

What Motivates People to Carpool?
The Interplay Between Goal Framing, Attitudes and Subjective Norms in Fostering
Ridesharing Intentions

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Abstract

In an attempt to predict participants' intention to sign up for a carpooling application, we combined goal framing theory (GFT) with the theory of planned behavior (TPB). It was predicted that participants who are presented with framed information will have more positive attitudes towards carpooling. Furthermore, we expected the normative condition to have a positive relationship with subjective norms. Subjective norms and attitudes would then mediate the relationship between goal framing and intention. We tested this framework with an online experiment, where participants were randomly presented with one of three videos showcasing the carpooling app. While one video served as the control, the other two were manipulated with either normative framed cues or gain framed cues. Participants then had to fill out an online survey asking questions about various TPB constructs. The research reveals that people who are presented with gain framed information do have more positive attitudes towards carpooling, potentially indicating the superiority of gain framed messages as compared to normative ones, in attitude formation. Additionally, we found that subjective norms had a significant effect on participants' intention to use the app, suggesting that social support plays an important role in the intention to use carpooling. Despite the lack of support for most of our hypotheses, this paper still provides insights into the relationship between GFT and TPB and might be used to better design future goal framing studies in the context of green mobility.

Keywords: carpooling, goal-framing, attitude, subjective norms, environment

What Motivates People to Carpool?

The Interplay Between Goal Framing, Attitudes and Subjective Norms in Fostering Ridesharing Intentions

In an era where global warming is an escalating concern, the rise of single occupancy vehicles is a pressing issue, because passenger cars are by far the strongest polluters within the transportation domain (Centraal Bureau voor de Statistiek (CBS), 2020). As of January 2020 there is over one car for every two persons in the Netherlands according to the CBS. A national survey has found that more than half of all people that are employed in the Netherlands have to commute to work (Salanki, 2017). Roughly 75% of these trips are done using single occupancy vehicles, which is worrisome regarding the fact that not only the number of cars on the road has increased over the last couple of years, but also the distance needed to travel (CBS, 2018). In light of this, it is imperative to explore viable solutions to the rising problem of greenhouse gas emissions caused by single occupancy vehicles. One such remedy may lie in car sharing. A study has shown that of all 4.5 million commuters in the Netherlands 1.2 million have potential for carpooling (International Road Federation, 2010). The question is how can we get people to engage in sharing rides, thereby mitigating the impact of single occupancy vehicles on the environment.

Goal Framing and the Theory of Planned Behavior

This study seeks to investigate how goal framing theory (Lindenberg & Steg, 2007) in combination with selected theory of planned behavior (Ajzen, 1991) constructs influences individuals' decisions to engage in ride sharing behaviors. The Theory of planned behavior delineates the psychological factors governing consumer behavior. Individuals attitudes, subjective norms and perceived behavioral control (PBC) determine behavioral intention which

in turn influences individuals actual behavior. Attitude is centered around the individual's overall evaluation or assessment of a specific behavior. It involves considering the person's beliefs about the outcomes or consequences of the behavior and their subjective evaluation of these outcomes as positive or negative. Subjective norms refer to an individual's perception of social pressure or the expectations of others regarding a specific behavior. In other words, subjective norms capture an individual's belief about whether important others in their social environment approve or disapprove of them engaging in a particular behavior. Perceived behavioral control represents an individual's belief in their ability to execute a behavior, taking into account both internal and external factors. Existing research links attitudes, subjective norms and PBC to behavioral intention across multiple contexts. However, in the absence of additional expansions to the original theory itself, TPBs capacity to predict pro-environmental intentions is rather limited (Abrahamse & Steg, 2011). TPB assumes that individuals make rational decisions based on careful consideration of relevant factors. However, human decision-making is often influenced by emotions, habits, and other non-rational factors, which TPB may not fully address. Emotional states can significantly impact the translation of intentions into actions. To increase the predictive power of TPB frameworks Conner and Abraham (2001) suggest adding additional constructs to the theory. By expanding TPB with Goal Framing Theory we can address some of its predictive shortcomings. Goal framing theory complements TPB insofar that goal frames are added as additional driving forces to determine behavioral intentions. While TPBs emphasis remains on rational decision making and cognitive factors, Goal framing theory recognizes that people often have multiple and conflicting goals, and their decisions may be influenced by how those goals are framed.

