



# Exploring Susceptibility Measures to Persuasion

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**Abstract.** There is increasing evidence that indicates how personalising persuasive strategies may increase the effectiveness of persuasive technologies and behaviour change interventions. This has led to a wide range of studies exploring self reported, perceived susceptibility to persuasion, which highlight the role of individual differences. Conducting such studies, while accounting for individual differences can be challenging, particularly where persuasive strategies may be considered similar due to their underlying components. In this paper, we present a study exploring perceived susceptibility to Cialdini's principles of persuasion, with a focus on how we can distinguish perceived susceptibility measures between the most recently identified Unity principle and Social proof. This study was conducted using an online survey incorporating perceived susceptibility measures to all seven Cialdini principles and a measure of the actual effectiveness of seven corresponding persuasive strategies. Our results indicate that while we are able to distinguish perceived susceptibility measures between Unity and Social proof, together with Commitment, Scarcity and Reciprocity, we were unable to obtain these measures for Liking and Authority.

**Keywords:** Susceptibility · Persuasion · Influence · Personalisation

## 1 Introduction

Persuasive technologies and behaviour change interventions are often designed to apply personalised persuasive strategies to increase their effectiveness for encouraging individuals to change their behaviour [2, 4, 13, 16, 18, 19, 21, 27]. This is partly motivated by the results from recent studies that report how the effectiveness of persuasive strategies can vary based on individual differences such as age, gender, culture, personality and other cognitive measures [6, 12, 25, 29, 30, 37, 41]. As such, personalising persuasive strategies is desirable as applying those which are unsuitable or inappropriate may limit an intervention's effectiveness and or result in demotivating individuals to perform a desired target behaviour [1, 17, 22, 24, 36].

Measuring individuals’ perceived susceptibility to different persuasive strategies can help provide an insight into what strategies are most suitable and likely to be effective. However, this may be challenging particularly for scenarios where there may be underlying similarities between the persuasive strategies being considered for deployment.

Amongst the variety of persuasion and influence techniques available, persuasive technologies and behaviour change interventions are often designed to apply persuasive strategies based on Cialdini’s [5] principles of persuasion. Recently, the original set of six principles was extended to incorporate a newly identified seventh principle, *Unity*. The principle of *Unity* suggests that an individual’s behaviour may be influenced by reference to shared identities, the individual may consider themselves to be a member of, together with others. As such, persuasive strategies developed from the principle of *Unity*, can leverage the concepts of acting together and being together to influence behaviour [5]. This is comparable to the Granfalloon influence technique, which emphasises the individual’s categorical and group membership association, to influence attitudes, beliefs and behaviour [33,39].

Prior to the definition of *Unity*, the principle of *Social proof* suggests that an individual’s behaviour may be influenced by the observation of others’, whose actions and behaviour may be considered as correct, suitable and appropriate by the individual. While *Social proof* is distinguishable from *Unity*, both share a common underlying social component, namely the reference to the behaviour of others. The distinction between both lies in how *Unity* draws upon reference to the shared identities of the individual, which is absent from *Social proof* and may be considered to rely upon a broader and less specific social context. However, given the underlying similarities between both principles, assessing susceptibility for either simultaneously may be challenging, due to the potential overlap between strategies developed from these principles.

In this paper, we report our findings from an exploratory study of perceived susceptibility measures to Cialdini’s [5] principles of persuasion. This study aims to validate the susceptibility to persuasion scale (STPS) [17], discover how to distinguish measures of perceived susceptibility to *Unity* and *Social proof* and whether this can be achieved together with the remaining five Cialdini principles.

In Sect. 2 we briefly review previous work concerning susceptibility measures for Cialdini principles and we outline the methodology of our study in Sect. 3. The results of the study are reported in Sect. 4 and finally we review these findings and outline our future work in Sect. 5.

