International Journal of Information Security (2026) 25:110
https://doi.org/10.1007/s10207-026-01281-7

REGULAR CONTRIBUTION

Cognition, affect, and intuition as predictors of susceptibility to persuasion in social engineering among risk-aware targets

Israa Abuelezz[1] · Mahmoud Barhamgi[1] · Ala Yankouskaya[2] · Khaled M. Khan[1] · Jordi Martin-Domingo[3] · Aiman Erbad[1] · Raian Ali[4]

Received: 14 March 2025 / Accepted: 3 June 2026

Abstract

Social engineering (SE) exploits human psychology to manipulate individuals into divulging confidential information or performing actions that compromise security. This study examines whether the personal factors of Need for Cognition (NFC), Need for Affect (NFA), and Faith in Intuition (FI) are associated with differences in risk-taking across different SE scenarios, each employing one of Cialdini's six persuasion principles: scarcity, reciprocity, likability, social proof, commitment and consistency, and authority. The study focuses on two distinct cultural contexts: Arab GCC and British populations, comparing how these factors affect risk-taking across both groups. Our methodological approach involved developing and face-validating twelve online scenarios reflecting the presence and absence of each of the six principles. The outcome measure was the delta in risk-taking attitude, representing the difference in risk-taking between a presence and an absence scenario. This approach offers a novel method to measure the direct impact of persuasive cues posed by each of Cialdini's principles. The survey scenarios revolved around an online group member, a software developer, asking group members to install and try a new mobile application. Hierarchical linear regression was employed to assess the incremental contribution of each predictor at different stages of the model. Our dataset consisted of 651 participants, with 329 from the Gulf region (Arab sample) and 322 from the UK (British sample). Results indicated that NFA was strongly associated with risk-taking behavior under the likability principle among the British sample. Additionally, a model incorporating all three predictors, NFC, FI, and NFA, performed best in scenarios involving the reciprocity principle across both samples. Future research should explore additional factors, relationships, and contexts that may enhance the predictive validity of these cognitive and affective traits in SE susceptibility. Understanding how NFC, NFA, and FI influence the processing of manipulative messages can aid in designing socio-technical and psychological interventions tailored to individuals' cognitive and emotional tendencies.

Keywords Social engineering · Faith in intuition · Need for cognition · Need for affect · Persuasion · Susceptibility · Cialdini's principles

1 Introduction

Modern technologies have revolutionized our lives, leading to increased reliance on the digital space for work, interaction, and socialization. Although this reliance enhances our daily activities, it also introduces new concerns and risks, particularly in the realm of cybercrime. Social engineering (SE) attacks, which exploit human psychology to gain control over sensitive information by manipulating trust, invoking fear, and creating a sense of urgency, have become alarmingly prevalent [1, 2]. In 2020 alone, there were over 1.6 million reported incidents of SE attacks globally, resulting in billions of dollars in financial losses [3, 4]. According to the FBI's Internet Crime Complaint Center (IC3), phishing, a

✉ Israa Abuelezz
esraa55saad@gmail.com

✉ Raian Ali
raali2@hbku.edu.qa

1 College of Engineering, Qatar University, Doha, Qatar

2 School of Psychology, Bournemouth University, Poole, UK

3 UNODC Regional Centre for Combatting Cybercrime, Doha, Qatar

4 College of Science and Engineering, Hamad Bin Khalifa University, Doha, Qatar

Published online: 18 June 2026

common form of SE, was one of the top reported cybercrimes in 2021 [5]. These attacks rely more on psychological manipulation than on technical means [6], making understanding the victim's cognitive and emotional responses critical for developing effective countermeasures.

Persuasion is a critical tool in SE attacks, allowing attackers to manipulate victims into revealing private information or taking actions that compromise their security. Previous studies have identified various tactics that influence persuasion and are central to the success of SE attacks. For instance, Mitnick and Simon [7] highlighted the exploitation of trust, pretexting, phishing, baiting, and tailgating as common tactics used by social engineers. Gragg (2003) explained how social engineers manipulate their targets by exploiting several psychological principles in a coordinated manner. They begin by leveraging commitment and consistency, starting with small requests that gradually escalate, which conditions individuals to comply with larger demands. By impersonating authoritative figures, such as company executives or IT staff, they exploit people's natural inclination to obey those in positions of power. Additionally, they create a sense of obligation through reciprocity, offering something of value to encourage cooperation. Finally, they amplify their influence by invoking scarcity, creating a sense of urgency that compels their targets to act quickly and without much deliberation [8]. These tactics align effectively with Robert Cialdini's six principles of persuasion: reciprocity, commitment and consistency, social proof, authority, likability, and scarcity [9]. The principles explain human behavior in specific circumstances and are often exploited by social engineers [10]. Understanding the personal factors that influence the success of these principles in knowingly risky situations provides a deeper insight into the psychological mechanisms behind SE attacks.

There has been growing research into the relationship between Cialdini's principles of persuasion and victim personality traits in the context of SE. Understanding these personal factors is essential for grasping why certain individuals are more susceptible to them [11]. Uebelacker and Quiel (2014) proposed the Social Engineering Personality Framework (SEPF), which links the Five-Factor Model (Big Five) of personality traits to susceptibility to SE [10]. The research suggested that agreeable individuals, who are generally more trusting and cooperative, are more prone to fall for tactics leveraging social proof due to their tendency to follow others' actions. Further supporting this, Oyibo et al. [12] found that individuals with high conscientiousness are more vulnerable to both the commitment and consistency and the reciprocity principles, while those high in agreeableness are more affected by authority, commitment, and liking. On the other hand, low openness was associated with increased susceptibility to authority and social proof, while high neuroticism was linked to higher susceptibility to social proof. However, Darwish et al. [13] indicated that neurotic individuals, who are more anxious and cautious, are less likely to fall for phishing attacks, as their cautious nature makes them distrustful of unverified sources. Moreover, Guadagno and Cialdini [14] conducted a review on the application of Cialdini's principles in online contexts, highlighting that commitment-consistency and authority principles are particularly effective in digital environments, which often lack physical and non-verbal cues. The research highlighted the necessity of considering personality traits when developing strategies to mitigate the risk of SE attacks, as these personal factors significantly influence how individuals respond to persuasive tactics.

Most of the literature focuses on personality traits, particularly those in the Big Five inventory, when examining susceptibility to Cialdini's principles within a security context. However, there is a lack of research on how other personal factors influence susceptibility to these persuasive tactics. Efforts to build an interdisciplinary bridge between cognitive psychology and information security have highlighted important gaps that the present study addresses. Montañez et al. [15] proposed a Cybersecurity Cognitive Psychology framework extending human cognitive functions to explain SE susceptibility, yet explicitly noted that the role of personality traits in this context remains unclear and called for quantitative studies on longer-term cognitive factors. Need for Cognition (NFC), Need for Affect (NFA), and Faith in Intuition (FI) have been found to be associated with differences in decision-making within the information security context [16–19]. Individuals with high NFC tend to enjoy and excel in activities requiring substantial mental effort, resulting in better problem-solving and decision-making across various situations [20, 21]. Reitter and Grossklags [16] found that high NFC individuals engage in deeper cognitive processing and are less likely to fall for superficial or heuristic-based manipulations. Faith in Intuition involves relying on gut feelings, which is linked to decisions in morally uncertain scenarios and correlates with perceptions of moral wrongdoing [22, 23]. Research shows that experienced security professionals often rely on their intuition, sometimes leading to overconfidence and impacting risk management strategies [17]. This reliance can influence their confidence in making security decisions, even with incomplete information [24]. Need for Affect dictates whether individuals seek or avoid emotional experiences [25], and has been associated with differences in decision-making, as emotions actively drive behavior toward specific goals according to the 'feeling-is-for-doing' framework [26]. Recent studies highlight the critical role of emotions in influencing security behavior, with emotional responses to security-related stressors driving compliance with information security policies and impacting cybersecurity decisions [18]. According to the

Affect Event Theory (AET), emotional responses to security-related stressors can lead to changes in security behavior [19]. Positive stress, such as challenge information security stress, can induce emotions like focus and self-assurance, enhancing compliance and performance in security tasks. Alshammari et al. [27] emphasize that both positive and negative emotions significantly impact employees' motivation to engage in cybersecurity protection behaviors, with self-efficacy and cybersecurity awareness acting as mediating factors.

Understanding individual differences in NFA, NFC, and FI, and how these variations relate to the processing of persuasive messages, is essential when examining the effectiveness of Cialdini's persuasive tactics. The Elaboration Likelihood Model (ELM) explains how individuals process persuasive messages through two routes: the central route and the peripheral route [28]. The central route involves careful and thoughtful consideration of the arguments presented, occurring when individuals are motivated and able to engage deeply with the content of the message. On the other hand, the peripheral route relies on surface characteristics, such as the attractiveness of the speaker or catchy slogans [29]. This model is relevant to understanding how people with varying degrees of NFC, NFA and FI respond to persuasive tactics. For instance, NFC influences which route is taken; individuals with high NFC are more likely to engage in the central route, deeply processing the persuasive content, while those with low NFC might rely on peripheral cues [28]. Additionally, high NFA individuals are often more responsive to emotional appeals and affective cues, leading them to focus more on the emotional impact of the persuasive message rather than its substantive content, thus engaging more frequently in peripheral route processing [30]. However, high NFA can also be associated with central route processing, particularly when the message is personally relevant and emotionally engaging, thereby encouraging deeper cognitive processing [31, 32]. Understanding these differences in processing can determine how susceptible individuals are to various Cialdini tactics and how manipulators can make their tactics more influential by targeting processing through either peripheral or central routes.

