

# A SELF-PERCEPTION THEORY META-ANALYSIS OF THE HABIT-BREAKING IMPACTS OF COVID-19 TRAVEL RESTRICTIONS IN SOUTH AFRICAN CITIES

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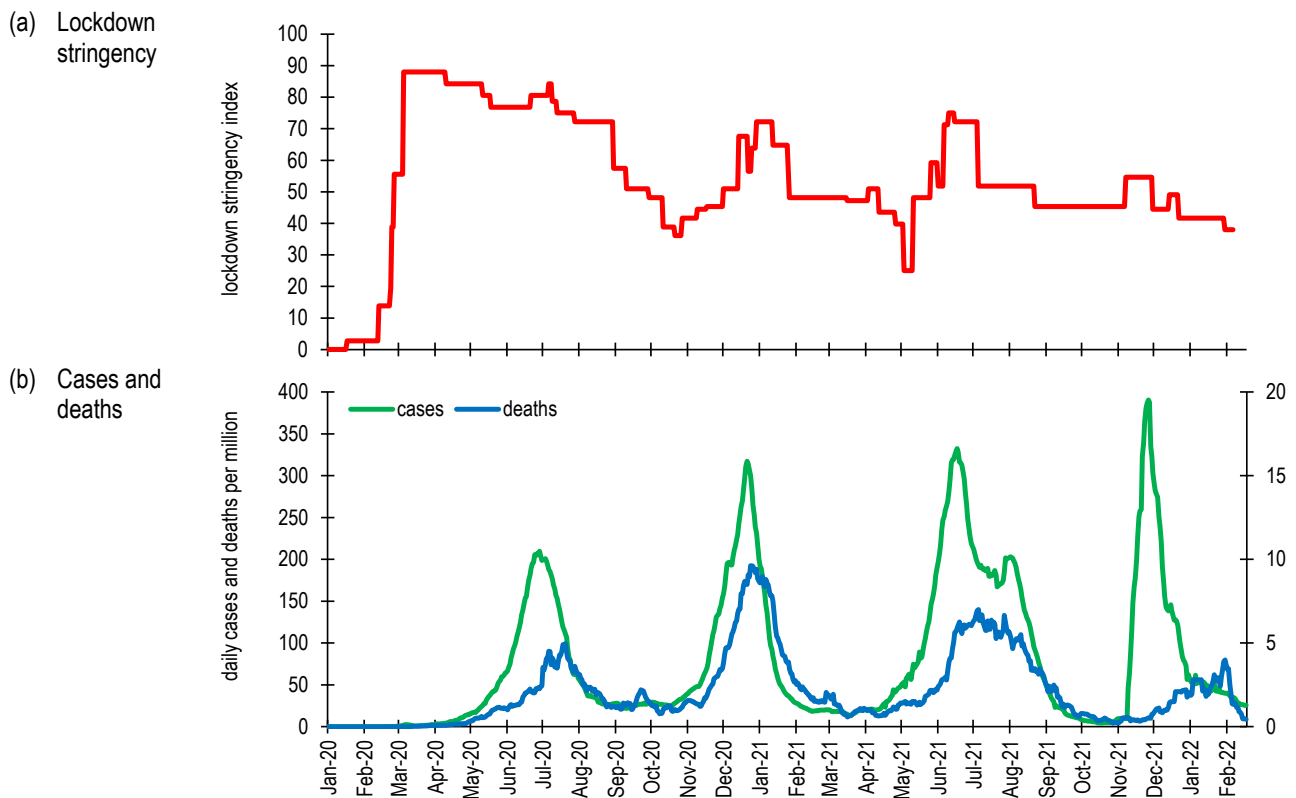
## ABSTRACT

In contrast to behavioural theories which argue that attitude informs intention and subsequently behaviour, 'self-perception theory' posits that, in instances of temporarily imposed restrictions or incentives, behaviour can inform attitude. If the experience of the new behaviour is positive, attitude may become more favourable, and as a result the changed behaviour may endure after the period of imposed change has lapsed. COVID-19 lockdowns in South Africa introduced a form of temporarily imposed travel restrictions. So, could COVID-19 lockdown regulations, which necessitated an increase in online activity, change attitudes towards remote activity participation? Further, could such a changed attitude lead to enduring trip substitution after restrictions are removed? Using the theoretical framework of self-perception theory, this paper undertakes a meta-analysis of four surveys to explore the prospects of enduring disruptions to pre-pandemic travel habits. The surveys were all conducted online at different lockdown levels, with small non-probability samples. Age cohort analysis of the (n=300) fused dataset suggests that the experience of greater remote activity participation and trip substitution amongst the sample of adult South African respondents was positive, this experience made attitudes toward these behaviours more favourable, and intentions to break pre-pandemic travel habits have been formed.

## 1. INTRODUCTION

The Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), which came to be known as COVID-19, began to spread across the world in early 2020. After the World Health Organisation declared it a pandemic on 11 March 2020, countries attempted to curb contagion by implementing lockdown restrictions. By the end of March 2020, most countries had implemented lockdown regulations which required activities such as work, education, and exercise, among others, to be carried out remotely, and imposed restrictions on the use of public transport services.

On 26 March 2020, South Africa implemented one of the 'harder' lockdowns in Africa, with an initial stringency index of 88 (see Figure 1(a)). The 'lockdown stringency index', developed by the Oxford Coronavirus Government Response Tracker project, is the mean score of nine response metrics: school closures; workplace closures; cancellation of public events; restrictions on public gatherings; closures of public transport; stay-at-home requirements; public information campaigns; restrictions on internal movements; and international travel controls (Hale *et al* 2022). Scores take a value between 0 and 100, with 100 the most severe lockdown.