GFT postulates that there are three overarching goals that steer behavior at all times. Hedonic goals encompass pleasure, self-indulgence and/or the avoidance of boredom. Individuals driven by hedonic goals seek experiences that bring joy or alleviate monotony, influencing behaviors such as recreational choices, leisure activities, and lifestyle preferences. Gain goals refer to the management and maintenance of one's resources such as money. Those motivated by gain goals exhibit behaviors aimed at accumulating, preserving, or increasing material wealth, impacting financial decisions, investment strategies, and consumption patterns. Lastly, normative goals refer to the wish to act appropriately, considering what ought to be done. Individuals guided by normative goals align their behavior with social norms, ethical considerations, or personal values. This influences ethical decision-making, social responsibility, and conformity to societal expectations. These three goals are activated by cues in the environment to form the goal frame. The frame which is made focal or the most salient will influence behavior the strongest. Research has shown that the normative goal frame is a strong predictor of pro environmental behavior. For example, Chakraborty et al., (2017) found that students with a strong normative goal had increased pro-environmental intentions.

Literature review

Han et al., 2017 showed that financial values had both a direct and indirect effect (over attitude) on consumers' intention to adopt an electric vehicle, while non-functional values (emotional, social and epistemic values) only had an indirect effect on adoption intentions. Steg et al., (2014) argue that the strength of the goal frame is dependent on which values are endorsed. Thus suggesting a possible mediation between framing and intention. Dastjerdi et al. (2019) demonstrated in their research on mobility management travel apps that the three goal frames, normative, hedonic and gain, had an effect on people's emotions and attitudes. Also hinting at

attitude as a potential mediator on the relationship between framing and intention. In an attempt to analyze commuters' intention to switch to multimodal mobility behavior, Timmer et al., (2023) successfully combined GFT with TPB. They found that normative framing had a significant effect on people's intention to alter commuting behavior. Furthermore, they did find support for the relationship between the normative goal frame and subjective norms. Indicating that perceived social support is affected by pro-environmental motives. The literature suggests a link between normative and gain values and TPB constructs. The influence of attitude on behavioral intention was also demonstrated multiple times in the context of mobility (Abrahamse et al., 2009; Borhan et al., 2019). Similarly the connection of subjective norms and intention was shown by Bamberg et al., (2007), Kaffashi and Shamsudin (2019) and Ru et al., (2019). They found a significant and direct effect of subjective norms on intentions in the transportation domain. Goal framing may contribute to the formation of attitudes by prompting individuals to assess the alignment of their values, which were shown to influence not only attitudes and subjective norms but also intentions. Furthermore, the normative goal frame's emphasis on the importance of social support was shown to significantly predict subjective norms. The existing literature implies a connection between goal framing, attitudes, subjective norms and behavioral intentions. The indirect effect of goal framing on intentions was suggested, as well as the direct effect of goal framing on attitudes and subjective norms. Thus we propose a framework to further explore the interplay between these constructs. We believe the relationship of goal framing and intention to be mediated by attitudes and subjective norms.

Hypothesis

Within the context of promoting carpooling as an environmentally friendly alternative, this study seeks to address two fundamental research questions. Firstly, we aim to investigate the

influence of goal framing, specifically examining the effects of normative and gain framing, on TPB constructs, namely subjective norms and attitudes. We predict that the normative framing condition, as well as the gain framing condition, will foster more positive attitudes toward carpooling, as compared to the no framing condition (Hypothesis 1). Since the normative goal frame emphasizes the importance of social factors we also predict that normative framing will have a positive influence on subjective norms as compared to the gain and control condition (Hypothesis 2).