## 2 Related Work

Table 1 lists all seven Cialdini [5] principles of persuasion, together with a summary on how these may be used to influence behaviour. The STPS [17] provides a means of measuring perceived susceptibility to the original six Cialdini [5] principles of persuasion, (excluding *Unity*). By measuring perceived susceptibility to different persuasive strategies, it is possible to personalise strategies by identifying which are most likely to be effective in addition to those which may be

**Table 1.** Cialdini’s principles of persuasion with examples of behavioural influence [5].

| Principle of persuasion    | Summary  |
|----------------------------|--|
| Reciprocity                | We are likely to respond in kind as the receiving party in an exchange out of a sense of obligation to do so                       |
| Commitment and consistency | We aim to be consistent in our actions and decision to avoid complexity arising from inconsistencies in our behaviour              |
| Social proof               | Our actions beliefs and behaviours may be strongly influenced by what we observe in others as correct and/or appropriate           |
| Liking                     | We may be significantly influenced by what is attractive and appealing to us   |
| Authority                  | We will often accept the beliefs and attitudes of those we consider to be within a position of expertise                           |
| Scarcity                   | We are strongly influenced to avoid loss   |
| Unity                      | Reference to shared identities we define ourselves as being a member of, together with others can strongly influence our behaviour |

counterproductive and unsuitable for a given audience [17]. The effectiveness of the STPS has been demonstrated in a longitudinal study of actual effectiveness; where personalised persuasive strategies (developed using the STPS) were more effective for reducing eating between meals, compared to non-personalised persuasive strategies [17]. The STPS has been applied in studies investigating differences and similarities in perceived susceptibility to persuasion between nationalities [28], differences based on cultures [23], language [3] in addition to measuring susceptibility to persuasive strategies designed to increase physical activity for individuals with chronic obstructive pulmonary disease [40] and in predicting susceptibility to phishing emails [32]. In this paper, we build upon this existing work through an exploratory study designed to discover how we can distinguish perceived susceptibility measures between the most recently identified *Unity* principle and *Social proof* in addition to how these can be obtained together with perceived susceptibility measures for all other Cialdini [5] principles of persuasion.

### 3 Methodology

We measured perceived susceptibility to all seven Cialdini [5] principles using a survey that consisted of three sections and recruited participants from Amazon mechanical turk (MT). Prior to starting the survey, informed consent was

acquired and a full summary of the research objectives was provided to participants. The first section captured participants' details including gender, age and location. The second section consisted of 46 question statements (Table 2), each with a seven item Likert scale ranging from strongly disagree to strongly agree. All 32 questions used to develop the original STPS scale as described in [17] were included, in addition to 10 questions designed to measure perceived susceptibility to the *Unity* principle. These were designed to assess whether participants' considered themselves to be influenced by membership of various potential social groups, through reference to shared identities of these groups within each *Unity* question. We also sought to provide scenarios that included potential overlap of behavioural determinants related to *Unity* and *Social proof* persuasive strategies. This was intended to assist us with discovering whether it was possible to distinguish perceived susceptibility measures between both principles as part of our research objectives. Four attention check questions were included, whereby participants were required to respond as instructed e.g. *Please select strongly disagree for this statement*. All 46 questions were displayed randomly, in 11 sets of four and one set of two. After responding to all questions, participants were provided with the opportunity to provide feedback on the study.

In the final section of the survey, participants were presented with a randomly selected persuasive message (based on one of the seven Cialdini [5] principles) which encouraged them to complete an optional ten item short personality inventory (TIPI) [10]. We included this section to provide a measure of actual effectiveness for all seven persuasive strategies. This also provided a means to investigate whether perceived susceptibility measures corresponded with participants' actual behaviour. This analysis was constrained to only those principles for which stable perceived susceptibility measures were acquired.

## 4 Results

To be eligible to participate in our study, participants were required to have a 95% acceptance rate (indication of previous work completed on MT considered to be of good quality) and be based in either the UK, USA or Canada. 320 participants completed the survey, 302 of which provided valid responses to the attention check questions. The final sample used in our analysis (rounded to the nearest whole number) consisted of 40% female, 59% male, 1% preferred not to indicate their gender, 1% aged 18–19, 24% aged 20–29, 42% aged 30–39, 16% aged 40–49, 12% aged 50–59 and 5% aged 60 or more. 98% of participants were based in the USA and 2% were based in Canada. 13% of participants received the Authority persuasive message, 12% Commitment, 15% Liking, 19% Reciprocity, 10% Scarcity, 17% Social proof and 13% Unity. 53% of participants completed the TIPI test, 47% did not.