Data Sources: Our World in Data (<https://ourworldindata.org/coronavirus>); Centre for Systems Science and Engineering (<https://www.arcgis.com/apps/dashboards/bda7594740fd40299423467b48e9ecf6>)

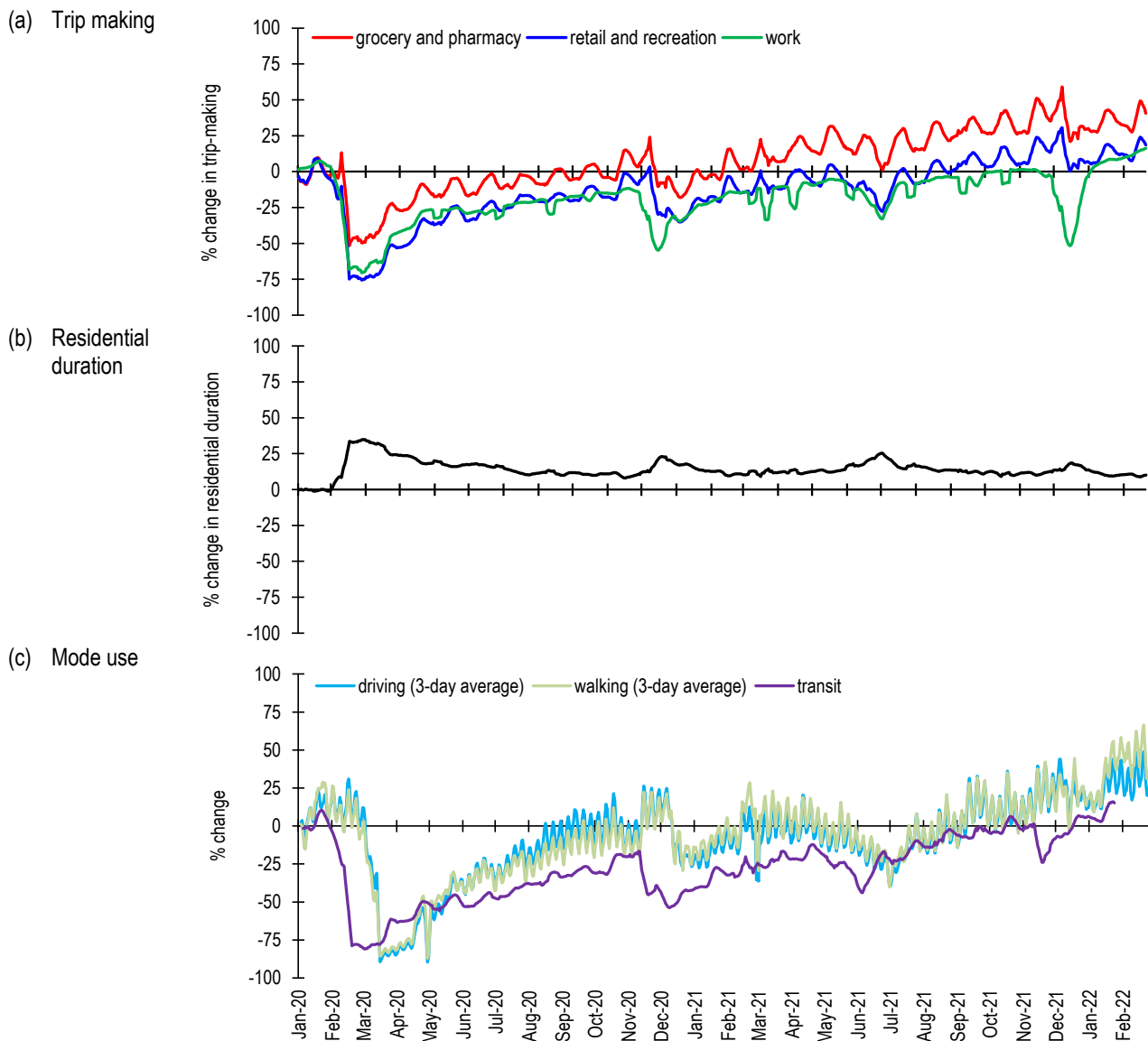
**Figure 1: South African COVID-19 contagion and lockdown stringency**

South African lockdown regulations were set at five levels of severity (Behrens and Newlands 2021). The first, most stringent level (Level 5), ended on 31 April 2020. At this level, movement outside of the home was restricted, apart from trips for essential groceries and medical care. Public transport services were suspended, except for bus or minibus-taxi services transporting essential workers, and even then, could only operate within truncated service spans and at 50% vehicle occupancy.

From 1 May 2020, the country began to move to lower levels of lockdown. During Levels 4 and 3, minibus-taxis were permitted to operate at 70% capacity, on the condition that all occupants wore masks and sanitised their hands, and that all windows remained open. During Level 2, train services resumed at 70% capacity, and bus and minibus-taxi services were permitted to operate at 100% vehicle capacity (Bruwer *et al* 2021). The less stringent lockdown levels allowed for varying degrees of individual movement, and non-essential businesses and shops were allowed to open.

At the time of writing (May 2022), South Africa had recorded the highest number of COVID-19 cases in Africa, recording up to 390 daily cases per million population at the peak of its fourth wave in December 2021 (see Figure 1(b)).

During the pandemic, Google has assembled data on trip-making from the location-tracking functionality of smartphones (and other mobile devices), with trip purposes imputed from land-use geographical information overlays. Apple has similarly assembled data from mode-specific wayfinding requests. The shortcoming of these secondary big datasets is that they are limited to a subset of the population that uses smartphones, and therefore skewed towards wealthier socio-economic groups.



Data sources: Google COVID-19 Community Mobility Reports (<https://www.google.com/covid19/mobility/>); Apple Mobility Trends Reports (<https://covid19.apple.com/mobility>)

- Notes:
1. The before lockdown baseline (i.e., the 0 value on the vertical axis) was set as the median value for each day of the week, calculated from daily measurements over a five-week period between 3 January and 6 February 2020.
  2. 'Grocery and pharmacy' trips are to destinations like grocery markets, farmers markets, specialty food shops, drug stores, and pharmacies.
  3. 'Retail and recreation' trips are to destinations like restaurants, café, shopping centres, theme parks, museums, libraries, and movie theatres.
  4. 'Transit' trips are to destinations like public transport service hubs such as subway, bus, and train stations. These data are skewed in contexts where the origins of public transport trips are often not formal public transport interchanges, ranks, stations, or stops. In such contexts, the loss of passengers experienced by formal and informal operators may be dissimilar.