Secondly, we aim to elucidate the significance of Attitude and Subjective norms in driving peoples intention. We seek to better understand the nuanced dynamics of how individual perceptions of social influence as well as people's attitudes impact the decision to sign up for a carpooling app. We predict that both attitudes and subjective norms will have a positive influence on participants' intention to sign up (Hypothesis 3).

By examining the interplay between goal framing, attitudes, subjective norms and intentions within the context of a newly developed carpooling app in the Netherlands, we aim to understand the determinants of carpooling app adoption, and contribute to the development of effective strategies for promoting sustainable and environmentally friendly commuting choices.

Methods

Participants and Procedure

This study was part of a group project and therefore differentiated into three individual analyses, one conducted by each member of the research group. This means other variables such as dispositional trust, place of residency and perceived behavioral control were investigated but are not explained in detail further on. The focus of this paper remains on the mediating effect that subjective norms and attitudes have on the relationship between goal framing and participants

intention to sign up for a carpooling app. To determine the minimum sample size requirements for the mediation analysis we relied on recommendations from Sim et al., (2022). The sample size needed for a complex partial mediation, with two mediators (subjective norms and attitude), using the bootstrap method and a medium effect size should at least be $N = 128$. To that end we aimed at recruiting at least 128 people who regularly commute by car. This was checked with a single item asking participants whether or not they commute regularly by car, which was defined as more than two times a week. In the end we got a total of 82 participants, who completed our questionnaire and were used for the analysis regardless of whether or not they commute regularly. The filter was discarded to improve our sample size, and because this construct did not add much to our model.

Fliers were posted over a LinkedIn profile of Groningen Bereikbaar as well as in their monthly newsletter. The fliers provided either a link or a qr code that forwards people directly to our online questionnaire, which was developed by the research team. Additionally, the same flier was shared in the research team's social network. The survey was designed and managed via the qualtrics software version December 2023.

The online survey was administered from 26th of December 2023 to 17th of January 2024. The participants included 27 men (33%) and 55 women (67%). Our sample included 21 people aged 18-24 (26%), 11 people aged 25-34 (13%), 4 people aged 35-44 (5%), another 11 were aged 45-54 (13%), 30 people aged 54-64 (37%) and 5 people were aged 65-74 (6%). Regarding education, 37 participants in our sample had a masters degree (45%), 23 had a bachelors degree (28%), 6 participants had higher general and pre-university education (7%), 14 people had intermediate vocational education (17%) and 2 participants had preparatory secondary vocational education (2%). Demographics collected on income revealed that 10

participants in our study made less than 1000€ a month (12%), 16 participants made 1000-2000€ a month (20%), 40 people made 2000-5000€ a month (49%), 10 people made 5000-7500€ (12%), 1 person made more than 10000€ a month (1%) and three participants did not indicate their income. There were no significant differences in the distribution of gender ($\chi^2(2) = 1.02$, $p = .60$), age ($\chi^2(10) = 11.64$, $p = .31$), education ($\chi^2(8) = 7.61$, $p = .47$) and income ($\chi^2(10) = 6.90$, $p = .74$) across our experimental conditions.

Before participants were able to fill in the survey they gave informed consent. They were then asked whether or not they commute regularly before being shown one of three videos about a newly developed carpooling app in the netherlands. Participants were randomly assigned to watch either one of the three videos resulting in our three experimental conditions, namely normative framing ($N = 30$), gain framing ($N = 26$) and the control condition ($N = 23$). To see if our manipulation worked we asked participants to name the first benefit of carpooling that came to mind after watching the video.