It is posited that beyond the central and peripheral routes of influence, perceived risk can be associated with differences in an individual's susceptibility to persuasive tactics in security contexts. Previous studies have utilized the ELM to examine SE victimization [33, 34]. One such study analyzed SE on Facebook, finding that both central route (argument quality) and peripheral route (contextual cues) significantly influence users' compliance with SE requests, with higher perceived risk reducing compliance [33]. The affect-as-information hypothesis [35] suggests that individuals use their current emotional state as information when making judgments and decisions, further elucidating the role of NFA and FI in understanding susceptibility to persuasion tactics. Prior research found that when individuals perceive their emotional reactions as pertinent, they incorporate these emotions into their decision-making processes [36, 37]. This is particularly relevant for individuals high in NFA and FI, who heavily rely on their emotions and gut feelings, respectively, making them more susceptible to emotional appeals and potentially bypassing analytical evaluation during manipulation attempts. By integrating these concepts and theories, we aim to better understand how emotional, cognitive, and intuitive processing influences susceptibility to SE manipulation, thereby developing more effective strategies to mitigate the risk of falling victim.

Cultural factors can moderate the influence of personal factors, shaping individual behavior and decision-making. According to Triandis [38], differences in how individuals across cultures interpret and process environmental information contribute to variations in personality. Factors such as social norms and collectivism can significantly shape individuals' risk tolerance, as Statman [39] highlights, noting that cultural contexts influence how people perceive and respond to risks. To delve deeper into the complex relationship between personal factors and persuasion, our study performs a comparative analysis of cultural influences, focusing on the UK and Arab GCC samples. The individualism-collectivism cultural dimension is considered one of the most prominent cultural differences among societies [40]. Notably, these differences have been found to be pronounced between Arab and UK cultures, as indicated by Hofstede and other scholars [41, 42]. Our comparative approach is essential for creating a more tailored and culturally sensitive understanding of persuasion and its countermeasures, thereby improving cybersecurity behaviors. Additionally, by incorporating samples from the Arab region, our study addresses the prevalent critique of an over-reliance on WEIRD (Western, Educated, Industrialized, Rich, and Democratic) samples [43].

Based on the above discussion, the key objective of this paper is to: *Investigate whether Need for Affect (NFA), Need for Cognition (NFC), and Faith in Intuition (FI) are related to susceptibility to Cialdini's persuasion tactics used in social engineering attempts.* This investigation focuses on two distinct cultural groups: British and Arab GCC populations. Participants were made aware of the potential risks associated with the study's context, controlling for technical knowledge and digital literacy. Specifically, the study presented scenarios where participants had to evaluate online requests (to install and try a mobile app developed by a group member) that could be either legitimate or malicious. These scenarios were intentionally crafted to be ambiguous, ensuring participants had to weigh both the legitimate and malicious possibilities evenly. The rationale behind the design, along with further details, will be provided in the following sections.

2 Method

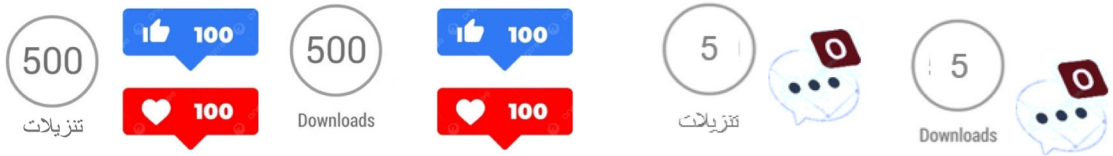
This section outlines the methodology used in the study and describes the recruitment of participants, survey design, data collection procedures, the development and validation of the 12 scenarios representing the presence and absence of each of Cialdini's persuasion principle, and the measures used to assess the impact of cognitive styles and emotional factors on individual decision-making processes when deciding whether or not to take a risk in each of the scenarios. The study was conducted through an online survey, developed using SurveyMonkey [44].

2.1 Development and validation of Cialdini's scenarios

Participants were presented with a fictional but realistic social media scenario. In this scenario, a group member named Oliver (for the UK participants) and Majid (for the Arab participants), introduced himself as a software developer and requested volunteers to download and test a new mobile app. This social group was centered around local events, and while the members were not entirely strangers, they had interacted with each other previously through posts and reactions. The app required users to provide personal data (e.g., name, age, and location) to generate customized recommendations. This introductory narrative aimed to create a naturalistic context for evaluating Cialdini persuasion principles while concealing the specific purpose of the study and minimizing response bias. Participants were cautioned about potential security risks associated with sharing personal information during the use of the mobile app. The caution was presented once within the introductory narrative (prior to the persuasion scenarios) to make participants aware of potential security risks. Specifically, the caution stated: "*Be cautious about sharing personal information during these trials. They might be used for undeclared reasons.*" The introductory narrative was shown twice to remind participants of the context before starting the scenarios. The caution statement served as a constant background context common to all scenarios. Repeating the caution before each individual scenario was intentionally avoided, as it could have biased participants' responses by making them systematically less likely to take risks, particularly when comparing the presence and absence scenarios of Cialdini's principles.

Based on the social media request scenario presented by Oliver (or Majid for the Arab participants), we developed 12 distinct scenarios: 6 scenarios depicting the presence of Cialdini's principles and 6 scenarios depicting their absence. Each scenario represented Oliver or Majid differently depending on whether the principle was present or absent. For example, in the presence of the social proof principle, we showed that a considerable number of other people had downloaded and tested the app, while in the absence of social proof, only a few people had installed and tested the app. In the absence scenarios, the messages were designed to be neutral rather than discouraging, ensuring that they did not actively dissuade participants from engaging with the app. The goal was to create a control condition where no explicit persuasive strategies were employed, allowing the comparison to focus on the effectiveness of the social proof principle without introducing any negative bias. Figure 1 illustrates two examples of the social proof and likability principles, each presented in both their presence and absence scenarios, in both Arabic and English. The inclusion of absence scenarios allows us to investigate the differences in susceptibility between the presence and absence of each principle, enabling us to compare and contrast their influence. All 12 scenarios were presented to participants in a random order to mitigate any learning effects. Furthermore, each scenario was meticulously crafted to focus exclusively on one of the six principles, ensuring that no other Cialdini principles or additional persuasive principles were incorporated into a single scenario. All 12 scenarios of Cialdini's principles in both Arabic and English versions can be found at the Open Science Framework (OSF) link provided in the supplementary material of this manuscript.

Before conducting the actual survey, a thorough validation process was carried out for the 12 Cialdini-designed scenarios to ensure the accurate representation of each principle in both the presence and absence conditions. We recruited a small group of participants and first introduced them to the definitions of the six Cialdini principles. The participants were then asked to review each designed scenario and match it to one or more Cialdini's principle, indicating whether the scenarios depicted the presence or absence of that principle. For each scenario, participants were asked to provide feedback on clarity, relevance, and the accurate representation of the principle in question and whether it contained any distracting elements that could shift attention to other factors potentially influencing their trust decision. Based on their feedback, adjustments were made to improve the scenarios. For example, in the social proof scenario, participants suggested that the number of users who had already installed the app should be more clearly specified to justify the app's popularity and correctly convey the principle's intended impact. Originally, the scenarios generically stated "many users downloaded the app" for presence and "only a few people downloaded" for the absence condition. Adjustments were made to include the specific number of downloads and likes for both presence and absence scenarios. Similarly, for the likability principle, feedback indicated that the description of Oliver's interactions and profile photos needed to be more distinct between the presence and absence scenarios. Initially, Oliver's profile photo in the likability presence scenario was the same as in the absence

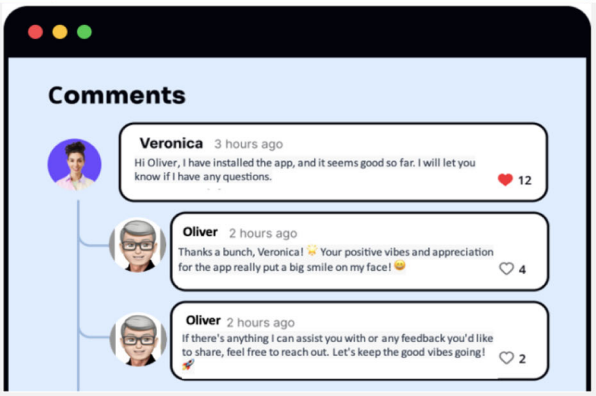


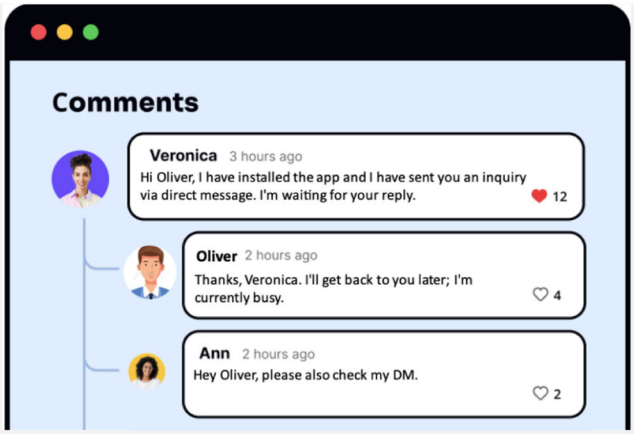
عضو)، بما في ذلك بعض 50 **عدد كبير من أعضاء المجموعة** (حوالي أصدقائك أو معارفك، قاموا بتثبيت التطبيق وعلقوا كم هو ممتع ومفيد.

A good number of the group members (about 500 members), including some of your friends or contacts, have installed the app and reported how fun and useful it is.

لم يقم سوى عدد قليل من الأشخاص (حوالي 5 أعضاء) بتثبيت التطبيق. لا تتوفر تعليقات حول تجربتهم مع التطبيق.

Only a few people (around 5 members) have installed the app. No comments are available about their experience with the app.





تفاعلات ماجد مع أعضاء المجموعة تظهر أنه شخص محترم جدًا، لطيف، وممتع. صورة البروفايل لماجد، والصور العامة الأخرى، تظهر شخصًا محبوبا وذو مظهر حسن.

The interactions of Oliver with the group members portray a very respectful, kind and fun person. Oliver's main profile photo, and other public photos, show a nice-looking and likable person.

