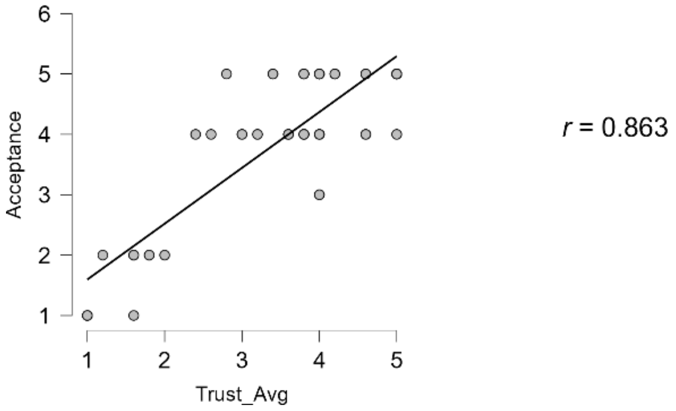


Fig. 7. Scatter plot of Trust_Avg versus Acceptance ($r = 0.863$, $p < .001$, $n = 63$). A strong positive correlation appears to exist between trust in the navigation system and willingness to accept the longer route. Participants with higher trust scores consistently reported higher acceptance.

Figure 8 presents a correlation heatmap summarizing all pairwise relationships among the three variables.

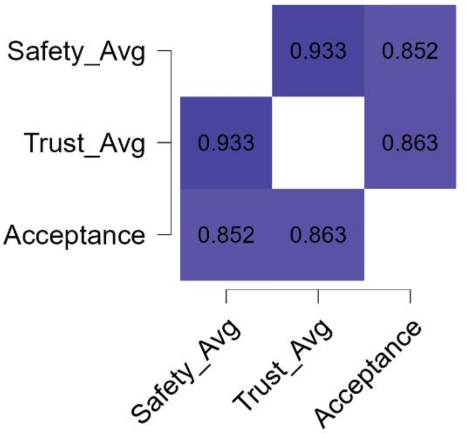


Fig. 8. Correlation heatmap of perceived safety, trust, and route acceptance. Darker blue squares indicate stronger positive correlations. The strongest correlation was observed between Safety_Avg and Trust_Avg (r = 0.933), followed by Trust_Avg and Acceptance (r = 0.863), and Safety_Avg and Acceptance (r = 0.852). All correlations were statistically significant at p < .001.

V. DISCUSSION

A. Impact of Explanations on Perceived Safety, Trust, and Route Acceptance

The findings of this study suggest that safety explanations may increase perceived safety, trust in navigation systems, and willingness to accept longer but safer routes among Libyan pedestrians. The effects appeared to be substantial, with Cohen's d values ranging from 1.27 to 1.54, indicating large effect sizes. These findings may align with previous research on explainable AI suggesting that transparency may enhance user understanding and confidence in system decisions [2], [11].

The finding that safety explanations appeared to increase perceived safety (H1) suggests that transparency about routing decisions may help users feel more secure. When participants understood that a longer route was recommended because of specific safety concerns on the alternative route—such as poor lighting or prior incidents—they perceived the recommended route as safer. This may extend previous work by Basu et al. [1] by suggesting that safety perceptions can be shaped not only by environmental factors but also by the way routing decisions are communicated.

The effect on trust (H2) is particularly noteworthy given that trust is considered a critical factor in technology acceptance. Participants who received explanations appeared to trust the navigation system more, suggesting that explanation may serve as a trust-building mechanism [11]. This may be consistent with prior work on automated driving, where transparency about system decisions appeared to increase trust and acceptance [10], [13]. It may also extend these findings to pedestrian navigation, suggesting that trust-building explanations may be effective beyond the driving context.

The strong effect on route acceptance (H3) suggests that explanations may translate into behavioral intentions. Participants appeared more willing to spend an additional 7 minutes on a safer route when they understood why the route was recommended. This may have practical implications: navigation systems that explain safety rationale may be more effective at influencing user behavior than systems that simply present route options without justification. This may align with findings from previous research that emphasized the importance of user-centered design in pedestrian navigation systems [13].

B. The Role of Perceived Safety

The strong correlations between perceived safety and both trust (r = 0.93) and route acceptance (r = 0.85) may support the mechanism proposed in H4 and H5. These findings suggest that explanations may work at least in part by increasing perceived safety, which in turn may drive trust and acceptance. This may be consistent with research on automated driving, where perceived safety appears to be a key predictor of trust and acceptance [10], and may extend these findings to the domain of pedestrian navigation.

The near-perfect correlation between perceived safety and trust (r = 0.93) suggests that these two constructs may be closely intertwined in this context. For Libyan pedestrians making nighttime walking decisions, feelings of safety may be inseparable from trust in the navigation system. This highlights the importance of designing systems that not only provide safe routes but also communicate safety information effectively to build user confidence. The strong correlation between trust and acceptance (r = 0.86) may further reinforce that trust is a key mediator in the relationship between explanations and behavioral intentions.

C. Practical Implications

These findings may have practical implications for designers of pedestrian navigation systems. First, incorporating safety explanations into route recommendations may enhance user trust and acceptance. Simple, actionable explanations that specify why a route was recommended—rather than just stating that it is longer—may help users understand and accept safety-oriented suggestions. This may align with design recommendations from Fulman et al. [9] for navigation systems that serve diverse populations.