**Figure 2: Changes in (imputed) trip making, time spent at home, and mode use**

Notwithstanding this limitation, Figure 2(a) suggests that, in the short-term, reduction in trips before and after the introduction of lockdown restrictions in South Africa varied by purpose. Trips to workplaces reduced by around 70%, returning to baseline frequencies after 20 months. Essential shopping trips reduced by around 50%, returning to baseline frequencies after eight months. Non-essential shopping and recreation trips reduced by around 75%, with a return to baseline frequencies occurring later than essential shopping trips, at 13 months. Figure 2(b) presents the corollary of part (a). It illustrates that as trips

to out-of-home activities were foregone (and to some extent substituted for remote work, education, social, entertainment, etc. activities), the amount of time people spent at home increased. At the time of writing (May 2022), residential duration had not returned to baseline levels.

Insight into changes in mode use is illustrated in Figure 2(c). Apple wayfinding request data suggest that public transport service restrictions led to a relative increase in trip-making by car and on foot. After six and seven months respectively, car and walking trip wayfinding requests exceeded pre-pandemic levels.

The aim of this paper is to explore the question: could lockdown movement restrictions and mandatory remote activity participation lead to enduring disruptions of pre-pandemic travel habits after restrictions are removed? The paper undertakes a meta-analysis of four online surveys of adult South Africans, administered during different lockdown levels. Fusing the small non-probability samples of the individual surveys enables greater accuracy in combined data analysis.

The paper is divided into five sections. In the following section a theoretical framework to guide the investigation is discussed. Section 3 describes the methods employed in the four individual surveys, as well as in the meta-analysis of their datasets. Section 4 presents the findings of the meta-analysis. Section 5 discusses findings and draws conclusions.

## **2. THEORETICAL FRAMEWORK**

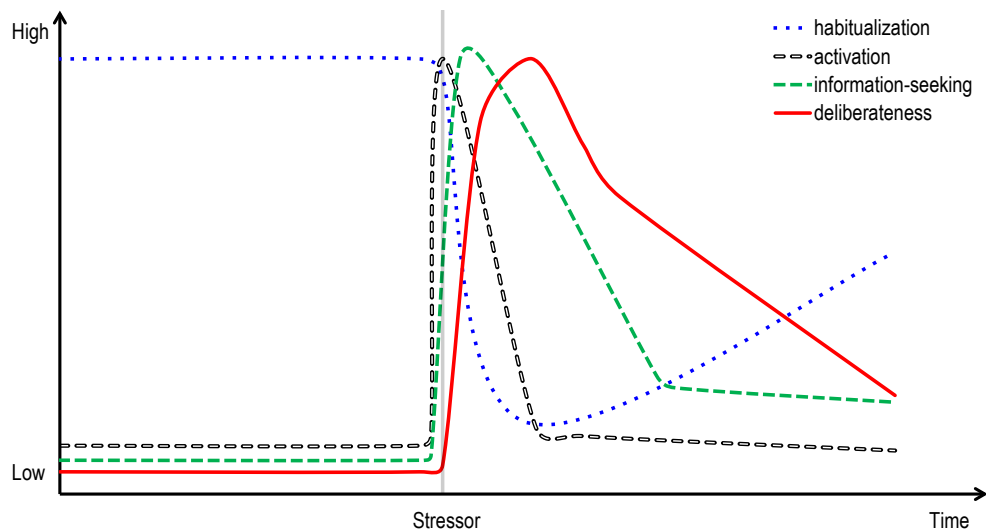
The theoretical framework used to guide this investigation draws from two strands of theory. The first relates the formation and breaking of habits. The second relates to the link between attitude and behaviour.

### 2.1 Habit Formation and Breaking

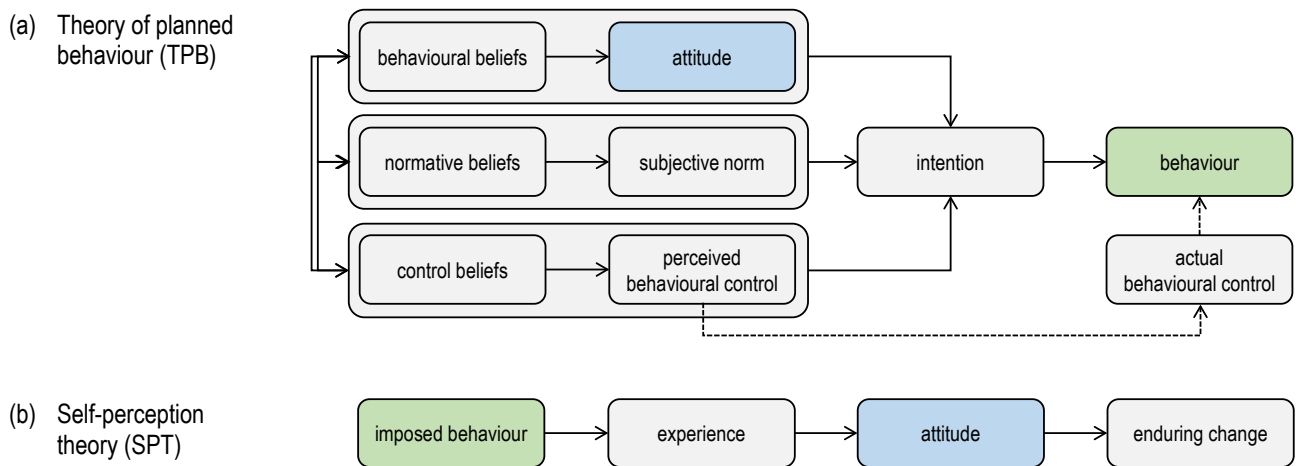
It is posited that individuals do not deliberately reappraise all aspects of their travel decisions on a trip-by-trip basis. If a travel choice has proven in past experiences to be of benefit, or at least satisfactory, to the trip-maker, that travel choice becomes habitual (Verplanken *et al* 1997, Gärling and Axhausen 2003). This conversion from deliberate decision-making to habit is described as a transition from 'preference-based' to 'script-based' choices (Fujii and Gärling 2003). Travel habits are broken typically when some form of stressor event (e.g., changes in employment, residence, and car ownership) occurs, or is anticipated, which activates deliberateness and information-seeking (see Figure 3) and leads to another 'preference-based', potentially habit-forming, decision (Verplanken *et al* 2008, Adjei and Behrens 2013, Scheiner and Holz-Rau 2013).