ماجد يظهر بمظهر جدي في صورة البروفايل الخاصة به. ماجد لا يتفاعل كثيرًا مع أعضاء المجموعة، حتى مع الذين أعطوا تعليقات إيجابية على منشوراته.

Oliver has a serious look in the profile photos. Oliver does not interact much with the group members, even those who commented positively on his own posts.

Fig. 1 Presence (left) and Absence (right) of Social Proof (top) and Likability (bottom) principles

scenario. Participants suggested that Oliver's profile in the absence scenario should convey a more serious look rather than a friendlier and more approachable appearance. Furthermore, we also ensured that the names chosen did not indicate any socio-economic status, religious affiliation, or political beliefs. This led to the selection of the names Oliver and Majid. These adjustments helped refine the scenarios to more accurately reflect the presence and absence conditions of all principles.

2.2 Dataset

Participants for this study were recruited from the Arab Gulf Cooperation Council (GCC) countries and the United Kingdom (UK) through the services of TGM Research, a company specializing in data collection for research studies [45]. The decision to focus on these two culturally distinct regions was intended to offer a broad basis for comparison, considering the differences in their cultural and societal values. This cultural variation became clear through an analysis using Hofstede's country comparison chart [46] and the GLOBE (Global Leadership and Organizational Behavior Effectiveness) study framework [47], which revealed noteworthy variations in Power Distance and Collectivism between the UK and GCC countries. To ensure the clarity and simplicity of the survey and to eliminate any potential ambiguities in the wording of questions, a pilot test was conducted prior to the main survey distribution with a small group of native Arabic or English speakers.

Prior to participating in the survey, participants underwent an eligibility assessment. The inclusion criteria required participants to be over 18 years of age and to have been born and currently residing in either one of the GCC countries (Saudi Arabia, Qatar, Bahrain, Kuwait, Oman, and the United Arab Emirates) or the United Kingdom (including England, Scotland, Wales, and Northern Ireland). As part of the recruitment process, the data collection platform (TGM) conducted an initial identity check to verify participants' place of birth and current residence. Additionally, the eligibility assessment included a self-identification question, asking participants whether they identified with the cultural norms and values associated with either the Arab GCC or the UK. Participants who did not meet these criteria were excluded from the study. They also had to be comfortable interacting with people they do not know personally on social media and willing to offer help, such as advice or information, to these individuals. All participants provided informed consent and were given the option to withdraw from the survey at any time. Participants were made aware that installing the app could involve security risks, ensuring they understood the potential consequences of their decision. To ensure data quality, attention checks were incorporated into the survey. Participants who did not pass these checks or completed the survey significantly faster than the median time (less than 50%) were excluded from the analysis. A total of 741 participants (378 British and 363 Arab GCC) initially completed the survey. Of these, 18 were excluded for failing all attention checks (9 British and 9 Arab GCC), and 49 (24 British and 25 Arab GCC) were excluded for completing the survey in less than 50% of the median completion time, providing straight-line answers for the majority of questions, or showing response inconsistencies on the cognitive scales (NFC, FI, and NFA) identified through author review of individual response patterns. Additionally, 23 British individuals over the age of 60 were excluded due to an uneven distribution of this age group between the Arab and British datasets, as we were unable to recruit Arab participants in that age group. The final dataset consisted of 651 participants in total, with 329 from the Arab GCC and 322 from the UK. The study received ethical approval from the Institutional Review Board (IRB) of the last author's institution.

2.3 Measures

The three scale-based questionnaires (FI, NFC, and NFA) were carefully translated into Arabic, with adjustments made to ensure cultural sensitivity while preserving their original meanings.. The translation process included back-translation [48] by bilingual experts to maintain consistency and accuracy. Furthermore, the translated questionnaires were pilot tested with a small group to ensure clarity and cultural relevance for Arabic-speaking participants. Participants were instructed to answer all items honestly and accurately. To reduce social desirability bias, anonymity and confidentiality of responses were assured. All the scale items used in the survey, in both in Arabic and English, are available via the Open Science Framework (OSF) link provided in the supplementary materials section.

2.3.1 Rational-experiential inventory-10

We utilized established scales to assess the psychological traits of FI and NFC, using items from the Rational-Experiential Inventory-10 (REI-10) [22]. The REI-10 is a concise version adapted from the original scales developed by Epstein et al. [22] for FI and by Cacioppo and Petty [20] for NFC. The scale includes ten items, five each for NFC and FI, rated on a 5-point Likert scale ranging from "1 = completely false" to "5 = completely true." An example item from the FI scale is, "*I trust my initial feelings about people.*" A sample item from the NFC scale is, "*I don't like to have to do a lot of thinking*." Some items were modified to improve clarity and ensure alignment between the English and Arabic versions of the scale. For instance, the original NFC item "*Thinking hard and for a long time about something gives me little satisfaction*" was revised to "*Thinking*

hard and for a long time about something gives me some satisfaction" to make it more relatable and comprehensible within the study's linguistic and cultural context. The scale demonstrated good internal reliability across samples, with Cronbach's alpha values of 0.87 for FI and 0.83 for NFC in the British sample, and 0.79 for FI and 0.70 for NFC in the Arab sample.

2.3.2 Need for affect

In our survey, we employed the short 10-item scale for NFA, which encompasses both the Avoidance (AV) and Approach (AP) subscales [49]. This short version was adapted from the Need for Affect Questionnaire (NAQ), developed by Maio and Esses [25]. Participants responded using a 7-point Likert scale ranging from "1 = strongly disagree" to "7 = strongly agree." An example item from the NFA scale is: "*I feel that I need to experience strong emotions regularly*." In our study, the correlation between the NFA approach and avoidance subscales was significant and negative in both samples (British: $r = -0.29$, $p < 0.001$; Arab: $r = -0.14$, $p < 0.05$), consistent with the findings of Maio and Esses [25]. This pattern supports the conceptualization of both subscales as opposite poles of the same construct and justifies their combination into a single NFA total score after reverse-coding the avoidance items. Full correlation tables are provided in the Supplementary Materials on OSF (Tables S13-S14). The NFA scale demonstrated good reliability in both subscales across samples. For the AP subscale, Cronbach's alpha was 0.75 for the British sample and 0.69 for the Arab sample. For the AV subscale, Cronbach's alpha was 0.80 for the British sample and 0.84 for the Arab sample.

2.3.3 Measure of susceptibility to Cialdini's principles

To evaluate participants' susceptibility to the 12 Cialdini scenarios, we asked two targeted questions for each scenario to capture their reactions and decision-making processes in response to either the presence or absence of the six principles. The first question assessed their risk-taking behavior by asking, "*In a similar scenario, how likely are you to install the app and give it a try?*" Responses were rated on a scale from "very likely" to "very unlikely." The second question gauged their level of trust in the persona presented (Oliver in the English version, Majid in the Arabic version) by asking, "*In a similar scenario, how much do you trust Oliver's [Majid's] transparency and intentions?"* This was measured using a six-point Likert scale ranging from 1, "Complete distrust," to 6, "Complete trust." The full survey is available via the OSF link provided in the supplementary material section.

To further refine our understanding of susceptibility, we created a new variable, the delta ($\Delta_{\text{Presence–absence}}$) which represents the difference in risk-taking attitude between the presence and absence of each Cialdini scenario. This approach was chosen to directly measure the impact of persuasive cues by contrasting participants' responses when the cues were present versus when they were absent. A positive delta indicates higher susceptibility, meaning the presence of persuasion principles has a greater effect, while a negative delta suggests lower susceptibility, where the absence of those principles has a stronger influence. This process generated six columns, each representing the delta between presence and absence for one of the six Cialdini principles. The values in each of these columns ranged from − 5 to 5. By examining this delta, we could more accurately capture the degree of influence that the Cialdini principles exert on participants, thereby isolating their effects from other variables, such as being generally trusting or having an extra device that can be used for non-essential purposes with less concern for security. Previous studies have shown that analyzing the difference between experimental conditions can provide deeper insights into psychological processes and behavioral response [50], which supports the validity of our approach.

2.4 Data analysis

The data analysis was performed using JASP version 0.18.2 [51]. The scoring of each scale followed the procedures outlined in the original references for the NFA and REI-10 [22, 49], including the grouping of items and the reversal of scores where applicable. For our data analysis, we employed multivariable linear regression [52] to investigate the relationship between the three continuous predictors (NFA, FI, NFC) and the six outcomes representing susceptibility to different Cialdini principles. Linear regression was chosen because it allows us to assess the combined effect of these predictors on the outcome variables, even when individual correlations may not be significant. Demographic variables (such as age and gender) were not included as covariates because the outcome measure in each regression model is a within-person difference score. Stable individual characteristics (like age and gender) exert an equivalent influence on both the presence and absence conditions and therefore cancel out mathematically when the delta is computed, leaving only the persuasive impact of each Cialdini principle as the quantity of interest. Prior to conducting the regression analysis, we performed a correlation analysis to examine the relationships between the predictors and the outcomes. The correlations between each predictor and the delta scores (dependent variables) were generally small.

Despite the lack of significant correlations between the predictors and dependent variables, previous literature supports the use of linear regression in such cases. The rationale is that multiple regression assesses the unique contribution of each predictor while controlling for the others, which can reveal significant relationships that might not be apparent in

simple correlations. Therefore, according to Cohen et al. [53] it is appropriate to proceed with linear regression analysis even when preliminary correlations are weak or not statistically significant, as the joint contribution of predictors might still be meaningful. We used a hierarchical regression procedure in our analysis, entering the predictors in order. The predictors were entered in the following order: FI, then NFC, then NFA. Faith in Intuition was entered first as it reflects an automatic, experience-based processing tendency expected to exert a more immediate association with social judgments. Need for Cognition was entered second to capture deliberative and analytical processing, allowing examination of whether rational engagement explains additional variance beyond intuitive tendencies. Finally, NFA was entered last to evaluate whether affective motivation contributes incremental explanatory power after accounting for both intuitive and cognitive dispositions. This approach enabled the assessment of each predictor's incremental contribution at different stages of the model, allowing us to identify which psychological factor most strongly contributes to susceptibility within each cultural group. This approach has been used in previous studies [54, 55].