Participants then had to fill out the questionnaire containing measures for our independent variable Intention, as well as for our predictor variables Attitude, Subjective Norms, Perceived Behavioral Control, Dispositional Trust and Place of Residency. Lastly, participant demographics were collected and they were debriefed before providing the opportunity to ask questions.

Materials

Flier

The research team designed the flier using the image editing software photoshop and some copyright free assets (see appendix). To increase the participation rate we made the

promise on our flier to donate one euro to Voedselbank Groningen for every completed survey up to the first 150 participants.

Videos

The videos were about thirty seconds long and showed the newly developed app alongside an explanation of its features. The videos were manipulated to either display a counter that shows how much CO₂ was saved by driving together instead of separately to emphasize sustainability for the normative condition, or a counter that displays how much money was saved by driving together instead of separately to emphasize cost-saving for the gain condition. The control group got to see a counter that shows how much time is left until their next carpooling appointment.

Attitude

People's attitude toward carpooling ($M = 4.5$, $SD = 0.8$) was measured on a 14-item scale based on Noppers et al., (2014) attribute scale. This scale can be differentiated into three subscales, first, instrumental attributes, which was made up of five items ($\alpha = .65$) like *carpooling is cheap* or *carpooling is comfortable*. Next, symbolic attributes, which consisted of five items ($\alpha = .83$) and included statements like *carpooling shows who I am* or *carpooling says something about me*. The last subscale was environmental attributes, made up of four items ($\alpha = .68$) like *carpooling reduces greenhouse gas emissions*. The complete 14-item scale for attitude has good reliability ($\alpha = .86$, $M = 62.5$, $SD = 11.4$). All items were measured on a 7-point Likert scale going from 1 = *strongly disagree* to 7 = *strongly agree*, giving participants the neutral answer option to *neither agree nor disagree*.

Subjective Norms

To accurately measure subjective norms ($M = 3.5$, $SD = 1.2$), we relied on guidelines for item construction in TPB questionnaires from Ajzen (2006). The five item-scale ($\alpha = .83$, $M = 17.1$, $SD = 5.9$) based on Ajzen's suggestions included items like *Most people who are important to me would approve of me carpooling* or *It is expected of me to engage in carpooling*. Items on the subjective norms scale were measured on a 7-point Likert scale going from 1 = *strongly disagree* to 7 = *strongly agree*, giving participants the neutral answer option to *neither agree nor disagree*.

Intention

The single item used to measure participants' intention to sign up for the carpooling app ($M = 3.0$, $SD = 1.8$) was also derived from Ajzen's guideline (2006) and adjusted to fit the context of our study. The item *How likely are you to use the app presented in this study for carpooling in the near future* was measured on a 7-point Likert scale going from 1 = *very unlikely* to 7 = *very likely*, again, giving participants the opportunity to *neither agree nor disagree*.

Manipulation Check

Since we checked our manipulation with the open ended item *After seeing the demo version of the carpooling app, we would like to ask you what the very first benefit of carpooling is that comes to your mind*, participants' answers had to be manually coded by the research team to fit the data. Based on what participants wrote down after watching the video we concluded that 32 people were put in the gain frame, 26 were put in a normative frame and 24 people talked about something unrelated to both gain and normative motives. This was compared to the actual assignment of conditions to determine whether or not participants had the desired goal frame activated.