### 2.2 Attitude and Behaviour

In contrast to most other behavioural theories, which argue that attitude informs intention and subsequently behaviour (e.g., the Theory of Planned Behaviour, Ajzen 1991), Self-Perception Theory (Bem 1972) posits that in instances of imposed travel restrictions or incentives (e.g., car use bans during megaevents or public transport fare reductions) behaviour can inform attitude (see Figure 4). If the experience of the new behaviour is positive, attitude may become more favourable, and as a result the changed behaviour may endure after the period of imposed change has lapsed.



**Figure 3: Conceptualisation of the influence of a stressor on habituation and deliberateness in travel habit-breaking (after Klöckner 2004:4)**



**Figure 4: Contrasting TPB and SPT relationships between attitude and behaviour**

### 2.3 Research Questions

In terms of habit-breaking theory, lockdown regulations introduced a form of temporarily imposed travel restrictions that clearly represent a stressor event in which previous travel behaviour patterns no longer met requirements. In terms of self-perception theory, the analysis of secondary big data presented in Figure 2 illustrates that imposed restrictions did change behaviour significantly. These theories of habit formation and behaviour change therefore facilitate the identification of a further set of sub research questions:

- Was the experience of greater remote activity participation and trip substitution positive?
- Did experience of remote activity participation and trip substitution change attitudes?
- Have behavioural intentions to break pre-pandemic travel habits, after mandatory remote activity participation and movement restrictions are removed, been formed?

### 3. RESEARCH METHOD

The research involved undertaking a meta-analysis of four unfunded surveys (in which one or more of the co-authors were involved) with small non-probability samples. The surveys were administered during COVID-19 lockdown when face-to-face interviewing was not permitted.

#### 3.1 Survey Data Collection

The first survey took the form of a panel and was administered in a sign-up and three waves between June and November 2020 (Amaris *et al* 2022). The survey instrument took the form of an online questionnaire (using *Qualtrics* software). The questionnaire included questions relating to attitudes and behaviours regarding a variety of trip purposes at different lockdown levels. Sampling took the form of non-random, non-probability 'snowballing', incentivised by a raffle prize. The first sign-up survey (June 2020) yielded 232 respondents. Through respondent attrition, this sample declined to 162 in wave 1 (September 2020), 120 in wave 2 (October 2020), and 88 in wave 3 (November 2020). The same basic survey was administered in Australia, Colombia, and the United Kingdom.

The second, third and fourth surveys were cross-sectional, administered in October 2021 (Ainebyoona 2021, Tshoko 2021, Maunick 2021). The survey instruments took the form of online questionnaires (using *SurveyMonkey* software). The questionnaires all included questions relating to socio-economic status. The second survey questionnaire focussed on attitudes and behaviours relating to trips to workplaces before, during, and after the COVID-19 pandemic. The third survey questionnaire focussed on attitudes and behaviours relating to business and conferencing trips. The fourth survey questionnaire focussed on attitudes and behaviours relating to trips for shopping and personal business purposes. Sampling took the form of non-random, non-probability 'snowballing'. The final database of the second survey included 110 respondents, recruited primarily from Cape Town (80%). The databases of the third and fourth surveys included 51 respondents each, recruited primarily from Cape Town (65% and 73% respectively).

#### 3.2 Meta-Analysis

Meta-analysis of the four surveys involved identifying common questions and data fields in the individual databases, and then fusing them into a combined flat-file database. Where necessary, data field coding was standardised. The data fields were grouped into three categories:

- Socio-economic characteristics.
- Attitudes and behaviours before the pandemic.
- Attitudes and behaviours during the more stringent level 5 lockdown regulations (Level 4 in the case of survey 3: business meetings and conferencing).
- Attitudes and behaviours during the less stringent level 1 lockdown regulations.
- Attitudes and behavioural intentions after the pandemic.

Data analysis was primarily organised around four commonly recognised age cohorts:

- Boomers (born between 1946 and 1964, and aged 58-76 years).
- Gen X (born between 1965 and 1980, and aged 42-57 years).
- Millennials (born between 1981 and 1996, and aged 26-41 years).
- Gen Z (born between 1997 and 2012, and aged 10-25 years).

The rationale for undertaking age cohort analysis was a proposition that the generational differences in digital technology adoption, that have been commonly observed in studies elsewhere (e.g., Barbosa Neves and Vetere 2019, Beldona 2005, Yang and Jolly 2008), would be relevant in this study too. While not producing counter-intuitive results, the 'Boomers' age cohort is omitted in the presented age cohort analysis because the sub-sample size (n=18) was small.

### 3.3 Limitations

The rationale for the meta-analysis undertaken was that combining the non-probability samples of the four individual surveys would produce a larger fused sample and enable greater accuracy in combined data analysis. The fusing of four small non-probability samples into a larger sample, however, does not produce a statistically representative sample. The larger fused dataset remains a non-probability sample, even if data analysis results are a more accurate reflection of broader trends. The research findings are therefore only indicative, not representative, of the South African adult population.

