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Public transport and public health: Regulatory focus and the impact of COVID-19 on the choice of public transport mode

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ABSTRACT

Objective: Based on regulatory focus theory, it was predicted that there would be a relationship between regulatory focus, health-related perceived risk of using public transport during COVID-19, and choice of public transport mode.

Method: The study focused on choice between demand responsive transport (DRT), and more traditional modes of public transport, buses and private taxis. Participants completed online questionnaires to measure chronic regulatory focus, perception of health-related risk of using public transport, and choice of public transport mode (choice between buses and DRT, and separately, between taxis and DRT).

Results: The choice between buses and DRT is explained by moderation. The relationship between promotion focus and choice is moderated by risk perception whereas the relationship between prevention focus and choice is moderated by age. Specifically, the probability of choosing DRT is smaller for those saying DRT is riskier (relative to bus is riskier), and the effect gets stronger with increasing strength of promotion focus. Furthermore, the probability of choosing DRT increases with increasing strength of prevention focus for individuals older in age, but decreases with increasing strength of prevention focus for those younger in age. The choice between taxis and DRT is explained by mediated-moderation. The relationship between promotion focus and choice is moderated by age and mediated by risk perception. Specifically, the probability of saying that DRT is riskier than taxis decreases with increasing strength of promotion focus for individuals older in age. As a result, the probability of choosing DRT increases with increasing strength of promotion focus for older people. Moreover, the probability of saying that DRT is riskier than taxis increases with increasing strength of promotion focus for individuals younger in age. As a result, the probability of choosing DRT decreases with increasing strength of promotion focus for younger people. Implications for transport and health are discussed.

1. Introduction

One way of coping with the spread of COVID-19 is to adhere to social distancing recommendations. Social distancing may reduce the risk of transmitting the virus from one person to another. However, when it comes to public transportation, maintaining a physical distance between passengers is challenging. The idea of mobilizing people with mass transit systems is to enable the usage of a vehicle by a large number of passengers simultaneously. When people share the same vehicle, social distancing is hard to maintain, and travel could easily be perceived as a risky endeavor from public health perspective. Hence, it seems likely that the danger of exposure to
contagious disease may affect the decision whether to use public transportation or not. Furthermore, if the decision is to use public transportation, the fear of catching the virus may affect the choice of public transport mode. This assessment is based on the rationale that risk perception should affect behavior in a way that the higher the perceived risk, the higher is the likelihood of engaging in protective behaviors.

In a study exploring the impact of 2003 SARS epidemic on use of mass transit systems in Taiwan, it was found that the fear of contracting the virus was associated with a massive drop in daily underground ridership (Wang, 2014). For each reported new SARS case, there was a loss of more than one thousand daily underground ridership in Taipei City alone. Roughly 50% of the daily underground ridership in the city was lost during the peak of the SARS outbreak. In 2009, the world was confronted with a new risk, the H1N1 (swine flu) virus. Studies have shown that risk perception for H1N1 was associated with the intention to get vaccinated against the virus, and also with avoidance behavior such as avoiding air travel and public places (Rudisill, 2013). A study in China at the early stages of COVID-19 found that the use of public transport (buses, metro) decreased significantly after the outbreak of the pandemic (Chiu, 2020). Fear of contracting the virus while using public transport was the main reason for the decrease. A study in the United States revealed that people used public transportation and ride-sharing services less often since the outbreak of COVID-19 (Newman, 2020).

There is no doubt that the fear of getting infected with COVID-19 is likely to influence the decision whether to use public transport, and further, the choice of public transport mode. However, the question remains how the outbreak of the pandemic might affect people’s preferences and choices. In this light, the objective of the current research was to develop and test a psychological model to explain how the choice of public transport mode is influenced by the fear of using public transport under pandemic condition.