No correction for multiple comparisons was applied across the six regression models. The hierarchical entry of predictors means that each predictor's beta coefficient (the standardized measure of each predictor's unique contribution to the outcome) and ΔR^2 (the incremental variance explained at each step) reflect unique, partialled variance conditional on all previously entered predictors. This prevents any one predictor from appearing significant merely because it correlates with another predictor that has genuine explanatory power. Additionally, the six models represent conceptually distinct outcomes, each underpinned by a different theoretical mechanism corresponding to a different Cialdini principle, and therefore do not share the common null hypothesis structure that would statistically justify a familywise error rate correction.

Q-Q plots for our data showed an approximately normal distribution around the mean. According to the Central Limit Theorem, even if the data does not follow a normal distribution in smaller samples, with a sufficiently large sample size (50 or more), the sampling distribution of the mean will approximate a normal distribution [56]. Overall, significant correlations were observed among the predictors, particularly between NFC and NFA. Although the correlation between NFC and NFC was significant, all correlations were well below thresholds for multicollinearity ($r < 0.70$), indicating that the predictors capture related yet distinct constructs. Multicollinearity among NFA, FI, and NFC was further examined using the Variance Inflation Factor (VIF) and tolerance values. The VIF values for all predictors were well below the generally accepted threshold of 2 in both samples [57], suggesting that there was no significant multicollinearity between these variables. The correlation analysis is presented as supplementary material in the OSF link provided at the data availability section (Tables S1-S12). Additionally, no outliers were detected, as Cook's distance values were below the standard threshold of 1 [57]. Full details of the Q-Q plots and collinearity statistics can be found in the OSF link provided in the supplementary materials section.

3 Results

Prior research conducted as part of a larger study on the impact of demographic and visual cues in SE revealed a strong correlation between trust and risk-taking behavior [58, 59]. Given this relationship, the present analysis will focus exclusively on app installation (as a measure of risk-taking) as the primary outcome variable. Specifically, we will examine whether susceptibility to app installation can be predicted by NFA, NFC, or FI across different Cialdini persuasion scenarios.

3.1 Descriptive statistics

Table 1 presents descriptive statistics showing the distribution of mean values for the presence and absence conditions of Cialdini's principles, the mean of the delta variable $\Delta_{(\text{Presence} - \text{Absence})}$ and its SD, the three scales statistics, across the Arab and British samples. Overall, both samples demonstrated higher mean values in the presence condition compared to the absence condition across all principles. The delta means further indicate that the strongest effect was observed for Social Proof (Arab: $M = 2.03$, $SD = 1.56$; British: $M = 1.77$, $SD = 1.27$), followed by Authority and Reciprocity, whereas the smallest differences were found for Commitment and Consistency and Scarcity in both groups. Higher delta means (all > 0) indicate a greater likelihood to take the risk or comply under the presence condition, while values close to zero reflect similar tendencies between the presence and absence conditions. No delta mean was < 0, reflecting that participants in both samples were overall more risk-accepting when the persuasion principles were present.

Regarding the scales, both the Arab and British samples showed identical minimum and maximum scores on the NFC scale. However, the range for the NFA scale was broader in the British sample (-20/30) compared to the Arab sample (-18/28). The mean NFA values for both the Arab and British samples were positive (Arab: $M = 5.26$, $SD = 7.87$; British: $M = 5.79$, $SD = 8.27$), indicating a general tendency toward higher affect in both groups.

Table 1 Descriptive statistics for outcome and predictor variables across the british and arabic samples

Variable/Principle	Participants (N = 651)			
	Arab (N = 329)		British (N = 322)	
	Presence/Absence ($\bar{x}_P/\bar{x}_A$)	$\Delta_{(Presence - Absence)}$ (Mean ± SD)	Presence/Absence $\bar{x}_p/\bar{x}_A$	$\Delta_{(Presence - Absence)}$ (Mean ± SD)
Social Proof	4.76/2.73	2.03 ± 1.56	3.97/ 2.21	1.77 ± 1.272
Likeability	4.44/3.20	1.25 ± 1.31	3.57/ 2.48	1.08 ± 1.281
Authority	4.51/2.77	1.75 ± 1.59	3.76/ 2.22	1.54 ± 1.316
Commitment & Consistency	4.23/3.79	0.44 ± 1.01	3.39/ 2.94	0.45 ± 1.026
Reciprocity	4.31/2.79	1.53 ± 1.49	3.64/2.32	1.32 ± 1.245
Scarcity	4.29/4.14	0.15 ± 1.07	3.65/3.46	0.19 ± 0.975

	Arab (N = 329)			British (N = 322)		
	Minimum	Maximum	Mean (SD)	Minimum	Maximum	Mean (SD)
NFC	6	25	16.23 (3.75)	6	25	17.44 (4.00)
FI	7	25	19.49 (3.12)	8	25	19.90 (3.03)
NFA	− 18	28	5.26 (7.87)	− 20	30	5.79 (8.27)

NFC: Need for Cognition, FI: Faith in Intuition, NFA**:** Need for Affect

Table 2 Hierarchical regression analysis predicting the social proof $\Delta_{Presence-absence}$ across Arab and British samples

	Step 1				Step 2				Step 3			
Principle 1: Social Proof	Arab (N = 329)		British (N = 322)		Arab (N = 329)		British (N = 322)		Arab (N = 329)		British (N = 322)	
	β	t	β	t	β	t	β	t	β	t	β	t
FI	0.125*	2.274	0.109*	1.969	0.122*	2.204	0.099	1.749	0.123*	2.211	0.091	1.609
NFC					0.027	0.496	0.066	1.165	0.032	0.542	0.050	0.863
NFA									− 0.013	− 0.224	0.072	1.253
$R^2(\Delta R^2)$	0.016*		0.012*		0.016		0.016		0.016		0.021	

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

3.2 Prediction results of susceptibility to Cialdini principles

Table 2 presents the standardized beta coefficients (β), t-values, and changes in R^2 (ΔR^2) from hierarchical regression analyses predicting the Social Proof $\Delta_{Presence-absence}$ across Arab and British samples. The table is divided into three steps for each sample, with Step 1 showing the inclusion of FI, Step 2 adding NFC, and Step 3 incorporating NFA to the prediction model.

Arab Sample. In the Arab sample, when FI was included in the first step of the model, it significantly predicted the $\Delta_{Presence-absence}$ ($\beta = 0.125$, $t = 2.274$, $p = 0.024$), with a modest improvement in explanatory power ($\Delta R^2 = 0.016$, $p = 0.024$). In the second step, adding NFC to the model did not lead to a significant improvement ($\beta = 0.027$, $t = 0.496$, $p = 0.620$), and there was no additional change in R^2 ($\Delta R^2 = 0.016$, $p = 0.620$). Finally, when NFA was included in the third step, the model's prediction remained consistent, with FI continuing to show significance ($\beta = 0.123$, $t = 2.211$, $p = 0.028$), while NFC ($\beta = 0.032$, $t = 0.542$, $p = 0.589$) and NFA (β = -0.013, t = -0.224, $p = 0.823$) did not contribute significantly.

British Sample. In the British sample, the initial inclusion of FI in the model also resulted in significant prediction ($\beta = 0.109$, $t = 1.969$, $p = 0.05$), with a slight increase in R^2 ($\Delta R^2 = 0.012$,$p = 0.05$). However, the subsequent addition of NFC and NFA at step 2 and 3 did not significantly enhance the model as none of the three predictors were significant, with no meaningful change in R^2.

In summary, the hierarchical regression analysis suggests that FI is a significant predictor of Social Proof $\Delta_{\text{Presence–absence}}$ in both Arab and British samples, particularly in the initial model. However, the additional inclusion of NFC and NFA did not significantly enhance the predictive power of the model in either sample, as shown by the minimal changes in R^2 and the non-significant beta coefficients.

Table 3 presents the prediction result for Likeability $\Delta_{\text{Presence–absence}}$ across the two samples.

Arab Sample. In the Arab sample, when FI was included in the first step of the model, it showed a trend towards significance in predicting the $\Delta_{\text{Presence–absence}}$ ($\beta = 0.100$, $t = 1.811$, $p = 0.071$), with a modest improvement in explanatory power ($\Delta R^2 = 0.010$). Adding NFC and NFA in the second and third steps slightly increased the change in R^2 (0.015 and 0.016, respectively), but these changes were not significant, and neither NFC nor NFA contributed significantly to the model.

British Sample. In the British sample, the initial inclusion of FI in the model also showed a trend towards significance in predicting the $\Delta_{\text{Presence–absence}}$ ($\beta = 0.098$, $t = 1.768$, $p = 0.078$), with a slight increase in R^2 ($\Delta R^2 = 0.010$). The subsequent addition of NFC in step 2 did not significantly enhance the model ($\beta = 0.066$, $t = 1.168$, $p = 0.244$), with no meaningful change in R^2 ($\Delta R^2 = 0.014$). However, when NFA was added in step 3, the model became significant ($\beta = 0.205$, $t = 3.635$, $p < 0.001$), resulting in a notable increase in explanatory power ($\Delta R^2 = 0.053$, $p < 0.001$).

In summary, none of the predictors (FI, NFC, or NFA) significantly influenced the prediction of the $\Delta_{\text{Presence–absence}}$ for likeability in the Arab sample across all three steps of the model. In the British sample, while FI and NFC did not yield significant changes in the model, the inclusion of NFA in the third step resulted in a significant increase in ΔR^2. The results highlight NFA's role as a potential driver of influence in this specific principle in the British sample.

Table 4 shows the prediction result for Authority $\Delta_{\text{Presence–absence}}$ across the two samples.

Arab Sample. In the Arab sample, when FI was included in the first step of the model, it did not significantly predict the Authority $\Delta_{\text{Presence–absence}}$ ($\beta = 0.052$, $t = 0.943$, $p = 0.346$). Adding NFC and NFA in the second and third steps slightly increased the change in R^2 (0.005 and 0.006, respectively), but these changes were not significant, and neither NFC nor NFA contributed significantly to the model.