**Table 1: Combined respondent sample socio-economic and demographic characteristics (n=300)**

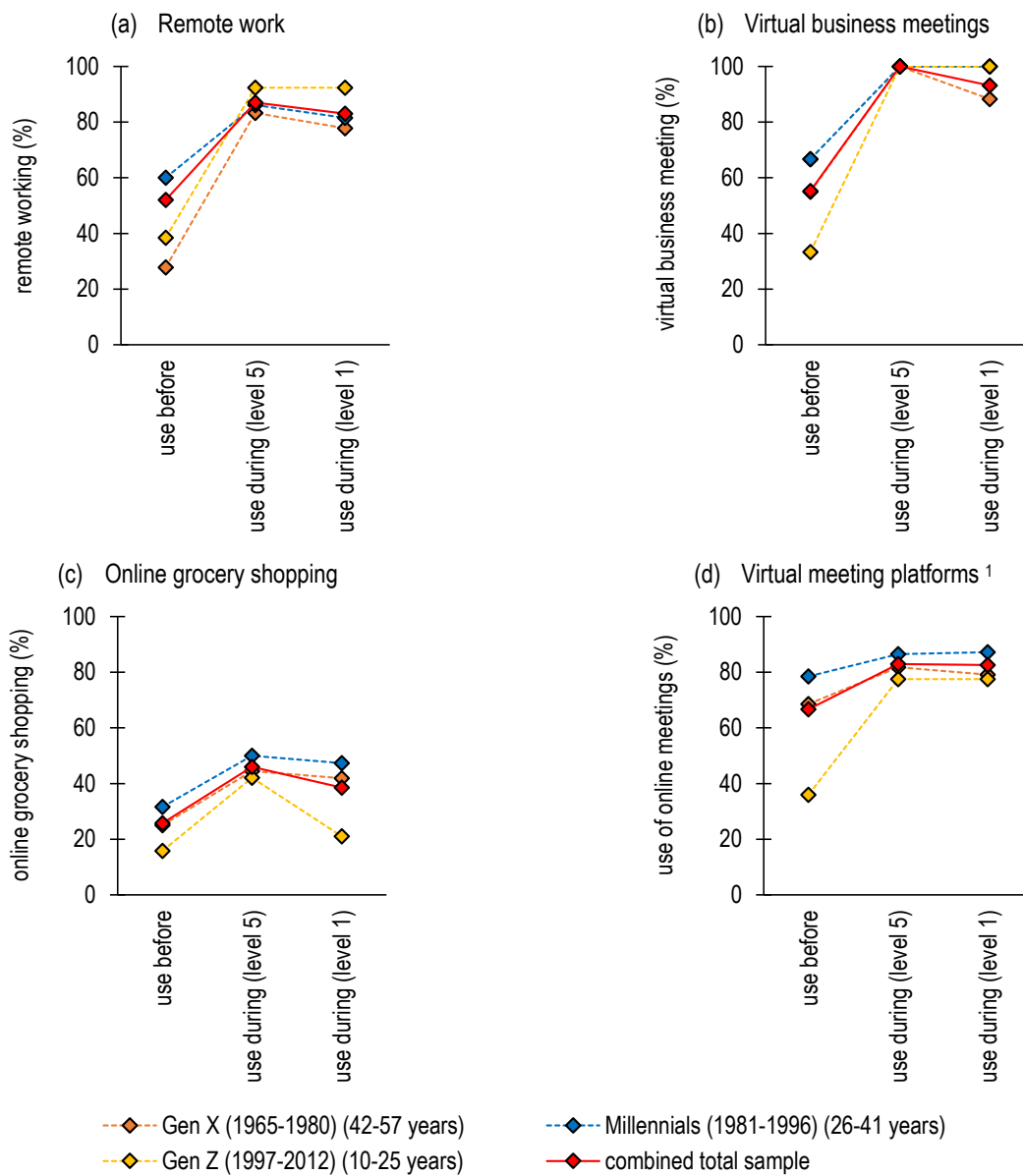
		S1 PANEL W3	S2 WORK	S3 BUSINESS	S4 SHOPPING	COMBINED TOTAL
Sample size (n)		88	110	51	51	300
Age cohort (%)	Boomers (1946-1964) (58-76 years)	5	5	12	8	6
	Gen X (1965-1980) (42-57 years)	25	17	43	18	24
	Millennials (1981-1996) (26-41 years)	23	61	16	35	38
	Gen Z (1997-2012) (10-25 years)	0	15	29	37	17
	item non-response	48	3	0	2	15
Sex (%)	male	42	50	55	no data	49
	female	39	50	43	no data	44
	other	1	0	2	no data	1
	Item non-response	18	0	0	no data	6
Household car access (%)	access	89	26	no data	27	48
	no access	11	74	no data	73	52
Employment status (%)	employed full-time	69	86	88	53	76
	employed part-time	9	12	6	0	8
	unemployed	8	0	0	0	2
	student	6	0	0	43	9
	retired	2	0	0	2	1
	other	2	0	0	2	1
	item non-response	3	2	6	0	3
City (%)	Cape Town	no data	80	65	73	53
	Gauteng city region	no data	15	12	10	9
	Durban	no data	3	4	10	3
	other	no data	2	16	4	4
	unknown	no data	0	4	4	31

## 4. RESEARCH FINDINGS

Research findings are discussed in terms of: the socio-economic characteristics of survey respondents; reported remote activity participation behaviours and attitudes; and intended future remote activity participation and trip substitution.

### 4.1 Socio-Economic Characteristics

Table 1 presents the socio-economic characteristics of respondents in the individual surveys and the (n=300) combined sample. The bulk of respondents (62%) were aged between 26 and 57 years. There were slightly more male respondents than females (49% vs 44%), and a fairly even split between respondents with and without access to the use of a motor car in their household (48% vs. 52%). Most respondents were employed full-time (76%), and most respondents lived in Cape Town (at least 53%).