Second, the strong link between perceived safety and trust suggests that systems may need to prioritize not only objective safety but also user perception of safety. This may involve presenting safety information in ways that are salient and understandable, such as highlighting specific hazards on alternative routes and providing clear explanations of why certain routes are recommended over others. Research on semantic XAI visualizations has demonstrated that users' understanding and perceived predictability of navigation systems improve significantly when they are presented with visual explanations—such as semantic projections of attribution scores—that clarify the system's reasoning [5]. This suggests that integrating XAI visualizations into pedestrian navigation interfaces may be essential for building user trust and acceptance in safety-critical contexts.

Third, these findings may be particularly relevant for contexts where safety concerns shape walking decisions. In Libyan cities, where pedestrian infrastructure is often underdeveloped and safety concerns are prominent [6], [7], explanations that address safety rationale may be especially effective at promoting route acceptance. This suggests that navigation systems may need to be context-sensitive, adapting their explanation strategies to the specific safety concerns of different regions.

D. Limitations

Several important limitations should be acknowledged when interpreting the findings of this study. These limitations do not invalidate the results but rather contextualize them and point toward directions for future research.

First, the study relied on a hypothetical scenario rather than real-world navigation behavior. Participants were asked to imagine a walking situation and report their intended responses rather than actually navigating in a real environment. This distinction is important because intentions do not always translate into actions, particularly in high-stakes situations involving personal safety. While scenario-based methods are common in experimental research and provide valuable controlled comparisons, they cannot fully replicate the complexity of real-world nighttime navigation. Future research could examine whether these effects hold in naturalistic settings using field studies.

Second, the study focused on a single type of explanation—a brief textual explanation that explicitly referenced safety concerns on the alternative route. While this design allowed for a clear experimental comparison, it does not capture the full range of possible explanation formats that could be employed in real navigation systems. Research has shown that different explanation formats—including visual versus textual, detailed versus concise, and location-specific versus general—may influence user responses differently [2], [11]. Future research could systematically compare different formats to identify optimal designs for pedestrian navigation.

Third, the sample was limited to Libyan pedestrians, with participants recruited from a single country through convenience sampling. While Libya provides a valuable context for studying pedestrian safety concerns given its underdeveloped infrastructure and safety challenges [6], [7], this specificity raises questions about the generalizability of the findings to other cultural and infrastructural contexts. Cross-cultural comparative studies could determine whether the observed effects are universal or context-dependent.

Fourth, the cross-sectional design of this study does not permit causal inferences. While the findings support the hypothesized relationships between explanations, perceived safety, trust, and route acceptance, the temporal sequencing of these variables remains unclear. Experimental designs that manipulate both explanation presence and safety information, or longitudinal studies that track changes over time, could help establish causal mechanisms.

Fifth, the use of self-report measures introduces the possibility of social desirability bias. Participants may have reported higher levels of trust, perceived safety, and route acceptance than they would actually experience in real situations. Future research could incorporate behavioral measures, such as actual route choices in navigation tasks, to complement self-report data and provide a more comprehensive understanding of user responses.

Despite these limitations, the study provides valuable initial evidence regarding the potential effectiveness of safety explanations in pedestrian navigation. The consistency of the findings across multiple measures and the large effect sizes suggest that the observed patterns are robust and merit further investigation. By acknowledging these limitations, this study aims to contribute not only empirical findings but also a foundation for more rigorous future research that can address these constraints.

VI. CONCLUSION AND FUTURE WORK

This study investigated whether safety explanations may increase perceived safety, trust, and route acceptance in pedestrian navigation systems among Libyan pedestrians. The findings suggest that explanations may improve all three outcomes, with large effect sizes and strong support for all hypotheses. Participants who received a safety explanation for a longer route recommendation reported higher perceived safety, greater trust in the navigation system, and greater willingness to accept the longer route. Perceived safety appeared to be strongly correlated with both trust and route acceptance, suggesting a mechanism through which explanations may influence behavior.

These findings may contribute to the growing literature on explainable AI and human-computer interaction by suggesting the effectiveness of safety explanations in a pedestrian navigation context. They may also provide practical guidance for designing transparent, trustworthy systems that promote informed user decision-making. As pedestrian navigation systems become more sophisticated and safety-aware, incorporating clear explanations for routing decisions may be essential for building trust and encouraging route acceptance, particularly in contexts where safety concerns shape walking decisions.

Future Work: Several directions for future research emerge from this study. First, examining real-world walking behavior would strengthen the ecological validity of these findings. Field studies in which participants actually navigate using systems with and without safety explanations could confirm whether the observed effects translate to actual behavior.

Second, exploring different explanation formats—such as visual maps highlighting hazards, auditory explanations for hands-free use, or concise versus detailed explanations—could identify optimal designs for different user groups and contexts. Research on senior-friendly routing [8], [9] suggests that older adults may benefit from explanations that reference identifiable landmarks, while younger users may prefer more concise explanations.

Third, cross-cultural comparisons would help determine whether these findings generalize beyond the Libyan context. Cultural differences in trust in technology, risk perception, and social norms around walking may moderate the effects of explanations [11]. Comparative studies across multiple countries could identify universal principles versus context-specific design considerations.

Fourth, investigating the durability of explanation effects over repeated use would illuminate whether explanations continue to build trust over time or whether their effects diminish as users become familiar with the system. Longitudinal studies tracking trust and acceptance across multiple navigation sessions could address this question.

Fifth, exploring the ethical implications of safety explanations—particularly the potential for manipulation or over-reliance on system recommendations—would contribute to responsible design of transparent navigation systems. Ilyankov et al. [4] raise important concerns about explainability pitfalls, and future research should examine how to design explanations that empower users rather than manipulate them.

Finally, examining how explanation effects vary across different demographic groups—including age, gender, and walking frequency—could inform personalized explanation design. Lieu and Guhathakurta [8] suggest that route choice behavior varies across demographic segments, and explanations may need to be tailored accordingly.

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