Three public transportation systems have been examined: demand responsive transport (DRT), traditional bus services, and private taxis. DRT systems provide flexible transportation services that take multiple passengers heading in the same direction and book them into a shared vehicle. Smart algorithms optimize the process of ride-sharing by making connections in real-time between passengers and vehicles with the goal of reaching the destination as fast as possible, while at the same time enabling the vehicle to travel as full as possible. DRT systems become more and more prevalent worldwide, as can be seen with the rapid expansion of Via in the United States (Via. Available at https://) and ViaVan in Europe (ViaVan. Available at http). The three public transportation systems, buses, taxis, and DRT differ from each other with respect to various operating characteristics, including size of the vehicle, capacity and occupancy rates, crowdedness, and distance between passengers. These differences may affect the perceived risk associated with each system, and thus the choice of public transport mode. Risk perception in this context refers only to the health-related risk associated with using public transport under pandemic conditions.

The decision to focus on DRT, buses, and private taxis was based on the fact that this research was conducted in the city of Tel-Aviv, Israel. Many cities around the world offer a wide-range of public transport systems including buses, taxis, trams, trains, subways, metro, and even ferries. However, in Tel-Aviv, buses and taxis are the main modes of public transport. In addition, DRT systems are starting to take hold in the city. Light rail systems are under different stages of construction at the time of the study, but are yet to be functional. One more point: DRT systems are on the rise in many cities worldwide including in Tel-Aviv. These systems represent smart public transport solutions and it is interesting to test these innovative solutions relative to more traditional ones particularly in times of COVID-19.

To answer the question of how COVID-19 might affect the choice of public transport mode, this research has drawn on regulatory focus theory (Scholer et al., 2019), a well-established theory of motivation, to develop a behavioral model. Based on the theory, it is proposed that there should be a relationship between regulatory focus and the choice of public transport mode, and this relationship should be either moderated or mediated (or both) by risk perception and age. In the next section, the theory of regulatory focus is reviewed, and the rationale behind this proposal is discussed. In the section that follows, results from an empirical study are reported. A model to predict the likelihood of choosing between competing alternatives of public transport is then presented. Finally, implications for public transport and public health are discussed.

2. Regulatory focus theory

The theory of regulatory focus provides a framework for understanding how people can achieve their goals in substantially different strategic ways (Scholer et al., 2019). According to the theory, goal-directed behavior is regulated by two distinct, and independently operating, motivational systems, promotion and prevention. Promotion-focused goal-pursuit is motivated by growth, and underlies concerns with accomplishment and advancement. Prevention-focused goal-pursuit is motivated by safety and security, and underlies concerns with fulfillment of responsibilities and duties (Higgins, 1997). All people are driven by both promotion concerns and prevention concerns. However, individuals differ on the strength of each of the two orientations and also on their relative strength. Some are more promotion-focused than others, and some are more prevention-focused than others. Moreover, some have stronger promotion than prevention concerns (a dominant promotion focus), whereas others have stronger prevention than promotion concerns (a dominant prevention focus). These differences have implications for the strategies people apply to pursue goals (Crowe and Higgins, 1997).

Motivated by growth, individuals with a strong promotion motivation are focused on approaching gains and avoiding nongains (Scholer et al., 2019). The primary motivation is to move from 0 to +1. These individuals maintain a strategic preference for eagerness means of goal attainment (Crowe and Higgins, 1997). This eagerness is reflected in considering multiple alternatives when making decisions (Liberman et al., 2001), enthusiastically taking action to achieve desired goals (Scholer et al., 2019), a liberal approach to risk-taking (Hamstra et al., 2011; Zou et al., 2014), enhanced creativity (Friedman and Förster, 2001), openness to experience (Vaughn et al., 2008), and a preference for change over stability (Liberman et al., 1999). Motivated by safety and security, individuals with a
strong prevention motivation are focused on approaching nonlosses and avoiding losses (Higgins, 1997). The primary motivation is to
not move from 0 to –1. These individuals maintain a strategic preference for vigilant means of goal attainment (Crowe and Higgins,
1997). This vigilance is reflected in considering fewer alternatives (Liberman et al., 2001), carefully vetting the alternatives before
taking action (Scholer et al., 2019), a more conservative approach to risk-taking (Hamstra et al., 2011), and a preference for the
status-quo over reform (Boldero and Higgins, 2011) and stability over change (Liberman et al., 1999). The current study extends these
findings by showing that regulatory focus has implications for the choice of public transport mode given the threat to public health
posed by COVID-19.