### 4.1 Analysis of Perceived Susceptibility Measures

To discover whether our survey provided a means of distinguishing perceived susceptibility to *Unity* and *Social proof*, together with other Cialdini [5] principles,

**Table 2.** Survey questions including, STPS, Unity extension and attention checks.

| Principle        | Principle ID   | Question statement   |
|------------------|----------------|--|
| Unity            | Unity1         | Community is vital, we are all here for each other   |
|                  | Unity2         | When we are faced with a challenge my colleagues and I work together to find a solution                      |
|                  | Unity3         | I am proud to be a member of the community and they are proud of me  |
|                  | Unity4         | My social network is close we try to help each other as much as we can                                       |
|                  | Unity5         | When faced with a decision I choose to do what is best for the team because this is also the best for me     |
|                  | Unity6         | I celebrate the achievements of others within my social network  |
|                  | Unity7         | I am more inclined towards suggestions from my community compared to those from others                       |
|                  | Unity8         | Together my colleagues and I consider the outcomes of our actions for each other. before we agree what to do |
|                  | Unity9         | I value recommendations from my social network   |
|                  | Unity10        | It is more important for me to be liked by my colleagues than my boss.                                       |
| Reciprocity      | Reciprocity11  | When a family member does me a favour I am very inclined to return this favour                               |
|                  | Reciprocity12  | I always pay back a favour   |
|                  | Reciprocity13  | If someone does something for me I try to do something of similar value to repay the favour                  |
|                  | Reciprocity14  | When I receive a gift I feel obliged to return a gift  |
|                  | Reciprocity15  | When someone helps me with my work I try to pay them back  |
| Scarcity         | Scarcity16     | I believe rare products (scarce) are more valuable than mass products  |
|                  | Scarcity17     | When my favourite shop is about to close I would visit it since it is my last chance                         |
|                  | Scarcity18     | I would feel good if I was the last person to be able to buy something                                       |
|                  | Scarcity19     | When my favourite shampoo is almost out of stock I buy two bottles   |
|                  | Scarcity20     | Products that are hard to get represent a special value  |
| Authority        | Authority21    | I always follow advice from my general practitioner  |
|                  | Authority22    | When a professor tells me something I tend to believe it is true   |
|                  | Authority23    | I am very inclined to listen to authority figures  |
|                  | Authority24    | I always obey directions from my superiors   |
|                  | Authority25    | I am more inclined to listen to an authority figure than a peer  |
|                  | Authority26    | I am more likely to do something if told than when asked   |
| Commitment       | Commitment27   | Whenever I commit to an appointment I always follow through  |
|                  | Commitment28   | I try to do everything I have promised to do   |
|                  | Commitment29   | When I make plans I commit to them by writing them down  |
|                  | Commitment30   | Telling friends about my future plans helps me to carry them out   |
|                  | Commitment31   | Once I have committed to do something I will surely do it  |
|                  | Commitment32   | If I miss an appointment I always make it up   |
| Social proof     | Social proof33 | If someone from my social network notifies me about a good book I tend to read it                            |
|                  | Social proof34 | When I am in a new situation I look at others to see what I should do  |
|                  | Social proof35 | I will do something as long as I know there are others doing it too  |
|                  | Social proof36 | I often rely on other people to know what I should do  |
|                  | Social proof37 | It is important to me to fit in  |
| Liking           | Liking38       | I accept advice from my social network   |
|                  | Liking39       | When I like someone I am more inclined to believe him or her   |
|                  | Liking40       | I will do a favour for people that I like  |
|                  | Liking41       | The opinions of friends are more important than the opinions of others                                       |
|                  | Liking42       | If I am unsure I will usually side with someone I like   |
| Attention checks | Attention1     | Please select Strongly agree for this statement  |
|                  | Attention2     | Please select Strongly disagree for this statement   |
|                  | Attention3     | Please select Strongly agree for this statement  |
|                  | Attention4     | Please select Strongly disagree for this statement   |