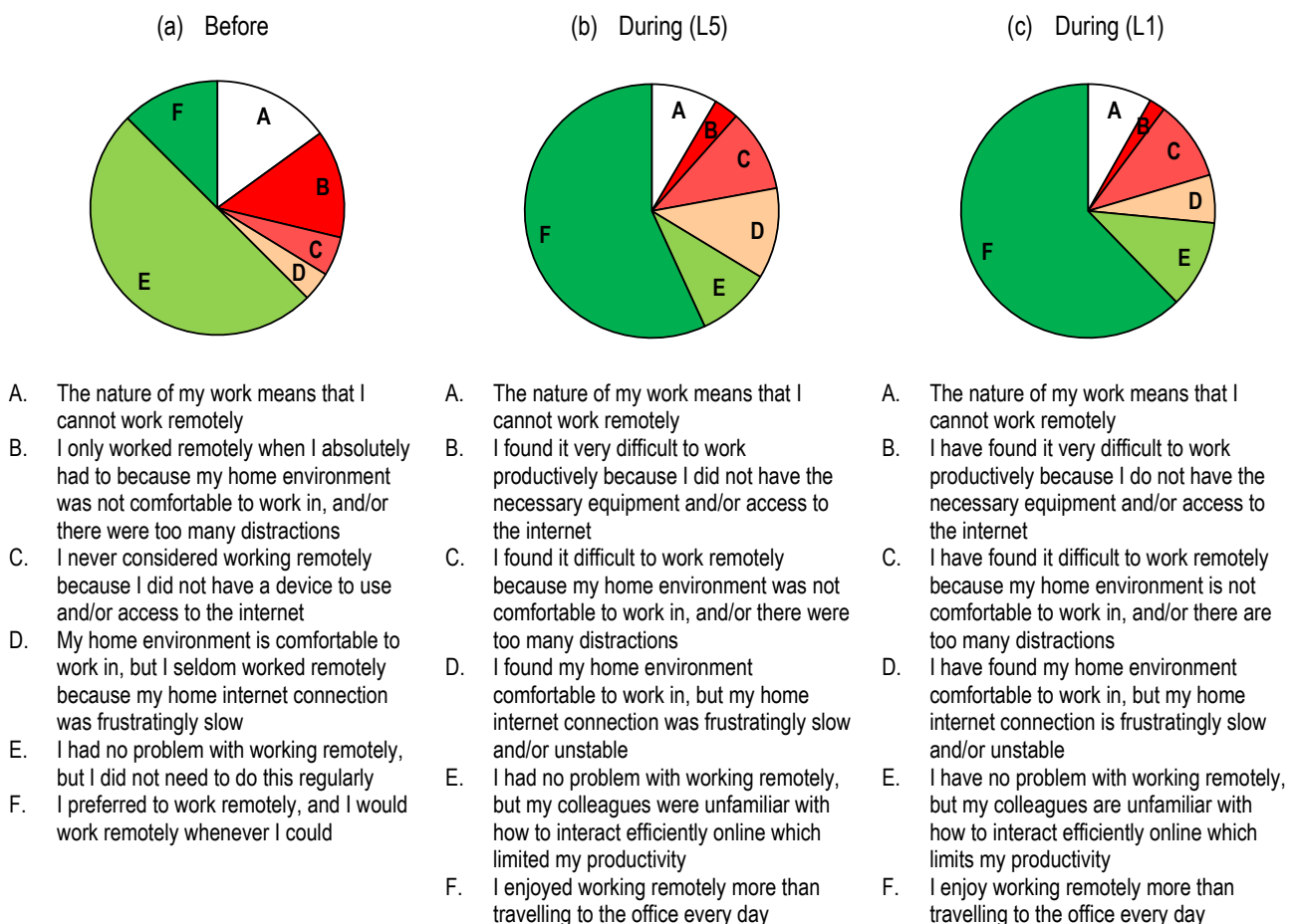
**Figure 5: Before and during pandemic remote activity participation, by age cohort (n=300)**



## 4.2 Reported Remote Activity Participation Behaviours and Attitudes

Figure 5 presents findings with respect to self-reported participation in remote activities before and during the COVID-19 pandemic. Parts (a) and (b) illustrate a similar and consistent pattern of working remotely and engaging in virtual business meetings. All age cohorts increased remote participation dramatically in the earlier, more stringent, lockdown, declining slightly in the later, less stringent, lockdown period. Millennials (26-41 years) reported engaging in work and business meetings remotely before the pandemic the most, and Gen Z (10-25 years) and Gen X (42-57 years) the least. The former presumably because, despite their tech savvy, they are least likely to have held full-time employment.

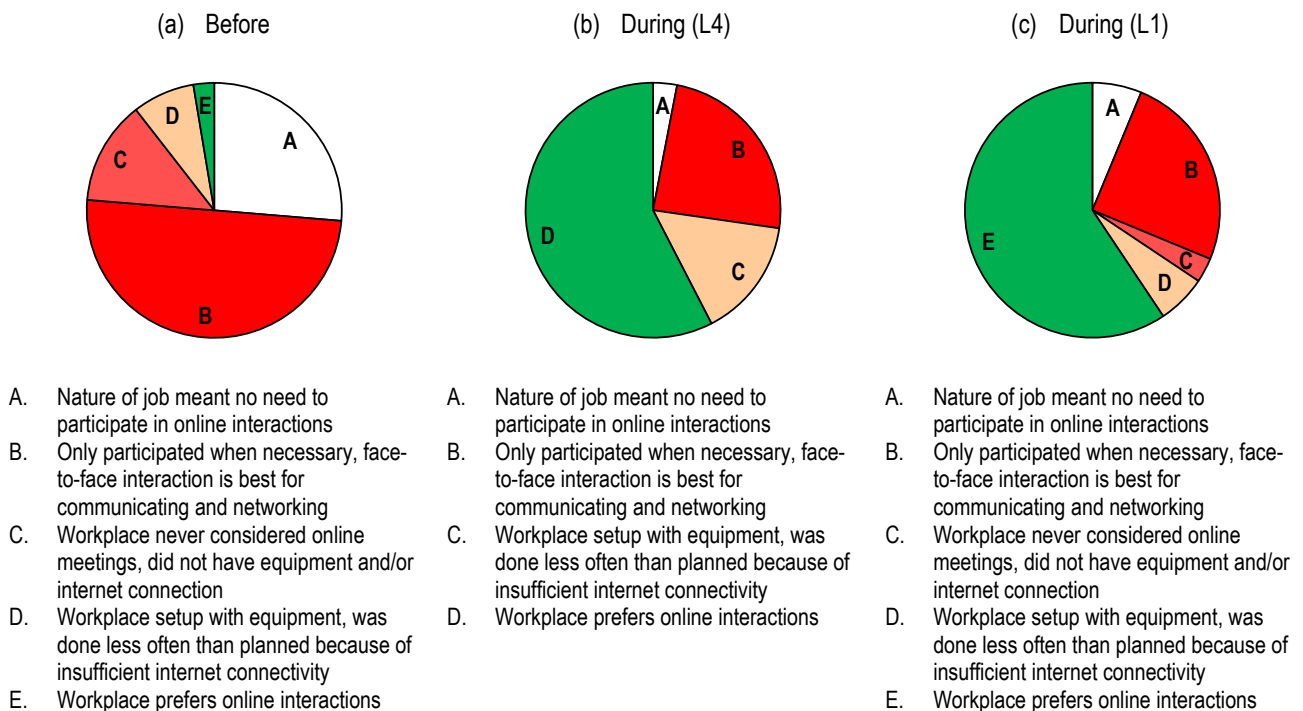
Changing attitudes towards remote working are illustrated in Figure 6(a-c). The proportion of respondents who found working remotely difficult or impossible declined between the before and after periods, while the proportion of respondents who enjoyed working remotely increased significantly. In the before period, a significant proportion of respondents indicated that they were willing to work remotely, but seldom needed to. This suggests that many respondents had a reasonably favourable attitude towards remote work before the pandemic, even if this was not acted upon.