3. Study

Three concepts have been examined for the relationship between regulatory focus and the choice of public transport mode, and the
role of risk perception and age in this relationship. Concept 1: moderation – there should be a relationship between regulatory focus
and the choice of public transport mode, and this relationship should be moderated either by risk perception or age (or both). Concept
2: mediation – there should be a relationship between regulatory focus and the choice of public transport mode, and this relationship
should be mediated by risk perception. Concept 3: mediated-moderation – there should be a relationship between regulatory focus and
the choice of public transport mode, and this relationship should be moderated by age and mediated by risk perception. Each of these
concepts was tested with respect to two different choice tasks – a choice between buses and DRT and a choice between private taxis and
DRT. Thus, overall the study consisted of six analyses: three concepts (moderation, mediation, and mediated-moderation) X two choice
tasks (buses vs. DRT, private taxis vs. DRT).

3.1. Material and methods

3.1.1. Participants

Three hundred and two people were enrolled in the study (173 women, 129 men, M_\text{age} = 36 years, age range: 20–75). Respondents
were recruited with the help of graduate students. The students had a link to an online questionnaire which they sent to people they
knew. Participation was on a voluntary basis. No payment assigned and anonymity was assured. The study was conducted in the city of
Tel-Aviv, Israel during a three-month period at the end of 2020.

3.1.2. Procedure

Participants filled out an online questionnaire. The first 11 items were taken from the regulatory focus questionnaire (RFQ), a tool
that has been developed in order to assess the strength of chronic regulatory focus (Higgins et al., 2001). The RFQ contains a six-item
promotion subscale and a five-item prevention subscale. The two subscales evaluate individual differences in accessible past histories,
thus reflecting chronic regulatory focus orientations. The promotion subscale measures individuals’ subjective histories of success in
promotion regulation, whereas the prevention subscale measures individuals’ subjective histories of success in prevention regulation.
Items in the questionnaire ask how frequently specific events actually occur or have occurred in one’s life. For example, promotion-focused items ask ‘Do you often do well at different things that you try?’ and ‘How often did you accomplish things that got you “psyched” to work even harder?’ Prevention-focused items ask ‘How often did you obey rules and regulations that were established by your parents?’ Respondents are asked to answer by indicating a number from 1 (never or seldom) to 5 (very often). RFQ
promotion scores and RFQ prevention scores reflect individuals’ sense of their history of promotion and prevention success in goal
pursuit, respectively. In addition, the online questionnaire included items on risk perception, choice of public transport mode, and
general information. To evaluate the risk associated with using one public transportation system versus another (perceived relative
risk), participants were asked in one item which of the two systems, buses versus DRT, and in a separate item, taxis versus DRT, would
involve a greater risk to the health of passengers, given that COVID-19 was spreading rapidly. Next, participants were asked in one item
to choose between a traditional bus system and a DRT service, and in a separate item between a private taxi and a DRT service. Two
additional items asked about age and gender. See Appendix.

It is noteworthy that prior to filling in the questionnaire, participants were given a detailed description of the three transportation
systems, especially DRT which is a relatively new system in the city of Tel-Aviv, including travel cost, number of passengers per
vehicle, frequency, and speed, as well as additional information unique to DRT systems such as the use of mobile applications in this
service.

3.2. Results

The choice between buses and DRT was explained by a moderation concept. The choice between private taxis and DRT was
explained by a mediated-moderation concept. The results are reported below.