British Sample. In the British sample, the initial inclusion of FI in the model significantly predicted the Authority $\Delta_{\text{Presence–absence}}$ ($\beta = 0.127$, $t = 2.296$, $p = 0.022$), with a notable increase in R^2 ($\Delta R^2 = 0.016$). The subsequent addition of NFC in step 2 also contributed significantly to the model, with a further increase in R^2 ($\Delta R^2 = 0.019$, $p = 0.043$). However, when NFA was added in step 3, the change in R^2 was not statistically significant ($\Delta R^2 = 0.020$, $p = 0.087$).

In summary, in the Arab sample, none of the predictors (FI, NFC, or NFA) significantly influenced the predictive power of susceptibility to Authority $\Delta_{\text{Presence–absence}}$ across all three steps. In contrast, in the British sample, FI significantly predicted Authority in both the first and second steps, with a modest increase in ΔR^2. The inclusion of NFA in the third step did not lead to a significant prediction in the British sample. These findings suggest that FI was an influential predictor in the British sample, while neither NFC nor NFA contributed significantly to the model prediction in either sample.

Table 5 presents the prediction results for Commitment & Consistency $\Delta_{\text{Presence–absence}}$ across Arab and British samples.

Arab Sample. In the Arab sample, none of the predictors (FI, NFC, or NFA) significantly predicted the Commitment & Consistency $\Delta_{\text{Presence–absence}}$, as the changes in R^2 across all steps were not significant. However, NFC became a significant predictor ($\beta = 0.116$, $t = 1.966$, $p = 0.050$) in step 3, though the overall change in R^2 remained minimal.

British Sample. Similarly, in the British sample, the initial inclusion of FI also did not significantly predict the $\Delta_{\text{Presence–absence}}$ ($\beta = 0.033$, $t = 0.599$, $p = 0.550$), and the addition of NFC and NFA in subsequent steps did not lead to significant improvements in the model, as reflected by the non-significant changes in R^2 ($\Delta R^2 = 0.001$ and $\Delta R^2 = 0.008$).

In summary, none of the three predictors (FI, NFC, or NFA) significantly influenced the prediction of Commitment & Consistency $\Delta_{\text{Presence–absence}}$ in either the Arab or British samples.

Table 6 illustrates the prediction results for Reciprocity $\Delta_{\text{Presence–absence}}$ across the Arab and British samples.

Arab Sample. In the Arab sample, the initial inclusion of FI in the model did not significantly predict the Reciprocity $\Delta_{\text{Presence–absence}}$ ($\beta = 0.080$, $t = 1.449$, $p = 0.148$), resulting in a minor increase in explanatory power ($\Delta R^2 = 0.006$). Adding NFC in the second step led to a significant change, with NFC emerging as a significant predictor ($\beta = 0.144$, $t = 2.629$, $p = 0.009$), enhancing the model's explanatory power ($\Delta R^2 = 0.027$, $p = 0.003$). However, the addition of NFA in the third step did not significantly contribute to the model ($\beta = -0.058$, $t = -0.993$, $p = 0.321$), with only a slight further increase in R^2 ($\Delta R^2 = 0.030$, $p = 0.019$).

British Sample. In contrast, in the British sample, FI was a significant predictor right from the first step, with a notable impact on predicting Reciprocity $\Delta_{\text{Presence–absence}}$ ($\beta = 0.165$, $t = 2.993$, $p = 0.003$), accompanied by a meaningful improvement in R^2 ($\Delta R^2 = 0.027$, $p = 0.005$). The subsequent inclusion of NFC also significantly enhanced the model with an increase in R^2 ($\Delta R^2 = 0.033$, $p = 0.003$). Notably, adding NFA in the third step contributed significantly to the

Table 3 Hierarchical regression analysis predicting the likeability $\Delta_{\text{Presence–absence}}$ across Arab and British samples

Principle 2: Likeability	Step 1				Step 2				Step 3			
	Arab (N = 329)		British (N = 322)		Arab (N = 329)		British (N = 322)		Arab (N = 329)		British (N = 322)	
	β	*t*	β	*t*	β	*t*	β	*t*	β	*t*	β	*t*
FI	0.100	1.811	0.098	1.768	0.092	1.657	0.087	1.550	0.094	1.692	0.066	1.189
NFC					0.074	1.333	0.066	1.168	1.692	1.445	0.021	0.715
NFA									− 0.033	− 0.567	0.205***	3.635
$R^2(\Delta R^2)$	0.010		0.010		0.015		0.014		0.016		0.053***	

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

Table 4 Hierarchical regression analysis predicting the authority $\Delta_{\text{Presence–absence}}$ across Arab and British samples

Principle 3: Authority	Step 1				Step 2				Step 3			
	Arab (N = 329)		British (N = 322)		Arab (N = 329)		British (N = 322)		Arab (N = 329)		British (N = 322)	
	β	*t*	β	*t*	β	*t*	β	*t*	β	*t*	β	*t*
FI	0.052	0.943	0.127*	2.296	0.047	0.837	0.118*	2.093	0.045	0.798	0.114*	2.021
NFC					0.051	0.917	0.058	1.034	0.041	0.694	0.051	0.887
NFA									0.029	0.490	0.032	0.554
$R^2(\Delta R^2)$	0.003		0.016*		0.005		0.019*		0.006		0.020	

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

Table 5 Hierarchical regression analysis predicting the commitment & consistency $\Delta_{\text{Presence–absence}}$ across Arab and British samples

Principle 4: Commitment& Consistency	Step 1				Step 2				Step 3			
	Arab (N = 329)		British (N = 322)		Arab (N = 329)		British (N = 322)		Arab (N = 329)		British (N = 322)	
	β	*t*	β	*t*	β	*t*	β	*t*	β	*t*	β	*t*
FI	0.038	0.693	0.033	0.599	0.030	0.548	0.036	0.642	0.039	0.707	0.027	0.483
NFC					0.072	1.296	− 0.018	− 0.314	0.116*	1.966	− 0.037	− 0.634
NFA									− 0.128	− 2.171	0.086	1.492
$R^2(\Delta R^2)$	0.001		0.001		0.007		0.001		0.021		0.008	

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

model, with a great increase in R^2 ($\Delta R^2 = 0.044, p = 0.003$), highlighting that while FI was a consistently significant predictor across the steps for the British sample, and that the model was better explained by the three predictors included.

In summary, NFC emerged as a significant predictor of Reciprocity $\Delta_{\text{Presence–absence in}}$ the Arab sample. In the British sample, FI was a consistently significant predictor across all steps. These results highlight the different predictors of influence for Reciprocity susceptibility across the two samples, with NFC being influential for the Arab sample and FI for the British sample.

Table 7 presents the prediction results for Scarcity $\Delta_{\text{Presence–absence}}$ across Arab and British samples.

British Sample. In the British sample, the initial inclusion of FI in the model showed a trend towards significance in predicting the Scarcity $\Delta_{\text{Presence–absence}}$ ($\beta = 0.107, t = 1.933$, $p = 0.054$), with a modest improvement in explanatory power ($\Delta R^2 = 0.012$). When NFC was added in the second step, it led to a further improvement in the model's explanatory

Table 7 Hierarchical regression analysis predicting the scarcity $\Delta_{\text{Presence–absence}}$ across Arab and British samples

Principle 6: Scarcity	Step 1				Step 2				Step 3			
	Arab (N = 329)		*British (N = 322)*		*Arab (N = 329)*		*British (N = 322)*		*Arab (N = 329)*		*British (N = 322)*	
	β	*t*	β	*t*	β	*t*	β	*t*	β	*t*	β	*t*
FI	0.076	1.378	0.107	1.933	0.076	1.363	0.090	1.596	0.073	1.308	0.085	1.508
NFC					0.002	0.042	0.108	1.916	− 0.012	− 0.198	0.098	1.706
NFA									0.041	0.695	0.042	0.738
$R^2(\Delta R^2)$	0.006		0.012		0.006		0.023*		0.007		0.024*	

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

power ($\Delta R^2 = 0.023$, $p = 0.025$), though neither FI nor NFC were a significant predictor. The British sample model was better explained by the three predictors included, particularly in step 3 with the inclusion of NFA, which contributed to a slight increase in the model's explanatory power ($\Delta R^2 = 0.024$, $p = 0.048$), but no prediction significance observed by any of the three predictors.

Arab Sample. In contrast, for the Arab sample, the addition of FI, NFC and NFA in all steps did not significantly enhance the model, as indicated by the nonsignificant changes in R^2 and predictor coefficients across all steps.

In summary, for the British sample, the inclusion of FI, NFC, and NFA across the three steps significantly enhanced the prediction model for Scarcity $\Delta_{\text{Presence–absence}}$, with NFA contributing to a notable improvement in the model's explanatory power in step 3. In contrast, in the Arab sample, none of the predictors (FI, NFC, or NFA) significantly improved the model, as indicated by the very minimal changes in ΔR^2 across all steps. These findings suggest that the model was better explained by the predictors in the British sample, while no significant prediction was observed in the Arab sample.

4 Discussion

This study aimed to explore how individual differences, specifically the NFA, NFC, and FI, are associated with susceptibility to app installation across various Cialdini persuasion scenarios in Arab GCC and British samples. Need for Cognition, NFA, and FI have been shown to play a significant role in relating to differences in decision-making in the context of information security [16–19]. Although the effects observed in this study are statistically modest, they are practically important in the context of SE. Social Engineering attacks depend on scale rather than precision, and campaigns can succeed even when only a very small proportion of targets comply. When applied to a large-scale campaign targeting 10,000 people, a one- to two-percentage-point increase in compliance would equate to an additional 100–200 successful compromises. It must be noted that the cumulative effect of many low-probability events can be strategically decisive: one compromised account can grant access to networks, contacts, and reputational trust that enable subsequent attacks. In this sense, minor psychological tendencies become system-level vulnerabilities. From a methodological standpoint, modest coefficients are also consistent with the conservative nature of our analysis. Specifically, the hierarchical regression isolates the unique contribution of each predictor after accounting for shared variance among constructs, producing smaller but more trustworthy effect size estimates.