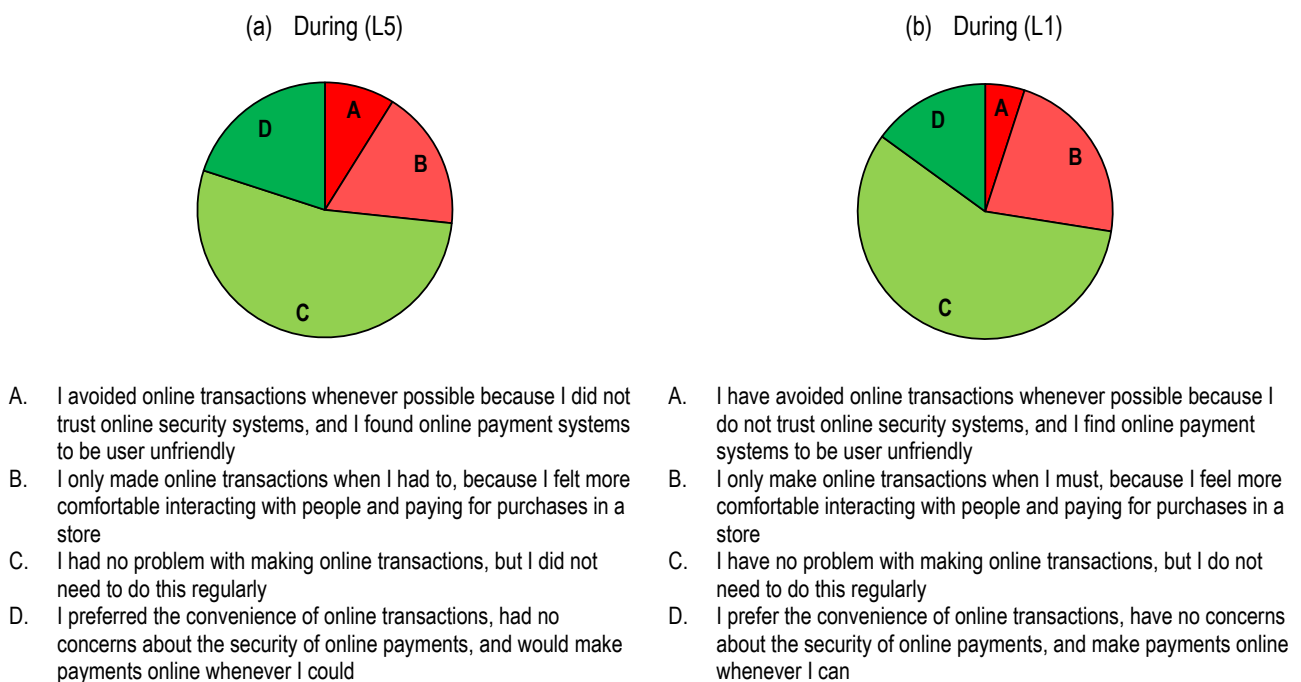
**Figure 6: Before and during pandemic attitudes towards remote working (n=110)**

Figure 5(d) corroborates the pattern observed in Figure 5(b), illustrating a significant increase in the use of virtual business meeting platforms (*Skype, Zoom, Microsoft Teams, and Google Meet*), and the least use of these platforms before the pandemic amongst the Gen Z (10-25 years) respondents. In contrast to meeting platforms, surprisingly, it was

found that the use of *WhatsApp* and *Skype* remained constant amongst the respondent sample before and during lockdown. Changing attitudes towards online business meetings are illustrated in Figure 7(a-c). As in the case of remote working, the proportion of respondents who found online meetings undesirable declined between the before and after periods, while the proportion of respondents who indicated their employers preferred online interaction increased significantly.