3.2.1. Buses versus DRT

Three concepts have been examined: moderation, mediation, and mediated-moderation. Of these three, the moderation concept
was the only one with significant effects. According to the moderation concept, there should be a relationship between regulatory focus
and the choice of public transport mode, and this relationship should be moderated either by risk perception or age (or both). In this
conceptualization, regulatory focus bears a direct relationship to the choice of public transport mode, and this relationship varies
across different levels of perceived risk associated with various public transport systems and also across different levels of age. To test
for moderation, a series of logistic regression models were examined (Baron and Kenny, 1986). There were five independent variables and one dependent variable. The independent variables were RFQ promotion scores, RFQ prevention scores, age (continuous measured variables), gender (0-male, 1-female), and perceived relative risk associated with using buses and DRT (0-traveling by bus is riskier than traveling by DRT, 1-traveling by DRT is riskier than traveling by bus). The dependent variable was the participants’ self-reported choice between bus (coded 0) and DRT (coded 1). In Step 1, five simple regression models were run each with one independent variable. In Step 2, a multiple regression model was run with all five independent variables. In Step 3, various models were run each included four independent variables, a moderator, and a two-way interaction between an independent variable and the moderator. In Step 4, additional models were run, each of which involved a different combination of two-way interactions. Next, in Step 5, models involving higher-order interactions were examined, and in Step 6, models with quadratic moderation were examined. To diminish multicollinearity, especially between the interaction effects and their constituent main effects, one additional step had to be taken. Thus, in Step 7, all data pertaining to the continuously measured variables (RFQ promotion scores, RFQ prevention scores, age) were mean centered, and all the models were rerun. There was always the possibility to mean center the data from the beginning, and only then run the models. However, the decision to first run models with raw data and only then models with mean centered data had the advantage of being able to identify the improvement in the quality of the results once multicollinearity had been reduced. Of all the models, the one that offered the best explanation of the data (in terms of R-squared McFadden and adjusted R-squared) is shown in Table 1.

The interaction between RFQ promotion scores and perceived relative risk associated with buses and DRT was negatively related to the choice of DRT ($b = -1.18, \ p < 0.05$), suggesting that the relationship between promotion focus and choice was moderated by risk perception. See Fig. 1. The interaction between RFQ prevention scores and age was positively related to the choice of DRT ($b = 0.04, \ p < 0.05$), implying that the relationship between prevention focus and choice was moderated by age. See Fig. 2. In addition, the relationship between perceived relative risk and choice reached statistical significance. Saying that DRT was riskier than bus was negatively related to the choice of DRT over bus ($b = -1.65, \ p < 0.05$).

Taken together, these results support a moderation concept, according to which (1) there is a relationship between regulatory focus and the choice of public transport mode (buses vs. DRT); (2) the relationship between promotion focus and choice is moderated by risk perception; and (3) the relationship between prevention focus and choice is moderated by age.

### 3.2.2. Private taxis versus DRT

Three concepts have been tested: moderation, mediation, and mediated-moderation. Of these three, mediated-moderation was the only one with significant effects. According to the mediated-moderation concept, there is a relationship between regulatory focus and choice of public transport mode, and this relationship is moderated by age and mediated by risk perception. To test for mediated moderation, a series of logistic regression models were evaluated (Baron and Kenny, 1986; MacKinnon et al., 2007). RFQ promotion scores, RFQ prevention scores, and gender were the independent variables, perceived relative risk associated with using taxis and DRT was a mediator (0-traveling by taxi is riskier than traveling by DRT, 1-traveling by DRT is riskier than traveling by taxi), and age was a moderator. The dependent variable was the participants’ self-reported choice of public transport mode (0-Taxi, 1-DRT).

First, the mediator (perceived relative risk associated with taxis and DRT) was regressed on RFQ promotion scores, RFQ prevention scores, gender, age, and the interaction between RFQ promotion scores and age. See Table 2. The interaction between RFQ promotion scores and age was negatively related to saying that traveling by DRT was riskier than traveling by taxi ($b = -0.05, \ p < 0.05$). See Fig. 3. In addition, RFQ promotion scores were positively related to saying that DRT was riskier than taxi ($b = 1.01, \ p < 0.05$).