Our results suggest that FI could significantly predict the Social Proof principle, in both the Arab and British samples. This finding aligns with research in other domains, such as decision-making in high-stakes environments, where intuitive processing often overrides deliberate analysis [60]. In the context of social proof in our scenario, individuals with high FI tended to rely more on social cues, such as the number of downloads, likes and comments, when making decisions, rather than conducting a thorough evaluation. These social cues on a social media post can trigger heuristics like the "bandwagon effect" [61], where individuals assume that if many others are endorsing or engaging with something, it must be valuable or correct [62]. The reliance on such heuristics may help explain why individuals with higher FI might use social cues for quick decision-making rather than engaging in deeper cognitive evaluation. Interestingly, despite the theoretical relevance of the NFC and NFA in decision-making processes, their inclusion in the model did not significantly enhance its predictive power. This outcome suggests that, in the context of social proof, the reliance on social cues and intuitive processing may overshadow the roles of cognitive and affective needs.

For the Likeability principle, the findings diverged between the two samples. In the Arab sample, FI showed a

Table 6 Hierarchical regression analysis predicting the reciprocity $\Delta_{Presence\text{–}absence}$ across Arab and British samples

Principle 5: Reciprocity	Step 1				Step 2				Step 3			
	Arab (N = 329)		British (N = 322)		Arab (N = 329)		British (N = 322)		Arab (N = 329)		British (N = 322)	
	β	*t*	β	*t*	β	*t*	β	*t*	β	*t*	β	*t*
FI	0.080	1.449	0.165**	2.993	0.064	1.166	0.153**	2.734	0.068	1.235	0.141*	2.527
NFC					0.144**	2.629	0.074	1.331	0.164**	2.810	0.050	0.880
NFA									- 0.058	- 0.993	0.110	1.938
$R^2(\Delta R^2)$	0.006		0.027**		0.027*		0.033**		0.030*		0.044*	

$*p < 0.05$, $**p < 0.01$, $***p < 0.001$

trend toward significance, but the model's explanatory power remained relatively low. Conversely, in the British sample, while FI was initially marginally significant, the inclusion of NFA in the final step was associated with an improved model fit. This suggests that affective processing plays a more prominent role in the British context, potentially reflecting cultural differences in how emotional cues are perceived and acted upon. Although there is limited literature explicitly demonstrating that NFA strongly influences susceptibility to likeability-based persuasion, research in consumer psychology highlights how emotions, particularly those elicited by pleasant sensory experiences like taste and smell, can powerfully shape decision-making in response to persuasive cues emphasizing likability [63]. This parallels findings in marketing, where emotional appeal often trumps rational arguments in shaping consumer preferences because emotions can create a strong, immediate connection with the audience by leveraging feelings such as happiness, nostalgia, fear, or excitement to drive associative responses to persuasive stimuli [64, 65].

The cultural variations observed with the Likeability principle also extend to the Authority principle, where cognitive and affective processing show different patterns of association across the two samples. FI was a significant predictor of susceptibility to the Authority principle from the outset in the British sample, and its impact was further strengthened by the inclusion of NFC in the model. However, adding NFA did not lead to significant changes, indicating that while intuitive and cognitive processes are important for authority-based persuasion, affective factors may play a less significant role. This finding is consistent with research in social psychology, where authority figures are often perceived through a cognitive lens of rationality and expertise, meaning individuals tend to evaluate authority figures based on their perceived competence, credibility, and the knowledge they bring to a situation [66, 67]. Research in organizational behavior has demonstrated that leaders perceived as knowledgeable are more effective at influencing decision-making processes because followers trust their judgments to be based on factual or rational reasoning [68]. In contrast, none of the predictors were significant in the Arab sample, highlighting potential cultural differences in how authority cues are perceived and acted upon. This variation aligns with Hofstede's concept of power distance, suggesting that in higher power distance cultures like the Arab sample, deference to authority and hierarchical norms may reduce reliance on individual cognitive or affective processing [46, 69]. NFC was the only predictor to show significant influence on susceptibility to the Commitment & Consistency principle in the Arab sample, emerging as a notable factor only at the final step. Despite this, the overall predictive power of NFC in explaining susceptibility to this principle was minimal across both samples. This suggests that while individuals with a higher NFC may

be slightly more responsive to commitment and consistency cues, this effect is weak and does not generalize across cultures. Interestingly, this result contradicts existing literature that often highlights the influence of NFC on susceptibility to commitment and consistency-based persuasion tactics, such as the Foot-in-the-Door (FITD) technique [70]. The FITD technique begins with a small request to increase compliance with a larger one later [71]. The lack of significance in the British sample highlights the variability in how different populations respond to this persuasion tactic, potentially reflecting cultural differences in the importance placed on consistency in decision-making processes [72].

The influence of cognitive factors is not limited to Commitment & Consistency; they also play a central role in the Reciprocity principle. FI emerged as a significant predictor of susceptibility to the Reciprocity principle in both samples. Integrating NFC and NFA into the British sample increased the model's strength and significance. This suggests that intuitive, cognitive, and affective factors all contribute to susceptibility to reciprocity-based persuasion, particularly in the British sample. Although insightful, existing research rarely shows that intuitive, cognitive, and affective factors jointly predict reciprocity. Theoretical models in the field often integrate cognitive elements from attribution theory and the affective process of consumer gratitude, proposing that gratitude mediates the relationship between cognitive attributions and behavioral outcomes in reciprocity [73].

Similarly, cognitive and affective factors were also associated with susceptibility to scarcity-based persuasion, though the pattern of influence differs. FI and NFC modestly improved the model's ability to predict susceptibility to scarcity-based cues in the British sample, though neither predictor was independently significant. The addition of NFA provided a slight further enhancement, yet no predictor reached statistical significance, indicating a complex but not strong influence of these factors on scarcity responses. This finding contrasts with research suggesting that cognitive factors are generally better predictors of scarcity mindsets, while affective factors have a less consistent influence [74]. Conversely, in the Arab sample, none of these predictors significantly contributed to the model, highlighting potential cultural differences in how scarcity cues are perceived and processed.

These findings provide valuable insights into how individual differences in NFC, FI, and NFA relate to susceptibility within SE attacks. While these cognitive styles may influence general susceptibility to persuasion, their effects are understandably modest in targeted scenarios involving sophisticated tactics. This aligns with the blended nature of compliance principles such as reciprocity, commitment, and authority, which do not rely solely on affective, cognitive, or intuitive pathways. Prior research shows that NFC and NFA show the strongest associations when stimuli are explicitly designed to appeal to cognitive or affective processes [75–77]. The weaker but patterned effects observed for likeability suggest that SE tactics engage multiple processing routes simultaneously [78]. Notably, our approach, examining the delta between the presence and absence of Cialdini's principles, a method not previously explored in cybersecurity, allows for more precise isolation of each principle's influence compared to studies that only assess presence, such as research on UK rental scammers exploiting social influence principles to fraudulently obtain deposits [59, 79].

Our methodological choices also speak to broader gaps identified in the empirical SE literature. Burda et al. [80], in a systematic review of 169 empirical SE studies, found that existing experiments only partially reproduce real-world attacks and that factors such as targets' cognitive processes and contextual conditions are often absent from or underspecified in experimental designs. They further note that the range of attack scenarios and outcome measures in the literature is narrower than the actual SE attack surface warrants, and they point to the need for studies that adopt more ecologically grounded and cognitively situated approaches. Our research responds to this gap by using app installation intention as the primary outcome variable, contextualized to a social media scenario, and examining its association with the cognitive processes through which individuals evaluate and respond to persuasive cues. Importantly, participation was conditioned on awareness of potential security risk for installing the app, ensuring that the observed effects reflect deliberate risk-acceptance decisions rather than naive compliance. Situating NFC, NFA, and FI as predictors within this framework aligns with the call by Montañez et al. [15] to advance a dedicated sub-field at the intersection of cybersecurity and psychology that moves beyond broad personality dimensions toward the cognitive functions and processing tendencies that mediate susceptibility.

While our findings highlight several significant predictors, other factors, such as trust propensity, cybercrime awareness, and perceived source credibility, may also play influential roles. Previous studies [81–83] have highlighted the importance of cybersecurity awareness in mitigating susceptibility to phishing attacks and other cyber threats. This study treated cultural background as one theoretically motivated contextual dimension in the acceptance of risk. Statman [39] highlighted that cultural contexts influence how people perceive and respond to risks, noting that collectivism as a cultural dimension is associated with individual risk tolerance. This study relied on British and Arab datasets as the cultural dimension to consider, since they exhibited significant differences in individualism-collectivism, as indicated by Hofstede and other scholars [41, 42]. Additionally, cultural differences could also affect how individuals from various regions respond to persuasion tactics. Overall, our

study underscores the need for further research to explore additional factors that may influence susceptibility to SE attacks. Future research could also employ generative AI to produce social engineering scenarios that are both more personalized and culturally adapted [84]. While individual cognitive styles are important, their role in such contexts may be more complex and less direct than previously assumed.

4.1 Implications

The findings of this study have substantial implications for refining cybercrime strategies and advancing persuasion research. Tailoring cybersecurity training programs to accommodate individual differences in cognitive styles, such as NFC, FI, and NFA, can enhance their effectiveness. For example, individuals with high NFC engage in deeper cognitive processing [36], which can be leveraged by incorporating detailed analytical content into training programs to mitigate heuristic-based manipulations. Conversely, those with high FI may benefit from interventions that address intuitive decision-making and promote critical evaluation of social cues. While fear appeals, such as highlighting potential security risks, can be effective in motivating behavior change, it is important to avoid overwhelming users, as excessive fear may lead to defensive avoidance or disengagement [85]. Training programs could integrate real-world scenarios emphasizing the importance of skepticism towards persuasive tactics, thus reducing vulnerability to SE attacks.