Statistical Analysis

An alpha level of .05 was used throughout the entire analysis. IBM SPSS statistics version 28 was used for the analysis. According to the Fein et al., (2022), the assumptions underlying a mediation analysis are the same as for linear regression. First, we made a PP-Plot that indicated that the standardized residuals are normally distributed. We then used a scatter plot to check the assumption of homoscedasticity. The data was scattered around evenly, showing no signs of a pattern in the data. Tests to see if the data met the assumption of collinearity indicated that multicollinearity was not a concern (Attitude, Tolerance = .55, VIF = 1.8; Subjective Norms, Tolerance = .56, VIF = 1.8; Framing, Tolerance = .94, VIF = 1.1). Lastly, an analysis of standard residuals was carried out, which showed that the data contained no outliers (Std. Residual Min = -2.2, Std. Residual Max = 2.4). To conduct our mediation analysis we relied on model 4 of the PROCESS macro for mediation analysis by Hayes (2013). Other than that we used one-way ANOVAs and linear regression alongside the PROCESS output to determine the significance of pathways in our model. The assumption of independence of observations for the ANOVAs is met, and the assumption of normality is of no concern, since we have relatively large sample sizes for our three experimental conditions. However, Levene's test for equality of variances was found to be violated for attitudes $F(2, 79) = 3.79, p = .03$, but not for subjective norms $F(2, 79) = 2.21, p = .12$. Thus we will rely on the Welch F-test to compare the means of our three experimental conditions in regards to attitudes.

Results

Manipulation Check

To see if what people indicated after watching the video about the carpooling app was independent of which experimental group they were assigned to, we ran a chi-square test of

independence to see if our manipulation worked $\chi^2(4, 75) = 1.30, p = .86$. The test results suggest that our manipulation of the videos did not activate the desired goal frame for the participants in our study.

Mediation

A mediation analysis using PROCESS was performed with intention as our dependent variable, goal framing was entered as a multicategorical predictor with the conditions normative, gain and control, and attitudes and subjective norms were entered as mediators. The results showed that there was no significant total effect between goal framing and intentions ($b_{Normative} = .09, p = .85$), ($b_{Gain} = .09, p = .87$). Path a (i.e., goal framing on attitudes and goal framing on subjective norms) in our model was partially significant for attitudes ($b_{Normative} = .14, p = .51$), ($b_{Gain} = .51, p = .03$), and nonsignificant for subjective norms ($b_{Normative} = .29, p = .36$), ($b_{Gain} = .57, p = .09$). The b path (i.e., attitude on intentions and subjective norms on intentions) was nonsignificant for attitudes ($b = .48, p = .11$), and significant for subjective norms ($b = .48, p = .02$). Finally, when attitude and subjective norms entered the relationship between goal framing and intention, the direct effect for both the normative ($b_{Normative} = -.12, p = .79$) and the gain condition ($b_{Gain} = -.43, p = .37$) were still nonsignificant. In addition, the bias corrected confidence interval for the indirect effect of normative framing on intention is 95% CI [-.20, .37] for the attitude path and 95% CI [-.18, .59] for the path over subjective norms. For the gain condition the bias corrected confidence interval is 95% CI [-.08, .64] for the path over attitudes and 95% CI [-.04, .75] for the path over subjective norms. All confidence intervals include zero, hence, attitude and subjective norms are not considered as mediators for goal framing on intention. The R^2 for the complete mediation model was .23, indicating that goal framing

explained approximately 23% of the variance in intention, when mediated by attitude and subjective norms.

Normative and Gain Framing

Next to the mediation analysis a Welch ANOVA was conducted to compare the effects of goal framing on attitude in the normative, gain and control conditions. The results reveal that there is a significant effect of goal framing on attitudes $F(2, 79) = 3.38, p = .04$. To determine which groups differ, we made use of the Games-Howell multiple comparison method, a post hoc test that does not assume equal variances and is similar to the Tukey method for classical ANOVAs. The confidence interval for the mean difference between the control and gain condition (95% *CI* [-1.05, .03], $p = .07$) indicated a bigger difference than the confidence interval for the mean difference between the control and normative condition (95% *CI* [-.73, .44], $p = .82$). This is in line with the results of our mediation analysis, which only found a significant connection between gain framing and attitudes, but not normative framing and attitudes.

Similarly we conducted a one-way between subjects ANOVA to see if there would be a significant difference between the three conditions on subjective norms. The results indicate that there is not a significant effect of goal framing on subjective norms $F(2, 79) = 1.44, p = .24$. This means that the second hypothesis, that normative framing would significantly influence subjective norms when compared to the gain and control conditions, was also not supported by our results.