Next, the choice between taxi and DRT was regressed on RFQ promotion scores, RFQ prevention scores, gender, age, and the interaction between RFQ promotion scores and age. See Table 3. The interaction between RFQ promotion scores and age was positively related to choosing DRT over taxi ($b = 0.03, \ p = 0.05$). See Fig. 4. Note that in this step, the perceived relative risk (the mediator) was not controlled for.

In the next step, the choice between taxi and DRT was regressed on RFQ promotion scores, RFQ prevention scores, gender, age, and the interaction between RFQ promotion scores and age, as well as on perceived relative risk associated with taxis and DRT (the mediator). See Table 4.

| Variable          | Coefficient | Std.Err. | z-statistic | P-value | Lower95% | Upper95% | VIF  | Std. coeff. |
|-------------------|-------------|----------|-------------|---------|----------|----------|------|-------------|
| Constant          | 0.81        | 0.26     | 3.07        | 0.00    | 0.30     | 1.33     | 0.08 |             |
| Promotion         | 0.23        | 0.32     | 0.71        | 0.48    | -0.40    | 0.85     | 2.79 |             |
| Prevention        | 0.16        | 0.16     | 0.95        | 0.34    | -0.17    | 0.48     | 1.08 |             |
| Age               | -0.02       | 0.01     | -1.33       | 0.18    | -0.04    | 0.01     | 1.08 |             |
| Gender_Male_Female| -0.27       | 0.26     | -1.02       | 0.31    | -0.78    | 0.25     | 1.02 | -0.07       |
| Riskier_Taxi      | -1.65       | 0.28     | -5.87       | 0.00    | -2.21    | -1.10    | 1.04 | -0.43       |
| Promotion X Riskier| -1.18   | 0.42     | -2.78       | 0.01    | -2.01    | -0.35    | 2.79 | -0.34       |
| Prevention X Age  | 0.04        | 0.01     | 3.05        | 0.00    | 0.02     | 0.07     | 1.02 | 0.25        |

Notes. Logistic regression model for predicted probability of choosing DRT over bus. R-squared (McFadden) 0.14, Adj.R-Sqr. 0.10.
Analysis of the results shows that the interaction between RFQ promotion scores and age was negatively related to the mediator (perceived relative risk associated with taxis and DRT), $b = 0.05, p < 0.05$ (see Table 2), and the mediator was negatively related to the dependent variable (choice of public transport mode between taxis and DRT), $b = 0.92, p < 0.05$ (see Table 4). In addition, the interaction between RFQ promotion scores and age was significantly related to choice when the mediator was uncontrolled, $b = 0.03, p = 0.05$ (see Table 3), but was not significantly related to choice when the mediator was controlled, $b = 0.02, p = 0.13$ (see Table 4). Together, these findings provide prima facie evidence for mediated-moderation. Specifically, the relationship between promotion focus and choice of public transport mode (taxis vs. DRT) is moderated by age and mediated by risk perception. An additional finding was that female (relative to male) participants were less likely to choose the DRT service over a private taxi, $b = 0.53, p < 0.05$ (see Table 4).

A sensitivity power analysis with an alpha significance criterion of 0.05 (two-tailed), a standard power criterion of 80%, an anticipated effect size of 0.15, and 7 predictors showed that the minimum required sample size was 103. The actual sample size was
Table 2
‘Of the two options, to travel by taxi or travel by demand responsive transport, which in your opinion would involve a greater risk to the health of passengers, given that COVID-19 is spreading so fast?’

| Variable                  | Coefficient | Std.Err. | z-statistic | P-value | Lower95% | Upper95% | VIF | Std. coeff. |
|---------------------------|-------------|----------|-------------|---------|----------|----------|-----|-------------|
| Constant                  | 1.40        | 0.23     | 6.06        | 0.00    | 0.95     | 1.86     |     |             |
| Promotion                 | 1.01        | 0.25     | 4.10        | 0.00    | 0.53     | 1.49     | 1.09| 0.37        |
| Prevention                | −0.16       | 0.17     | −0.94       | 0.35    | −0.50    | 0.18     | 1.06| −0.08       |
| Age                       | 0.00        | 0.01     | −0.07       | 0.94    | −0.03    | 0.02     | 1.07| −0.01       |
| Gender_0Male_1Female      | −0.30       | 0.28     | −1.08       | 0.28    | −0.86    | 0.25     | 1.00| −0.08       |
| Promotion X Age           | −0.05       | 0.02     | −2.70       | 0.01    | −0.08    | −0.01    | 1.03| −0.21       |