**Table 3.** Persuasive messages designed to encourage participants to complete the TIPI test.

| Principle    | Persuasive message  |
|--------------|---|
| Unity        | Please join your fellow participants by completing the following short personality test   |
| Social proof | We would like to invite you to complete a short personality test. The majority of participants, have also completed this part of the study                                |
| Reciprocity  | We will shortly process and approve your responses to this HIT. Meanwhile, please consider completing the following short personality test                                |
| Commitment   | As part of your agreement to participate in this study, we would like to invite you to complete a short personality test  |
| Liking       | We hope you have enjoyed participating with our study and would like to invite you to complete a short personality test   |
| Authority    | We recommend completing the following short personality test to further support the research objectives of our study  |
| Scarcity     | We would like to invite you complete a short personality test. This is the last opportunity for you to contribute towards our research on social influence and persuasion |

we conducted an exploratory factor analysis using principal component analysis (PCA). We used this approach to discover whether latent variables within the study data could be identified as Cialdini [5] principles and to discover whether participants' perceived susceptibility corresponded with measures of actual effectiveness.

As participant responses were captured using an ordinal scale, we created a polychoric correlation matrix from participant responses (to susceptibility questions) as suggested by [31]. Reviewing the correlation matrix revealed that all 42 susceptibility question responses correlated with others with at least  $r = .3$ . The Kaiser-Meyer-Olkin test measure of sampling adequacy was 0.93 and Bartlett's test of sphericity was significant ( $\chi^2 = (861, N = 302) = 6560.346, p < .001$ ).

In order to determine the number of components to extract, we used parallel analysis (PA) [14] and Velcier's minimum average partial (MAP) test [38]. Results from these tests conflicted, with PA suggesting four components to retain and MAP suggesting five. Interpretation of the scree plot was inconclusive, given the potential for multiple inflexions. As suggested by [26], we investigated both four and five component solutions, which we deemed to be overly complex due to multiple high and low cross loadings of susceptibility questions across all components. We anticipated that this was likely due to the presence of redundant questions within both solutions resulting with increased complexity and consequently difficult to interpret. To resolve these issues, we used an iterative exploratory approach to identify which questions were most relevant to which

component and which could be considered as redundant. To achieve this we used the following process.

We first set the number of components to extract based on the number of principles our survey was designed to measure. This is considered suitable given positive results reported in prior studies using questions included in our study [11]. Secondly, components would only be considered for extraction based on the latent root or Kaiser's criterion [15]. This is considered suitable provided the sample size is greater than 250, the average communality of the questions is greater than or equal to .6 [7] and when the number of variables included in the analysis is between 20 and 50 [11]. Thirdly, only stable components would be retained; that is components with a minimum of three strong loadings of at least .5 as these may be considered to be practically significant for developing a solution [11, 20, 26, 34]. Finally, a component solution would only be considered suitable provided all components were interpretable and demonstrated an optimal structure whereby responses for questions load highly on a single component only and may be considered conceptually related to that component. Solutions produced in our iterative exploratory analysis were required to meet all of these conditions.

A preliminary analysis revealed seven components within the data which match the number of principles our survey was designed to measure and each component met the latent root criteria of eigenvalues greater than one. Together these factors accounted for 59% of the variance. To improve interpretation of these components, we repeated the analysis using Oblimin rotation with seven components specified for extraction. To further improve interpretation and structural clarity of the seven components, questions with low primary loadings and or high cross loadings were removed individually and the component solution respecified (using a polychoric correlation matrix excluding values from questions removed). Questions removed from the initial seven component solutions included *Unity 10* and *Social proof 23* and this respecified solution accounted for 60% of the variance.

Upon removing *Social proof 23*, the seventh component was reduced below the latent root criteria and therefore was respecified to six components, which accounted for 59% of the variance. All five *Liking* related questions were removed from the six component solution due to high cross loading, none of which loaded onto a single component that could be considered as stable for the *Liking* principle. This resulted with increasing the cumulative variance the six component solution accounted for to 60%. We continued our exploratory process of removing questions individually from the six component solution considered as redundant. These included *Authority 12*, *Commitment 20*, *Scarcity 7*, *Authority 11*, *Unity 7*, *Unity 2*, *Reciprocity 2*, *Authority 16* and *Commitment 19*.