Our study showed that persuasion principles had varying levels of impact across Arab and British samples, highlighting the need for culturally specific messaging that aligns with local attitudes and values [69]. Moreover, the results suggest incorporating cognitive and affective factors into persuasion models to better understand influence tactics. Recognizing that emotional and cognitive processing significantly impact decision-making can inform the development of more targeted persuasion strategies. Finally, our findings underscore the importance of considering additional factors, such as trust propensity and situational context, in developing risk management strategies. Previous research has highlighted the role of trust in cybersecurity contexts, where higher trust propensity can both increase and decrease vulnerability depending on the context [86]. Future research should explore these factors further to create comprehensive strategies that address various aspects of susceptibility to SE attacks.

4.2 Limitations of the study

The study's limitations include potential issues with sample representativeness, as the Arab GCC and British populations sampled may not fully reflect broader cultural contexts, and the reliance on self-reported data, which could introduce biases such as social desirability or inaccurate self-assessment. To counteract the biases associated with self-reported data, the study incorporated anonymous data collection and provided participants with the option to withdraw at any time, reducing potential social desirability effects. Additionally, we provided graphical representations of the scenarios to enhance the validity of participants' responses. Additionally, the cross-sectional design captures only a snapshot in time, limiting the ability to assess causal relationships or temporal changes. Cultural specificity is also a concern, as regional or subcultural differences within each country are not accounted for. Furthermore, potential confounding variables, such as participants' prior experiences with SE, were not controlled for, and statistical power issues may arise depending on sample size and observed effect sizes. Additionally, we ensured each scenario represents only one principle and refined when it was mapped to more than one. Furthermore, the use of vignette-based scenarios and a within-subjects design may limit the ecological validity of participants' responses. As participants were asked to imagine their decisions in hypothetical situations, their reported choices might not fully reflect actual behavior. To mitigate this, pre-selection criteria ensured that participants were familiar with social media group interactions and perceived some degree of risk when downloading and testing a new mobile app. Participants who selected "Not risky at all" regarding installing and testing the app were excluded from the study. In addition, presenting a caution about the potential risks associated with installing the app before the scenarios, together with randomizing the order of scenario presentation, helped minimize potential biases. Nevertheless, future studies should incorporate more ecologically valid or real-world experimental approaches to further enhance the generalizability of findings.

5 Conclusion and future work

Our study contributes new insights into the role of individual cognitive styles—NFC, FI, and NFA as they relate to susceptibility to Cialdini's principles of persuasion within the context of social engineering (SE) attacks. In this study, we intentionally focused on cognitive styles and used a delta variable to measure the net impact under different persuasion conditions. To maintain this focus, we excluded contextual factors such as age, gender, education, and employment, allowing for a more precise analysis of susceptibility related specifically to cognitive influences. Using validated scenarios, we examined how these cognitive styles interact with persuasion tactics such as scarcity, reciprocity, likability, social proof, commitment and consistency, and authority. For instance, in the Likeability principle, when NFA was introduced in the British sample, the model significantly improved, suggesting that NFA may be a strong predictor

of susceptibility to this principle. Similarly, for the Reciprocity principle, the model showed notable improvements with NFC emerging as a significant predictor for the Arab sample and FI for the British sample. These findings suggest that FI, NFA, and NFC collectively enhance the model's ability to explain susceptibility to certain persuasion principles.

Future research should expand on our findings by exploring a broader range of psychological and situational factors, such as cybercrime awareness, perceived trustworthiness, cognitive load, stress, and trust propensity, to provide a more comprehensive understanding of susceptibility to SE. Specifically, investigating how cognitive styles interact with contextual variables and trust dynamics in susceptibility to persuasion tactics within SE contexts would offer deeper insights. Additionally, examining whether individuals susceptible to specific persuasion tactics also trust the entity proposing app installations could enhance our understanding of decision-making processes. Studies should also consider diverse cultural backgrounds and broader demographic factors alongside cognitive styles. Finally, interdisciplinary collaborations across psychology, cybersecurity, and behavioral economics could further enrich the development of robust defenses against evolving SE threats.

Acknowledgements The authors would like to sincerely thank Tourjana Islam Supti for her valuable assistance with part of the literature review and for the discussions that enriched the interpretation of the findings.

Author contribution R.A., M.B., and K.K. designed and supervised the study and conceptualized the research. I.A. and R.A. prepared the study materials, collected, cleaned, and analyzed the data. A.Y. guided the statistical analysis, verified it, and contributed to the methodology and conceptualization. J.M. and A.E. reviewed the study design and helped the data collection and preparation. I.A. drafted the initial manuscript, and all authors critically reviewed and contributed feedback to the text.

Funding Open Access funding provided by the Qatar National Library. This research was made possible by an NPRP-14-Cluster Grant # NPRP 14C-0916-210015 from the Qatar National Research Fund (a member of Qatar Foundation). The findings herein reflect the work and are solely the responsibility of the authors. Open Access Fund has been provided by Qatar National Library.

Data availability The dataset associated with this work are uploaded alongside the supplementary material for this article at: https://osf.io/ymkpx? The supplementary materials uploaded to OSF include: 1. Dataset—Contains British and Arab (GCC) datasets used in this study. The dataset collected from the full survey is also attached. 2. Full Survey Design—Provides the complete survey design used in the study. 3. Scales used (English & Arabic)—Includes the measurement scales for Need for Cognition (NFC), Need for Affect (NFA), and Faith in Intuition (FI) in both English and Arabic. 4. Supplementary material.pdf—Offers detailed methodological descriptions and additional analyses to complement the findings in the manuscript. 5. Eligibility Assessment Survey—Questions used to include or exclude participants.

Declarations

Conflict of interest The authors declare no competing interests.

References

1. Koyun, A., Al Janabi, E.: Social engineering attacks. J. Multidiscip. Eng. Sci. Technol. (JMEST) **4**(6), 7533–7538 (2017)
2. Abuelezz, I., Barhamgi, M., Alshakhsi, S., Yankouskaya, A., Nhlabatsi, A., Khan, K.M., Ali, R.: How do gender and age similarities with a potential social engineer influence one's trust and willingness to take security risks? Int. J. Inf. Secur. **24**, 44 (2025)
3. Langlois, P.: 2020 data breach investigations report. Verizon (2020)
4. Netwrix: 2020 Cyber Threats Report. Netwrix (2020)
5. Internet Crime Complaint Center (IC3): 2021 Internet Crime Report. Federal Bureau of Investigation (FBI) (2022)
6. Hadnagy, C.: Social engineering: The art of human hacking. John Wiley & Sons (2010)
7. Mitnick, K.D.: The art of deception: Controlling the human element of security. Wiley (2003)
8. Gragg, D.: A multi-level defense against social engineering. SANS Reading Room **13**, 1–21 (2003)
9. Cialdini, R.: Principles of persuasion. Arizona State University, eBrand Media Publication, (2001)
10. Uebelacker, S., Quiel, S.: The social engineering personality framework. In: 2014 Workshop on Socio-Technical Aspects in Security and Trust. IEEE, (2014)
11. Ingemarsson, J., Birath, M., Kävrestad, J.: Factors influencing Swedish citizens' willingness to provide their mobile phones to forensic examination. Int. J. Inf. Secur. **24**(1), 1–15 (2025)
12. Oyibo, K., Orji, R., Vassileva, J.: Investigation of the influence of personality traits on Cialdini's persuasive strategies. PPT@ PERSUASIVE 8–20. (2017)
13. Darwish, A., El Zarka, A., Aloul, F.: Towards understanding phishing victims' profile. In: 2012 International Conference on Computer Systems and Industrial Informatics. IEEE (2012)
14. Guadagno, R.E., Cialdini, R.B.: Online persuasion and compliance: Social influence on the Internet and beyond. The Social Net: The social psychology of the Internet, 91–113 (2005)
15. Montañez, R., Golob, E., Xu, S.: Human cognition through the lens of social engineering cyberattacks. Front. Psychol. **11**, 1755 (2020)
16. Reitter, D., Grossklags, J.: The positive impact of task familiarity, risk propensity, and need for cognition on observed timing decisions in a security game. Games **10**(4), 49 (2019)
17. ICARAS Security Consultants: Overcoming cognitive biases in security decision-making. https://www.icaras.nz/blog/overcoming-cognitive-biases-in-security-decision-making. Accessed 15 June 2026
18. Chen, L., et al.: The impact of challenge information security stress on information security policy compliance: The mediating roles of emotions. Psychol. Res. Behav. Manag. 1177–1191 (2022)
19. D'Arcy, J., Teh, P.-L.: Predicting employee information security policy compliance on a daily basis: the interplay of security-related stress, emotions, and neutralization. Inf. Manag. **56**(7), 103151 (2019)