Attitudes and Subjective Norms

Lastly, a linear regression analysis was conducted to investigate the extent to which attitudes and subjective norms could predict participants intentions to sign up for the carpooling app. A significant regression was found $F(2, 79) = 11.03, p < .001$. The R^2 was .22, indicating

that subjective norms and attitudes explained approximately 22% of the variance in intention.

The regression equation was: $\text{Intention} = -.61 + .43(\text{Attitude}) + .48(\text{SubjectiveNorms})$. Attitude was not a significant predictor $\beta = .20, t = 1.47, p = .15$, while subjective norms predicted intentions significantly $\beta = .32, t = 2.37, p = .02$. The results provide partial support for the third hypothesis. Contrary to what was expected, only subjective norms significantly influence intentions to sign up for the carpooling app.

Discussion

This study was conducted to investigate the effect of the normative and gain goal frame on attitudes and subjective norms, which were thought to mediate the relationship between the two goal frames and people's intentions.

Findings

We hypothesized that goal framing would impact the TPB constructs attitudes and subjective norms significantly. More specifically we expected to see both the normative and gain conditions to have a significant effect on attitudes, when compared to a control group. We also predicted the normative condition to have a significant effect on subjective norms, as compared to the gain and control conditions. Our expectations were not supported by the data in this study. Neither the gain, nor the normative conditions had a significant effect on subjective norms, and only the gain condition had a significant effect on attitudes towards carpooling in our mediation model, which partially supports the first hypothesis.

Furthermore, we expected that attitudes and subjective norms would both significantly influence participants' intention to sign up for the carpooling app. Contrary to what we predicted, only subjective norms had a significant effect on intentions, not attitudes. Our data also did not support the underlying assumption of a mediation effect of attitudes and subjective norms on the

relationship between goal framing and intention. The total, direct, and indirect effects of goal framing on intentions were all found to be nonsignificant.

Goal Framing

The initial idea of our experiment was to make the normative goal frame salient by emphasizing the opportunity to do what ought to be done in terms of protecting the environment by saving CO₂ as a result of carpooling on the one hand, and to make the gain goal frame salient by emphasizing an opportunity to save resources, mainly fuel costs, as a result of sharing rides on the other hand. However, in the current study the only statistically significant effect we found was that of the gain goal frame on attitudes.

This is contradicting other research on goal framing, who found that the normative goal frame had a significant relationship with attitudes (e.g., Lindenberg & Steg, 2007; Westin et al., 2020; Timmer et al., 2023). For instance, Westin and colleagues (2020) found that people who were presented with a normative message had more positive attitudes towards and stronger acceptability of a new traffic policy, as compared to a gain and control condition. Yet, there are a number of studies supporting our finding that the gain goal frame does have a significant impact on attitudes (e.g., Schaefers, 2013; Cairns et al., 2014; Barnes & Mattsson, 2016; Wilhelms et al., 2017). This might imply that gain goals (e.g., cost saving or time saving) have a stronger impact on attitude formation than normative goals (e.g., protecting the environment).

Furthermore, we did not find support for the predicted significant direct effect of normative framing on subjective norms. Again, this finding is in contrast to existing literature that has established a link between the normative goal frame and subjective norms (e.g., Timmer et al., 2023; Ates, 2020; Nguyen et al., 2016). For example, Liu et al., (2023) demonstrated the

effectiveness of normative messages on personal and subjective norms in motivating college students to save energy.