Upon removing *Commitment 19* from the six component solution, the sixth component was reduced below the latent root criteria and as such was removed, together with all *Authority* related questions, as these did not contribute to a stable component for this principle due to multiple high and low cross loading. The initial five component solution accounted for 64% of the variance, which

**Table 4.** Five component solution loadings with Oblimin rotation and Ordinal  $\alpha$  for each component. Primary component loadings are shown in bold.

| Question Id           | Components labelled as Cialdini principles |             |              |             |             |
|-----------------------|--|-------------|--------------|-------------|-------------|
|                       | Unity                                      | Commitment  | Social proof | Reciprocity | Scarcity    |
| <i>Unity1</i>         | <b>0.73</b>                                | 0.06        | -0.01        | 0.15        | -0.08       |
| <i>Unity3</i>         | <b>0.73</b>                                | 0.00        | 0.07         | 0.01        | 0.09        |
| <i>Unity4</i>         | <b>0.83</b>                                | -0.05       | -0.01        | 0.02        | 0.07        |
| <i>Unity5</i>         | <b>0.60</b>                                | 0.08        | 0.12         | -0.03       | 0.06        |
| <i>Unity6</i>         | <b>0.88</b>                                | 0.01        | -0.12        | -0.05       | -0.07       |
| <i>Unity8</i>         | <b>0.56</b>                                | 0.25        | 0.10         | 0.01        | 0.04        |
| <i>Unity9</i>         | <b>0.65</b>                                | -0.07       | 0.23         | 0.09        | 0.06        |
| <i>Reciprocity1</i>   | -0.05                                      | 0.07        | -0.05        | <b>0.82</b> | 0.01        |
| <i>Reciprocity3</i>   | 0.07                                       | 0.09        | -0.05        | <b>0.78</b> | -0.01       |
| <i>Reciprocity4</i>   | -0.02                                      | -0.12       | 0.18         | <b>0.77</b> | 0.10        |
| <i>Reciprocity5</i>   | 0.14                                       | 0.08        | -0.04        | <b>0.75</b> | 0.01        |
| <i>Scarcity6</i>      | 0.01                                       | 0.05        | -0.13        | 0.08        | <b>0.87</b> |
| <i>Scarcity8</i>      | 0.02                                       | 0.09        | 0.29         | -0.15       | <b>0.58</b> |
| <i>Scarcity10</i>     | 0.02                                       | -0.07       | 0.05         | 0.02        | <b>0.85</b> |
| <i>Commitment17</i>   | 0.00                                       | <b>0.86</b> | 0.02         | 0.00        | 0.02        |
| <i>Commitment18</i>   | -0.02                                      | <b>0.74</b> | -0.07        | 0.12        | -0.05       |
| <i>Commitment21</i>   | 0.12                                       | <b>0.79</b> | -0.07        | -0.10       | 0.07        |
| <i>Commitment22</i>   | -0.04                                      | <b>0.74</b> | 0.16         | 0.14        | -0.01       |
| <i>Social proof24</i> | 0.00                                       | 0.10        | <b>0.73</b>  | 0.13        | 0.05        |
| <i>Social proof25</i> | 0.01                                       | -0.02       | <b>0.79</b>  | 0.02        | 0.00        |
| <i>Social proof26</i> | 0.03                                       | -0.12       | <b>0.81</b>  | -0.07       | -0.07       |
| <i>Social proof27</i> | 0.10                                       | 0.10        | <b>0.71</b>  | -0.02       | 0.09        |
| <b>Eigenvalues</b>    | 4.0  | 2.85        | 2.75         | 2.79        | 2.04        |
| <b>% of variance</b>  | 18   | 13          | 12           | 12          | 9           |
| $\alpha$              | .89  | .89         | .8           | .84         | .73         |

after removing *Scarcity 7*, increased to 65%. The five components were labelled as *Unity*, *Commitment*, *Social proof*, *Reciprocity* and *Scarcity*.

A reliability analysis was performed to assess the consistency of the questions retained for measuring perceived susceptibility to the five Cialdini principles identified from our analysis. Following suggestions from [8, 9, 42] we calculated the ordinal  $\alpha$  coefficient using a polychoric correlation matrix from the subset of retained questions for each component of the five component solution. The results indicate good reliability for *Unity*, *Commitment*, *Social proof* and *Reciprocity* and acceptable for *Scarcity*.