Notes. Logistic regression model for predicted probability of saying that DRT is riskier than taxi. R-squared (McFadden) 0.08, Adj.R-Sqr. 0.04.

Fig. 3. The interaction between RFQ promotion scores and age (Table 2) shows that the probability of saying that DRT is riskier than taxi decreases with increasing strength of promotion motivation for individuals older in age, but increases with increasing strength of promotion motivation for those younger in age (http://www.jeremydawson.co.uk/slopes.htm).

Table 3
‘If you had to decide between taxi and demand responsive transport, which would you choose these days when the COVID-19 pandemic is spreading rapidly throughout the world?’

| Variable                  | Coefficient | Std.Err. | z-statistic | P-value | Lower95% | Upper95% | VIF | Std. coeff. |
|---------------------------|-------------|----------|-------------|---------|----------|----------|-----|-------------|
| Constant                  | 0.53        | 0.19     | −2.84       | 0.00    | −0.90    | −0.16    |     |             |
| Promotion                 | 0.33        | 0.20     | −1.65       | 0.10    | −0.73    | 0.06     | 1.09| −0.12       |
| Prevention                | −0.15       | 0.15     | −0.96       | 0.34    | −0.45    | 0.15     | 1.06| −0.07       |
| Age                       | 0.00        | 0.01     | 0.18        | 0.85    | −0.02    | 0.02     | 1.07| 0.01        |
| Gender_0Male_1Female      | −0.46       | 0.25     | −1.85       | 0.06    | −0.96    | 0.03     | 1.00| −0.13       |
| Promotion X Age           | 0.03        | 0.02     | 1.99        | 0.05    | 0.00     | 0.06     | 1.03| 0.14        |

Notes. Logistic regression model for predicted probability of choosing DRT over taxi. The mediator (perceived relative risk) is not controlled for. R-squared (McFadden) 0.03, Adj.R-Sqr. 0.00.

302, nearly three times as large as the minimum required.

One final comment regarding the plot of the interactions: the interaction effects (Figs. 1–4) were plotted so that they could be interpreted visually. This was done by calculating predicted values of Y (dependent variable) under different conditions, high and low values of X (independent variable) and high and low values of Z (moderator), and showing the predicted relationship (simple slopes) between the X and Y at different levels of Z. To represent high and low values, a common method is to use values that are one standard deviation above and below the mean. For example, young age (Figs. 2–4) refers to age one standard deviation below the mean whereas old age refers to age one standard deviation above the mean. Note that to diminish multicollinearity between the interaction effects
4. General discussion

4.1. Models

The purpose of this study was to develop models to predict the choice of public transport mode under circumstances in which the COVID-19 pandemic was prevalent. In the case of buses versus DRT, the empirical data support a moderation concept according to which the relationship between promotion focus and the choice between bus and DRT is moderated by the perceived relative risk associated with the two transportation systems, whereas the relationship between prevention focus and the choice is moderated by age. See Fig. 5.

An in-depth analysis of the relationships in the model shows that the interaction between RFQ promotion scores and age (Table 3) shows that the probability of choosing DRT over taxi increases with increasing strength of promotion motivation for older people but decreases with increasing strength of promotion motivation for younger people. Note that perceived relative risk (the mediator) is not controlled for (http://www.jeremydawson.co.uk/slopes.htm).