**Figure 7: Before and during pandemic attitudes towards online business (n=51)**

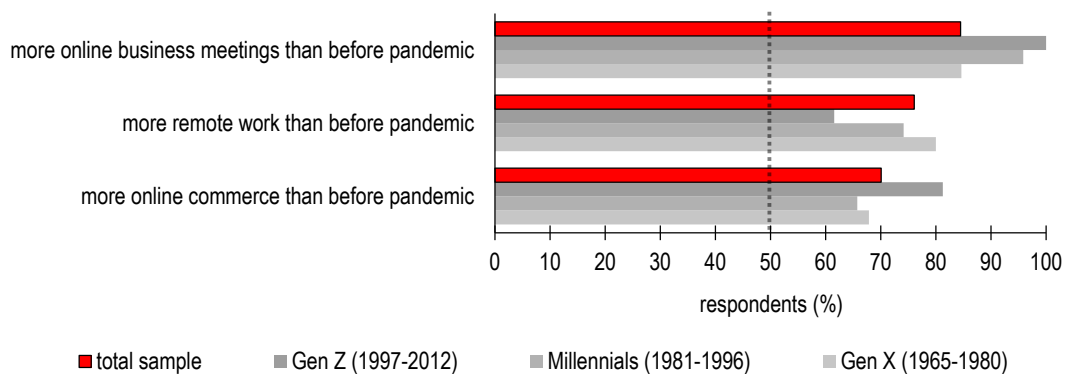


**Figure 8: Before and during pandemic attitudes towards online commerce (n=51)**

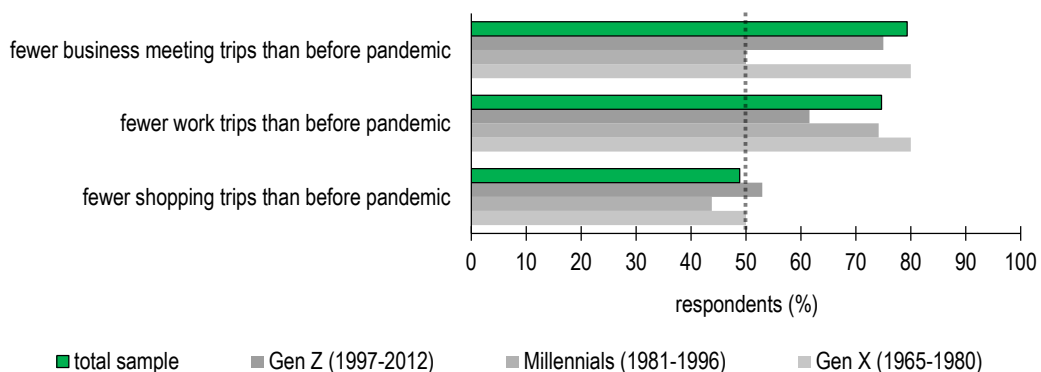
Figure 5(c) illustrates a different pattern of online grocery shopping uptake compared to remote work and virtual business meetings, but a consistent relative uptake across age cohorts. Less than 50% of the respondents reported using online grocery shopping services during the lockdown period, which is considerably lower than the uptake of remote working and virtual business meetings. Attitudes towards online shopping during lockdown are illustrated in Figure 8(a-b). The minority proportion of respondents who avoided online transactions whenever possible, decreased.

### 4.3 Intended Remote Activity Participation and Trip Substitution

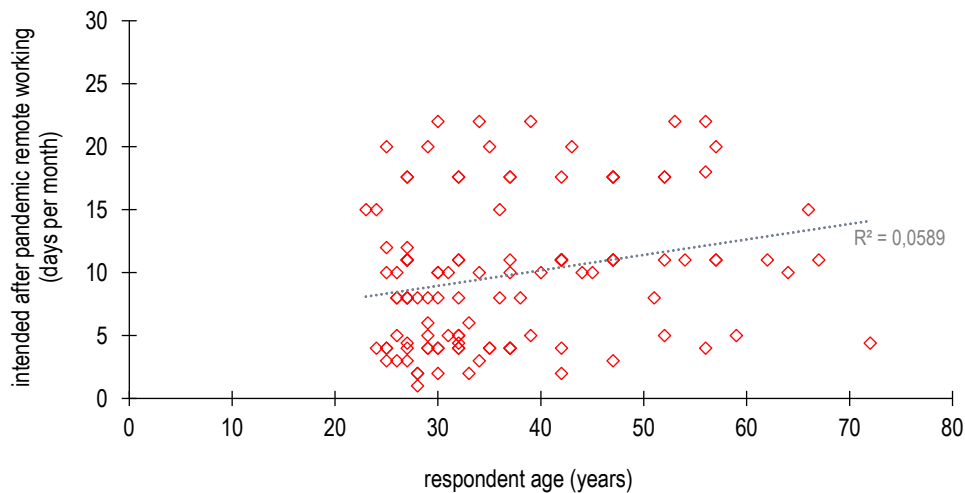
Figure 9 reports intended continuation with remote activity participation practices after the pandemic, while Figure 10 reports intentions regarding associated trip substitution. Respondents indicated a general intention to increase all forms of remote activity participation relative to before the pandemic. The greatest intention to increase remote participation was reported for business meetings (84%), followed by work (76%), and shopping (70%). Associated intended trip substitution was, commensurately, highest for business meetings (79%), followed by work (75%), and shopping (49%). Figure 11 drills deeper into work trip substitution intentions by testing whether there is a correlation between age and the extent of intended substitution. No such correlation was found ( $R^2=0,0589$ ).



**Figure 9: After pandemic intentions to increase remote activity participation, by age cohort (n=300)**



**Figure 10: After pandemic intentions to decrease trip-making, by age cohort (n=300)**



**Figure 11: After pandemic intentions to substitute work trips for remote working, by age (n=300)**

## 5. CONCLUSION

This paper set out to explore whether lockdown movement restrictions and mandatory remote activity participation might lead to enduring disruptions of pre-pandemic travel habits. Drawing from habit formation and self-perception theories, the COVID-19 lockdown is conceptualised as a potentially habit-breaking stressor event which imposed behaviour modification. The sub research questions explored in the paper included whether the experience of greater remote activity participation and trip substitution during lockdown was positive, whether experience of remote activity participation and trip substitution changed attitudes, and whether longer term behavioural intentions to break pre-pandemic travel habits have been formed. Because of non-random non-probability sampling, the meta-analysis results can only be interpreted as indicative, rather than representative of the South African population.

With regard to whether the experience of greater remote activity participation and trip substitution was positive, the meta-analysis indicated that it was. With regard to whether experience changed attitudes, the meta-analysis indicated that it has, noting however that many respondents indicated that their reason for not working remotely was not necessarily because of a negative attitude, but more because they did not need to. The greatest change was observed amongst the Gen Z (10-25 years) age cohort, presumably because they are not yet fully integrated into the workforce. With regard to whether intentions to break pre-pandemic travel habits have been formed, the meta-analysis indicated the majority of respondents intend to engage in greater remote work, business meeting and shopping, and that, with the exception shopping trips, the majority intend to undertake fewer trips for these purposes. Intentions of course do not always translate into enduring actions, so tracking future behavioural change over time will be important.

## 6. ACKNOWLEDGEMENTS

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