**4.2 Analysis of Actual Effectiveness and Perceived Susceptibility**

We used a  $\chi^2$  test to investigate the actual effectiveness of the seven strategies listed in Table 3 for encouraging participants to complete the TIPI test<sup>1</sup>. Results suggest that there is an overall significant difference in the distribution of actual effectiveness across all strategies:  $\chi^2 = (302, 6) = 16.811, p = .01, V = .236$ . However, there was no significant difference in the distribution of actual effectiveness for any of the strategies based on participants’ gender ( $\chi^2 = (302, 2) = 2.307, p = .31, V = .08$ ) or age ( $\chi^2 = (302, 5) = 3.14, p = .67, V = .1$ ). This suggests overall that the persuasive strategies differ in actual effectiveness, but these differences were not related to individual differences of age and gender between participants.

We further investigated the actual effectiveness of the strategies and participant responses to susceptibility to persuasion questions, to discover whether there was any significant difference in perceived susceptibility and the actual effectiveness of the strategies. To achieve this, we calculated composite perceived susceptibility scores using the median of participant responses for each set of perceived susceptibility questions, for only retained components of the PCA model (as listed in Table 4). We then compared the distribution of the susceptibility scores for each component of the PCA model, and the actual effectiveness of the corresponding strategy. This was measured in terms of whether participants were persuaded to complete the TIPI test or did not (for each of the five strategies listed in Table 4). To perform this analysis, we used a Mann-Whitney U test which is suitable for comparing the distribution between two independent groups (participants who were persuaded or not persuaded to complete the TIPI test) and a non-normally distributed dependent variable (composite perceived susceptibility scores for only the five stable retained components in Table 4) [35].

**Table 5.** Analysis of composite perceived susceptibility scores and participant behaviour.

| Principle    | Persuaded | Not persuaded | <i>U</i> | <i>z</i> | <i>p</i> | <i>r</i> |
|--------------|-----------|---------------|----------|----------|----------|----------|
| Unity        | 15        | 26            | 259      | 1.76     | .086     | .3       |
| Commitment   | 20        | 16            | 172      | 0.388    | .718     | .1       |
| Reciprocity  | 38        | 21            | 422      | 0.398    | .69      | .1       |
| Scarcity     | 13        | 19            | 127.5    | 0.160    | .88      | 0        |
| Social proof | 27        | 24            | 332.5    | 0.161    | .872     | 0        |

Results from this analysis indicate that there is no significant difference in the distribution of participants’ composite susceptibility scores for the

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<sup>1</sup> This analysis was performed prior to investigating whether perceived susceptibility measures for each component of the PCA model in Table 4 corresponded with participants’ actual behaviour.

*Unity*, *Commitment*, *Reciprocity* and *Scarcity* principles (see Table 5). However, an analysis of the distribution of susceptibility scores and whether participants were persuaded to complete the TIPI test or not (actual effectiveness irrespective of persuasive strategy received), indicates a significant difference in susceptibility scores amongst participants for *Unity* ( $U(\text{Persuaded} = 160, \text{Not Persuaded} = 142) = 13109.5, z = 2.352, \text{two-tailed}, p = .019, r = .1$ ), *Scarcity* ( $U(\text{Persuaded} = 160, \text{Not Persuaded} = 142) = 12994.5, z = -2.219, \text{two-tailed}, p = .027, r = .1$ ) and *Social proof* ( $U(\text{Persuaded} = 160, \text{Not Persuaded} = 142) = 12898.5, z = 2.04, \text{two-tailed}, p = .04, r = .1$ ) but not for *Reciprocity* ( $U(\text{Persuaded} = 160, \text{Not Persuaded} = 142) = 11730, z = 0.521, \text{two-tailed}, p = .602, r = 0$ ) or *Commitment* ( $U(\text{Persuaded} = 160, \text{Not Persuaded} = 142) = 12095, z = 0.995, \text{two-tailed}, p = .320, r = 1$ ). This suggests that participants with greater composite susceptibility scores for *Unity*, *Scarcity* and *Social proof* were more likely to be persuaded to complete the TIPI test.