The nonsignificant effect of goal framing in our study might be explained by several factors. Most notably, our manipulation of presenting participants with framed messages in the form of videos about the new carpooling app did not work. The chi-square test for our manipulation check revealed that the different experimental conditions did not evoke the desired goal frame or made it the most salient. The gain frame was reported most frequently, indicating that this goal frame was the hardest to deactivate. On the other hand, the normative frame was reported less than what should have been the case, hinting at the possible difficulty of making this particular goal frame salient. Different groups of people are more or less resistant to influence by certain goal frames. For example, Hornsey et al., (2016) identified political conservatism as one of the strongest barriers to climate change belief, indicating that political orientation might have an effect on normative framed messages. Furthermore, research revealed that younger people usually show more concern for environmental issues than do older people (Torgler et al., 2008). We did not measure participants' political orientation, but we did measure age, which revealed that most people in our study were on the older side (more than 50% of participants were 45 or older). The way in which our manipulation was delivered, might have also made it more difficult for the normative frame to be activated. Our study was an online experiment, but as Lindenberg & Steg (2007; 2013) noted, social norms and especially the presence of others are most effective in activating the normative goal frame. Our manipulation could also have failed because it was “fat handed” (Eronen, 2020), or in other words likely to influence multiple constructs, not just goal frames. Next to the counters, the color of the layout, as well as, background images were varied depending on the experimental condition to further

strengthen for example the normative manipulation with a green layout to put even more emphasis on the aspect of pro-environmentalism. In hindsight, this might have been a mistake, as an experiment by Granato et al. (2022) demonstrated. They found that when multiple sustainable packaging cues are combined, it may work against the intended effect, lowering the perceived sustainability. People may doubt a product's sustainability if too many cues are present (Aji & Sutikno, 2015; Magnier & Schoormans, 2015). This shows how difficult it is to activate the normative goal frame.

Attitudes and Subjective Norms

The nonsignificance of the relationship between attitudes and intentions was perhaps the most surprising finding since there is a well established body of research on TPB and the theory was applied in a lot of different contexts and even in the very similar context of using attitude to predict people's intention not to rely on a private car (Abrahamse et al., 2009; Borhan et al., 2019). These past investigations found attitude the strongest predictor of intentions in the mobility domain, raising questions about the results found in this study. One possible explanation for the attitude-behavior discrepancy in our study is what Fishbein & Ajzen (2010) named the compatibility of measures. In our study, measures might not have been compatible enough, as items on our attitude scale mainly asked about carpooling itself, but our measure on behavioral intention was purely focused on the carpooling application. Siegel et al., (2014) explored the effect of compatibility in the context of attitudes towards organ donation. Even though most people have favorable attitudes towards organ donation, like people in our study who expressed mostly positive attitudes towards carpooling, there is a huge gap between attitudes and behavioral intention. They found that specific attitudes towards organ donation accounted for 250% more variance in registration behavior than did general attitudes, highlighting how

powerful this effect can be. Still, this issue merits further investigation into how exactly attitude influences people's intention in the specific context of carpooling.

And while some studies found a nonsignificant relationship between subjective norms and intentions (e.g., Davis & Morgan, 2008; Moan & Rise, 2011; Borhan et al., 2017) there is an overwhelming amount of evidence that implies a significant and positive relationship between the two variables (Bamberg et al., 2007; Kaffashi and Shamsudin, 2019; Ru et al., 2019), like we found in our study. Subjective norms exhibit a significant and direct effect on behavioral intentions, suggesting that social support plays a significant role for the intention to adopt different modes of transport.

Mediation Power Concerns

The main objective of the mediation analysis was to investigate the existence of a possible indirect effect of goal framing on intentions. Despite the literature suggesting a mediation between constructs (e.g. Han et al., 2017), our analysis did not yield sufficient evidence to conclude the presence or absence of an indirect effect. This might be due to the small sample size. Instead of the desired $N = 128$ participants, we ended up with $N = 82$, suggesting that our study lacked statistical power to find the smallest effect size of interest. For our mediation analysis that means an increased risk of encountering a type II error, and a reduced probability that a statistically significant outcome corresponds to a true effect (Button et al., 2013). Fritz et al., (2007) noted that most mediation analyses are underpowered. In the context of mediation analysis, the use of bias corrected bootstrap confers an advantage by enhancing statistical power. However, it is essential to note a potential drawback, particularly when dealing with smaller sample sizes (e.g., $N = 25, 50, 100$). Fritz et al. (2012) observed an interaction effect between path size and sample size, leading to increased Type I error rates, particularly evident