Table 4

| Variable               | Coefficient | Std.Err. | z-statistic | P-value | Lower95% | Upper95% | VIF | Std. coeff. |
|------------------------|-------------|----------|-------------|---------|----------|----------|-----|-------------|
| Constant               | 0.17        | 0.29     | 0.60        | 0.55    | −0.39    | 0.74     |     |             |
| Promotion              | −0.18       | 0.21     | −0.83       | 0.40    | −0.59    | 0.24     | 1.17 | −0.06       |
| Prevention             | −0.19       | 0.16     | −1.18       | 0.24    | −0.50    | 0.12     | 1.06 | −0.09       |
| Age                    | 0.00        | 0.01     | 0.23        | 0.82    | −0.02    | 0.03     | 1.07 | 0.02        |
| Gender_0Male_1Female   | −0.53       | 0.26     | −2.08       | 0.04    | −1.04    | −0.03    | 1.01 | −0.15       |
| Promotion X Age        | 0.02        | 0.02     | 1.53        | 0.13    | −0.01    | 0.05     | 1.06 | 0.11        |
| Riskier_0Taxi_1DRT     | −0.92       | 0.29     | −3.20       | 0.00    | −1.48    | −0.36    | 1.09 | −0.22       |

Notes. Logistic regression model for predicted probability of choosing DRT over taxi. The mediator (perceived relative risk) is controlled for. R-squared (McFadden) 0.06, Adj.R-Sqr. 0.02.

and their constituent main effects all data pertaining to the continuously measured variables (RFQ promotion scores, RFQ prevention scores, and age) were centered to the mean.

4. General discussion

4.1. Models

The purpose of this study was to develop models to predict the choice of public transport mode under circumstances in which the COVID-19 pandemic was prevalent. In the case of buses versus DRT, the empirical data support a moderation concept according to which the relationship between promotion focus and the choice between bus and DRT is moderated by the perceived relative risk associated with the two transportation systems, whereas the relationship between prevention focus and the choice is moderated by age. See Fig. 5.

An in-depth analysis of the relationships in the model shows that the interaction between RFQ promotion scores and perceived relative risk associated with buses and DRT is negatively related to the choice of DRT. In general, the probability of choosing DRT over bus is lower for those saying DRT is riskier than bus relative to those saying bus is riskier than DRT. This makes sense. However, the important point is that the effect gets stronger with increasing strength of the promotion motivation. The analysis also shows that the interaction between RFQ prevention scores and age is positively related to the choice of DRT. For people older in age, the probability of choosing DRT increases with increasing strength of prevention motivation. The effect is reversed for people younger in age such that the probability of choosing DRT decreases with increasing strength of prevention motivation.

In the case of taxis versus DRT, the empirical data support a mediated-moderation concept, according to which the relationship
between promotion focus and the choice between taxi and DRT is moderated by age and mediated by the perceived relative risk associated with the two transportation systems. See Fig. 6.

An in-depth analysis of the relationships in the model reveals two different behavioral patterns, one for old people and one for the young. For old people, the probability of saying that DRT is riskier than taxi decreases with increasing strength of promotion motivation. As a result, the probability of choosing DRT over taxi increases with increasing strength of promotion motivation. For young people, the probability of saying that DRT is riskier than taxi increases with increasing strength of promotion motivation. As a result, the probability of choosing DRT over taxi decreases with increasing strength of promotion motivation.

4.2. Implications

The findings in this study have implications for public transport and public health. It is rather obvious that risk perception would play a role in the choice of public transport mode under pandemic conditions. What is not obvious, however, is that motivation in goal-pursuit plays a role in the choice process. And here is the thing. In addition to varying chronically across individuals, promotion focus and prevention focus can be induced temporarily in momentary situations (Scholer et al., 2019; Higgins, 1997; Crowe and Higgins, 1997; Higgins et al., 2001). This can be used by the authorities, in times of pandemic, to send promotion-focused messages and prevention-focused messages, to either encourage or discourage the use of specific public transportation system. The goal would be to minimize the risk of viral transmission through interpersonal contact that may occur while using public transport.