20. Cacioppo, J.T., Petty, R.E.: The need for cognition. J. Pers. Soc. Psychol. **42**(1), 116 (1982)
21. Zerna, J., Strobel, A., Strobel, A.: The role of need for cognition in well-being–review and meta-analyses of associations and potentially underlying mechanisms. (2021)
22. Epstein, S., et al.: Individual differences in intuitive–experiential and analytical–rational thinking styles. J. Pers. Soc. Psychol. **71**(2), 390 (1996)
23. Jiang, S., Ding, S., Ding, D.: The effect of faith in intuition on moral judgment: the mediating role of perceived harm. Front. Psychol. **13**, 1084907 (2022)
24. Liebowitz, J., et al.: If numbers could "feel": How well do executives trust their intuition? VINE J. Inf. Knowl. Manag. Syst. **49**(4), 531–545 (2019)
25. Maio, G.R., Esses, V.M.: The need for affect: Individual differences in the motivation to approach or avoid emotions. J. Pers. **69**(4), 583–614 (2001)
26. Zeelenberg, M., et al.: On emotion specificity in decision making: Why feeling is for doing. Judgm. Decis. Mak. **3**(1), 18–27 (2008)
27. Alshammari, A., Benson, V., Batista, L.: The influences of employees' emotions on their cyber security protection motivation behaviour: a theoretical framework. In: 26th International conference on enterprise information systems (2024)
28. Petty, R.E., Cacioppo, J.T.: The elaboration likelihood model of persuasion. Springer (1986)
29. Greenberg, J., Schmader, T., Arndt, J., Landau, M.: Persuasion, attitudes, and behavior. In: Social Psychology: The Science of Everyday Life, 1st edn. Worth Publishers, New York (2015)
30. Petty, R.E., Cacioppo, J.T., Kasmer, J.A.: The role of affect in the elaboration likelihood model of persuasion. In: Communication, social cognition, and affect (PLE: Emotion), pp. 117–146. Psychology Press (2015)
31. Washington State University: Module 6: Persuasion. In: Principles of Social Psychology. Washington State University (2021). https://opentext.wsu.edu/social-psychology/chapter/module-6-persuasion/. Accessed 15 June 2026
32. Short, C.E., et al.: Exploring the interplay between message format, need for cognition and personal relevance on processing messages about physical activity: a two-arm randomized experimental trial. Int. J. Behav. Med. **30**(3), 320–333 (2023)
33. Algarni, A.: What message characteristics make social engineering successful on Facebook: the role of central route, peripheral route, and perceived risk. Information **10**(6), 211 (2019)
34. Bullée, J.-W.H., et al.: The persuasion and security awareness experiment: reducing the success of social engineering attacks. J. Exp. Criminol. **11**, 97–115 (2015)
35. Clore, G.L., Gasper, K., Garvin, E.: Affect as information. In: Handbook of affect and social cognition, pp. 122–145. Psychology Press (2012)
36. Albarracín, D., Kumkale, G.T.: Affect as information in persuasion: a model of affect identification and discounting. J. Pers. Soc. Psychol. **84**(3), 453 (2003)
37. Nan, X.: Emotional responses to televised PSAs and their influence on persuasion: an investigation of the moderating role of faith in intuition. Commun. Stud. **60**(5), 426–442 (2009)
38. Triandis, H.C.: Individualism-collectivism and personality. J. Pers. **69**(6), 907–924 (2001)
39. Statman, M.: Culture in risk, regret, maximization, social trust, and life satisfaction. J. Invest. Consult. **16**(1), 20–30 (2015)
40. Greenfield, P.M.: Three approaches to the psychology of culture: Where do they come from? Where can they go? Asian J. Soc. Psychol. **3**(3), 223–240 (2000)
41. Hofstede, G.: Culture's consequences: International differences in work-related values. Vol. 5. (1984)
42. Harb, C.: The Arab region: Cultures, values, and identities. In: Handbook of Arab American psychology, pp. 3–18. Routledge (2015)
43. Henrich, J., Heine, S.J., Norenzayan, A.: Most people are not WEIRD. Nature **466**(7302), 29–29 (2010)
44. Waclawski, E.: How I use it: Survey monkey. Occup. Med. **62**(6), 477–477 (2012)
45. Phung, T.: About TGM Research | Team and Company Information. TGM Research. https://tgmresearch.com/. Accessed 15 June 2026
46. Hofstede Insights: Country comparison tool. https://www.theculturefactor.com/country-comparison-tool. Accessed 15 June 2026
47. House, R.J., et al.: Culture, leadership, and organizations: the GLOBE study of 62 societies. Sage publications, (2004)
48. Brislin, R.W., Freimanis, C.: Back-translation. An encyclopaedia of translation: Chinese-English, English-Chinese, (2001)
49. Appel, M., Gnambs, T., Maio, G.R.: A short measure of the need for affect. J. Pers. Assess. **94**(4), 418–426 (2012)
50. Rosenthal, R., Rosnow, R.L.: Essentials of behavioral research: methods and data analysis. (2008)
51. JASP Team: JASP (Version 0.18.2) [Computer Software] (2024). https://jasp-stats.org/
52. Frost, J.: Regression Analysis: An Intuitive Guide for Using and Interpreting Linear Models. Statisics By Jim Publishing (2019)
53. Cohen, J., et al.: Applied multiple regression/correlation analysis for the behavioral sciences. Routledge. (2013).
54. Richardson, D.B., et al.: Hierarchical regression for analyses of multiple outcomes. Am. J. Epidemiol. **182**(5), 459–467 (2015)
55. Stein, J.-P., et al.: Attitudes towards AI: measurement and associations with personality. Sci. Rep. **14**(1), 2909 (2024)
56. Kwak, S.G., Kim, J.H.: Central limit theorem: the cornerstone of modern statistics. Korean J. Anesthesiol. **70**(2), 144 (2017)
57. Kutner, M.H., et al.: Applied linear statistical models. 2005: McGraw-hill.
58. Abuelezz, I., Barhamgi, M., Nhlabatsi, A., Khan, K.M., Ali, R.: How demographic and appearance cues of a potential social engineer influence trust perception and risk-taking among targets? Inf. Comput. Secur. **33**(3), 320–343 (2025)
59. Mollazehi, A., et al.: Do Cialdini's persuasion principles still influence trust and risk-taking when social engineering is knowingly possible? In: International conference on research challenges in information science. Springer (2024)
60. Lee, C.B., Hanham, J., Leppink, J.: Expertise and problem solving in high-stakes environments. In: Instructional Design Principles for High-Stakes Problem-Solving Environments, pp. 25–39. (2019)
61. Nadeau, R., Cloutier, E., Guay, J.H.: New evidence about the existence of a bandwagon effect in the opinion formation process. Int. Polit. Sci. Rev. **14**(2), 203–213 (1993)
62. Mutz, D.C.: Impersonal influence: how perceptions of mass collectives affect political attitudes. In: Impersonal Influence: How Perceptions of Mass Collectives Affect Political Attitudes. Cambridge University Press (1998)
63. Fabrigar, L.R., Petty, R.E.: The role of the affective and cognitive bases of attitudes in susceptibility to affectively and cognitively based persuasion. Pers. Soc. Psychol. Bull. **25**(3), 363–381 (1999)
64. Vrtana, D., Krizanova, A.: The power of emotional advertising appeals: examining their influence on consumer purchasing behavior and brand–customer relationship. Sustainability **15**(18), 13337 (2023)
65. Fripp, G.: Emotional appeals in advertising. The Marketing Study Guide (2023). https://www.marketingstudyguide.com/emotional-appeals-advertising/. Accessed 15 June 2026
66. Dovetail Editorial Team: Understanding authority bias and how it affects decision-making. Dovetail (2024). https://dovetail.com/research/what-is-authority-bias/. Accessed 15 June 2026

67. Saha, S.: Authority bias: the psychology of trusting authority – a definitive guide. SimpliMBA (2023). https://www.simplimba.com/authority-bias-the-psychology-of/. Accessed 2 Sept 2024
68. Marques, J.: Leadership today: Practices for personal and professional performance. Springer (2017)
69. Hofstede's Six Cultural Dimensions—and Why They Matter. Verywell Mind.
70. Guadagno, R.E.: Compliance: a classic and contemporary review. Oxford Handbook Soc. Influence **1**, 107–128 (2017)
71. Freedman, J.L., Fraser, S.C.: Compliance without pressure: the foot-in-the-door technique. J. Pers. Soc. Psychol. **4**(2), 195 (1966)
72. Cialdini, R.B.: The science of persuasion. Sci. Am. **284**(2), 76–81 (2001)
73. Kim, Y., Smith, R.D., Kwak, D.H.: Feelings of gratitude: a mechanism for consumer reciprocity. Eur. Sport Manag. Q. **18**(3), 307–329 (2018)
74. Tripathi, R.C., et al.: Scarcity mindsets and generational differences in India: the role of cognitive and affective factors. Psychol. Dev. Soc. **34**(1), 45–78 (2022)
75. Aquino, A., et al.: Affective-cognitive matching in persuasion: similarities and differences among three intrapsychic perspectives. In: The Handbook of Personalized Persuasion, pp. 47–70. Routledge (2024)
76. Di Plinio, S., et al.: Brain and behavior in persuasion: the role of affective-cognitive matching. Psychophysiology **62**(6), e70088 (2025)
77. Haddock, G., et al.: Should persuasion be affective or cognitive? The moderating effects of need for affect and need for cognition. Pers. Soc. Psychol. Bull. **34**(6), 769–778 (2008)
78. Workman, M.: Wisecrackers: a theory-grounded investigation of phishing and pretext social engineering threats to information security. J. Am. Soc. Inform. Sci. Technol. **59**(4), 662–674 (2008)
79. Van Der Zee, S., Clayton, R., Anderson, R.: The gift of the gab: are rental scammers skilled at the art of persuasion? arXiv preprint arXiv:1911.08253, 2019.
80. Burda, P., Allodi, L., Zannone, N.: Cognition in social engineering empirical research: a systematic literature review. ACM Trans. Comput. Human Interact. **31**(2), 1–55 (2024)
81. Kuraku, D.S., et al.: Exploring how user behavior shapes cybersecurity awareness in the face of phishing attacks. Int. J. Comput. Trends Technol. 2023.
82. Ansari, M.F., Sharma, P.K., Dash, B.: Prevention of phishing attacks using AI-based cybersecurity awareness training. Prevention **3**(6), 61–72 (2022)
83. Szczepaniuk, E.K., Szczepaniuk, H.: Analysis of cybersecurity competencies: recommendations for telecommunications policy. Telecommun. Policy **46**(3), 102282 (2022)
84. Schmitt, M., Flechais, I.: Digital deception: generative artificial intelligence in social engineering and phishing. Artif. Intell. Rev. **57**(12), 324 (2024)
85. Witte, K.: Predicting risk behaviors: development and validation of a diagnostic scale. J. Health Commun. **1**(4), 317–342 (1996)
86. Searle, R., Renaud, K.: Trust and vulnerability in the cybersecurity context. In: Hawaii International Conference on System Science 2023.