when the sample size is limited. This elevation in Type I error rates is particularly notable when dealing with medium or larger effect sizes in the nonzero path (either path a or b). Therefore, researchers should exercise caution and consider the interplay between bootstrap techniques, sample size, and effect size when employing bias corrected bootstrap in mediation analyses.

Limitations and Implications

One of the strengths of the current study is the experimental design, with the inclusion of a control condition, allowing the comparison of the normative and gain condition and therefore providing further insights into how these two goal frames influence attitudes and subjective norms, and consequently intentions. Additionally, the random assignment of participants to the three experimental conditions reduces bias in data collection, thus improving the reliability of our results. That being said, although this study was an experiment, it took place online. Dandurand et al., (2008) argued that participants taking part in an online experiment, as compared to a lab study, might answer questions less effortfully, and might get sidetracked more easily, thus weakening the external validity. Therefore, to further explore the relationship between GFT and TPB, alongside studies that take place in an online environment, laboratory studies or field experiments should be conducted to further establish a link between theories. Also, next to the manipulation of goal frames, which was discussed in great detail above, the manipulation check itself might not have been sufficient in capturing a person's goal frame. As of right now, there is no validated tool to accurately measure a person's situation-specific goal frame (Timmer et al., 2023). While it is not uncommon in research studying goal framing to not include a mediation check at all (see Jenő et al., 2020), the studies that do include a manipulation check either devise measures themselves (e.g., Onwezen, 2022) or adopt already existing measures and fit them to the context of their studies (e.g., Chakraborty et al., 2017). This

inconsistency in the operationalization of goal framing should be addressed in future research to create a golden standard that has better structural validity and predictive utility making it easier to reliably and purposefully measure and evoke goal frames. This is especially of importance since Lindenberg and Steg (2007) argue that the activation of a goal frame varies within a person over time, implying that the single measure we employed right after participants viewed the video might not have been enough. Lastly, the sample of the current study should be addressed. For data collection we relied on the convenience sampling method, making it difficult to make statements about the generalizability of our findings.

Conclusion

To conclude, the outcomes of this study are inconclusive regarding the impact of goal frames on TPB constructs. This could stem from the limitations of this study or other variables that are currently unknown. Most of the existing literature highlights the importance of the normative goal frame in supporting environmentally friendly transportation (Cairns et al., 2004). However, in our study the gain framed message exerted a much stronger influence on both attitudes and subjective norms, compared to the normative and control condition. This warrants further investigation of how gain framing might play a much bigger role in eco-friendly travel choices, than what we initially expected. Also, since normative framing, one of the key-variables, failed to have an impact across the board, the operationalization of goal framing and how this construct can be purposefully manipulated should be reconsidered.

The present study was carried out with the intent to establish an understanding of the relationship between framed messages, attitudes and subjective norms and people's intentions to use a carpooling app. Although we failed to provide enough evidence for our claims, this paper contributes to the ongoing discourse on how to apply goal framing in a mobility context. We also

provide insight into how goal framing theory may be added as an additional driving force to the theory of planned behavior. Further research is needed to make a sound conclusion on the interplay between these constructs.

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Appendix A: Flier for Recruitment

The flier used in the recruitment process, which was posted via LinkedIn and social media.

Figure A1



Waarom alleen rijden?

HELP ONS MET ONDERZOEK NAAR CARPOOLING:
Woont u in Nederland en reist u regelmatig met de auto?

Het kost maar 10 minuten

Voor de eerste 150 deelnemers doneren wij €1,- aan de Voedselbank Groningen

Scan de QR code om deel te nemen