One of the main findings in this study is that the probability of choosing DRT over bus is lower for those saying DRT is riskier than bus (relative to those saying bus is riskier than DRT). This is understandable. What is more important is that the effect gets stronger with increasing strength of promotion motivation. Given that buses are bigger vehicles relative to DRT minivans, and are thus less risky (easier to maintain social distancing while on a bus), authorities should temporarily, under COVID-19 conditions, encourage the public to use buses more often and DRT less often. To encourage the public to use buses more often, promotion-focused messages should be sent. This will decrease the likelihood of choosing DRT. This implication is particularly relevant given the role of mass media in the promotion of public health. “Public transport! Only with buses we can maintain social distancing” and “We take the bus and we win the battle against the virus” are two examples of promotion-focused messages. “Public transport! Only with buses we can avoid close contacts” and “We take the bus and we do not lose the battle against the virus” are two examples for prevention-focused messages. Although all messages encourage the use of buses, this study suggests that the former two are more effective messages as compared.
Another finding is that the probability of choosing DRT over buses decreases with increasing strength of prevention focus for people younger in age (but increases with increasing strength of prevention focus for those older in age). If the goal is to encourage the public, as long as the pandemic is still spreading, to use buses more often, then, prevention-focused massages should be sent to the young public (but not to the older public). Therefore, two distinct communication strategies should be applied, one for the young public (prevention-focused messages), and one for the older public (promotion-focused messages).

Given that a private taxi usually takes one passenger at a time and DRT systems serve multiple passengers, then, private taxis would be considered less risky. Therefore, public health authorities should temporarily, under COVID-19, encourage the public (those who can afford it) to use private taxis more often and DRT less often. For old people, the probability of choosing DRT over taxi increases with increasing strength of promotion motivation. Therefore, the right strategy would be to send the older population prevention-focused messages. For young people, the probability of choosing DRT over taxi decreases with increasing strength of promotion motivation. Therefore, the right strategy would be to send the younger population promotion-focused messages.

The findings reported in the current study involve a choice between buses and DRT and a choice between public taxis and DRT. It should be noted, however, that an additional analysis was performed regarding the choice between bus and taxi. There was no evidence in this analysis for any relationship between regulatory focus and choice. A potential explanation might be that the choice between bus and DRT and the choice between taxi and DRT both involve a relatively new mode of public transport. DRT systems use smart algorithms to offer a new experience and an innovative service to the public. Openness to experience and the readiness to embrace innovation and technology, as well as the preference for change over stability are all positively associated with regulatory focus (Scholer et al., 2019). If this is the case, then this might explain why regulatory focus plays no role in the choice between bus and taxi, but does play a role in the choice between bus and DRT and between taxi and DRT.

Fig. 6. The relationship between promotion focus and the choice between taxi and DRT is moderated by age and mediated by the perceived relative risk associated with the two transportation systems.
4.3. Limitations

A limitation of this work is that it was based on self-report. Participants were asked to indicate their choice of public transport mode. Relying on self-reported data may raise questions about the validity of the methodology. Nevertheless, it is assumed that people, in general, know how they would choose in actual situations, and that they have no reason to mask their preferences. Another limitation stems from the fact that respondents were recruited with the help of graduate students. Recruiting participants in this way may yield a sample that is not representative of the general population.

4.4. Future research

This study focused on buses, private taxis, and DRT systems. However, many cities worldwide offer different transportation systems in addition to those being studied in the current work. A direction for future research will be, therefore, to examine the impact of public health crises such as COVID-19 on the relationship between regulatory focus and choice among other public transport systems (e.g., trains, subways, trams). In addition, it will be interesting to explore the impact of global pandemics on the relationship between regulatory focus and the choice between public transportation and private cars.

4.5. Concluding remarks

This research supports the proposal that under global pandemic the choice of public transport mode is affected by regulatory focus. In so doing, this work contributes to the understanding of travel behavior under extreme conditions, thus promoting public health. Furthermore, by introducing the theory of regulatory focus to the readers, this research provides a new framework in which to progress the science of transport and health.

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Author statement

I am the only author of this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jth.2021.101238.

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