We investigated whether there was any significant difference in the distribution of composite susceptibility scores and participants' gender and age respectively. This was in order to discover whether participants' susceptibility to persuasion varied based on individual differences. Excluding participants who choose not to indicate their gender during our study, results from a Mann-Whitney U test indicate that there is a significant difference in the distribution of composite susceptibility scores for the *Social proof* principle and participants' gender ( $U(\text{Female} = 123, \text{Male} = 178) = 12578, z = 2.212, \text{two-tailed}, p = .027, r = .1$ ). This suggests that Male participants reported greater susceptibility to the *Social proof* strategy, compared to Female participants. There was no significant difference in the distribution of participants' composite susceptibility scores and participants' gender for the *Unity* principle ( $U(\text{Female} = 123, \text{Male} = 178) = 10607.5, z = -0.466, \text{two-tailed}, p = .642, r = 0$ ), *Reciprocity* ( $U(\text{Female} = 123, \text{Male} = 178) = 11019, z = 0.103, \text{two-tailed}, p = .918, r = .1$ ), *Scarcity* ( $U(\text{Female} = 123, \text{Male} = 178) = 11936, z = 1.37, \text{two-tailed}, p = .171, r = .1$ ) and *Commitment* principle ( $U(\text{Female} = 123, \text{Male} = 178) = 9829, z = -1.544, \text{two-tailed}, p = .123, r = .1$ ).

We investigated the impact of age on the distribution of composite susceptibility scores using a Kruskal-Wallis test, which is suitable for measuring a non-normally distributed dependent variable (composite susceptibility score) across multiple groups (age bands) [35]. Results indicate that there is no significant difference in the distribution of composite perceived susceptibility scores for the *Unity* principle, ( $H(5) = 1.452, p = .919$ ), *Reciprocity* ( $H(5) = 5.514, p = .356$ ), *Scarcity* ( $H(5) = 1.872, p = .867$ ), *Commitment* ( $H(5) = 0.370, p = .996$ ) and the *Social proof* principle ( $H(5) = 8.401, p = .135$ ).

### 4.3 Limitations

One of the limitations of this study centres on how there are a greater number of questions for *Unity*, compared to all other principles, including *Social proof*. We accepted this trade off as we sought to provide participants with scenarios

that included potential overlapping of behavioural determinants related to *Unity* and *Social proof*; our objective was, in fact, to discover susceptibility measures to both, respectively.

With regards to measuring actual effectiveness during our study; while we assume participants who completed the TIPI were persuaded to do so, by stating that this section was optional and then applying a randomly selected persuasive strategy, we cannot rule out entirely that participants who completed the TIPI were motivated to do so for reasons outside our study design. Furthermore, our analysis of susceptibility and actual effectiveness is limited due to the sample being divided by those who completed the TIPI and based upon which of the seven persuasive strategies they received. This resulted in a low number of participants (who completed the TIPI) for each strategy, which limits our analysis and results for this part of the study.

## 5 Conclusion

In this paper, we investigated how we can distinguish perceived susceptibility measures to persuasive strategies based on *Unity* and *Social proof*, together with other Cialdini [5] principles. Results from our exploratory study indicate that while we are able to distinguish susceptibility measures for *Unity* and *Social proof*, together with *Commitment*, *Scarcity* and *Reciprocity*, with acceptable to good internal consistency, we are unable to measure these together with susceptibility to *Authority* and *Liking*. While the persuasive strategies for encouraging participants to complete the optional TIPI test differ in actual effectiveness, there appears to be no significant impact of individual differences amongst the participants, based on age and gender. There was also no significant difference in participants' susceptibility to persuasion and the actual effectiveness for each individual strategy, although it appears that participants with greater susceptibility to *Unity*, *Social proof* and *Scarcity* were more likely to complete the TIPI, irrespective of which strategy was received. We also discovered that male participants reported greater susceptibility to *Social proof*, compared to female participants. There was no significant impact of participants' age and susceptibility to persuasion.

In future work, we aim to build on our findings reported in this paper, by investigating how to extend our five component solution to incorporate measures of susceptibility to *Liking* and *Authority*. We also intend to investigate potential overlaps and similarities between other Cialdini [5] principles of persuasion, to discover how we can account for these and whether it is possible to develop susceptibility measures to persuasive strategies consisting of different combinations of Cialdini [5] principles. We believe this work can further help to design personalised persuasive strategies, taking into consideration overall perceived susceptibility to different strategies, different combinations of strategies together with individual differences.

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