Assessing the Relationships Between Capability, Opportunity, Motivation, and Behaviour of People During COVID-19 Lockdown in Great Britain: A Retrospective Analysis of a National Survey

Saval Khanal , Kelly Ann Schmidtke * , Kaloyan Haralampiev , Ivo Vlaev *

Posted Date: 24 July 2024

doi: 10.20944/preprints202407.1877.v1

Keywords: behaviour; COVID-19; nudge system thinking; retrospective; United Kingdom

Article

Assessing the Relationships between Capability, Opportunity, Motivation, and Behaviour of People during COVID-19 Lockdown in Great Britain: A Retrospective Analysis of a National Survey

Saval Khanal [1], Kelly Ann Schmidtke [2,*], Kaloyan Haralampiev [3] and Ivo Vlaev [4,*]

[1] Health Economics Consulting, University of East Anglia, East Anglia, United Kingdom; S.Khanal@uea.ac.uk; https://orcid.org/0000-0001-5201-0612

[2] Liberal Arts, University of Health Sciences and Pharmacy, St. Louis, United States; Kelly.Schmidtke@uhsp.edu; https://orcid.org/0000-0001-5993-0358

[3] Sofia University, St. Kliment Ohridski, Bulgaria; k_haralampiev@phls.uni-sofia.bg; https://orcid.org/0000-0001-7430-1867

[4] Warwick Business School, University of Warwick, Coventry, United Kingdom; Ivo.Vlaev@wbs.ac.uk; https://orcid.org/0000-0002-3218-0144

* Correspondence: **Authors:** Kelly Ann Schmidtke and Ivo Vlaev; Email: Kelly.Schmidtke@uhsp.edu; ivo.vlaev@wbs.ac.uk

Abstract: During the COVID-19 pandemic, the term "behavioural fatigue" became the centre of policy debates in Great Britain. These debates involved deciding when to go into lockdown and whether behavioural interventions could be effective. Behavioural interventions can only succeed where people's capabilities, opportunities, and motivations to perform target behaviours are supported. Our retrospective data analyses examine the relationships between people's capabilities, opportunities, motivations, and behaviours, i.e., adherence to lockdown guidelines. Our cross-sectional analyses include 17,962 unique participants in Great Britain who completed a survey over the initial 30 days of the first lockdown (April 2020). We examine trends in responses to each scale and then the relationships between the scales using Granger's causality test with tests for stationarity and cointegration. A mixture of increasing and decreasing trends were identified for capabilities and opportunities. Decreasing trends were identified for motivation and behaviour. Granger's causality tests found that capability forecasts opportunity and behaviour and that motivation forecasts opportunity. The discussion reiterates that to realize and maintain behaviour changes, policies surrounding people's capabilities, opportunities, and motivations must continue to support target behaviours.

Keywords: behaviour; COVID-19; nudge systems thinking; retrospective; United Kingdom

Background

Human behaviours influence the trajectories of infectious diseases, such as COVID-19.[1] In the absence of medical interventions, government guidance around the world aimed to decrease COVID-19 infections by changing people's behaviours.[2] Broadly speaking, two policy strategies shaped government interventions, which, in line with Rose's seminal work, we referred to as high-risk prevention strategies and population prevention strategies.[3] High-risk prevention strategies seek to reduce the health impact of the diseases in target areas while allowing population immunity to increase eventually resulting in lower case numbers. Given a high-risk prevention strategy, governments could ask people at higher risk to stay home while those at lower risk could continue traveling to work. In contrast, population strategies seek to reduce the number of infections until

 doi:10.20944/preprints202407.1877.v1

transmissions cease naturally or acceptable medical interventions become available. Given a population strategy, governments could encourage everyone to stay home in a national lockdown until an effective vaccine is available.

Different strategies were implemented across countries and time. For instance, governments in Russia and Brazil applied high-risk strategies and South Korea applied population strategies.[4] Initially the government in Great Britain appeared to adopt a high-risk strategy. On the 9th of March 2020, Chief Medical Officer Chris Whitty explained that "Anything we do, we have got to be able to sustain. Once we have started these things, we have to continue them through the peak, and there is a risk that, if we go too early, people will understandably get *fatigued,* and it will be difficult to sustain this over time."[5] His word-choice "fatigue" was criticised. The following week, on the 16th of March, 681 behavioural scientists penned an open letter arguing against the idea that "behavioural fatigue" had scientific underpinnings and urged the government to adopt actions better aligned with a population strategy.[6] Additionally, Ferguson's (2020) [7] mathematical models were published comparing the potential health impacts of each strategy. These models suggest that a population strategy, could dramatically reduce hospitalizations and deaths. On the 23rd of March, Prime Minister Boris Johnson announced the first national lockdown in Great Britain, wherein people were ordered to stay at home except for the following four purposes:[8] (1) "shopping for basic necessities, as infrequently as possible," (2) "one form of exercise a day—for example a run, walk, or cycle—alone or with members of your household," (3) "any medical need, to provide care or to help a vulnerable person," and (4) "travelling to and from work, but only where this is absolutely necessary and cannot be done from home."

The open letter composed by behavioural scientists did not say that behavioural fatigue did not exist; rather, they were "not convinced that enough is known about behavioural fatigue or to what extent these insights apply to the current exceptional circumstances." A more critical review states that behavioural fatigue "is not a real phenomenon: it must be either a naïve construct or a policy contrivance".[9] A related critique outlines three senses of fatigue (tiredness, impairment, and distress), none of which were supported across the COVID lockdowns.[10] We agree that the term behavioural fatigue was not well defined early in the pandemic. We disagree with those who conceptualize behavioural fatigue as an immutable psychological determinant of behaviour. Rather than a determinant of behaviour, we view it as a malleable outcome that describes behaviour. In other words, instead of positing immutable psychological factors that influence adherence to government guidelines, governments could consider more substantial factors that contribute to adherence: capability, opportunity, and motivation to inform future policy.

The Capability-Opportunity-Motivation-Behaviour model of behaviour, more commonly referred to as the COM-B model, describes these three interrelated factors that must be present at a sufficient level for a target behaviour to occur.[11,12] Compared to other models of behaviour (e.g., the common-sense models, the health beliefs model,[13] or the theory of planned behaviour),[14] the COM-B model offers a more comprehensive assessment.[15] Capability has to do with an individual's physical (e.g., skills) or psychological (e.g., awareness) capacity to perform the behaviour. Opportunity has to do with all the physical environment (e.g., objects) and social (e.g., social norms) factors that lie outside the individuals that may enable or prompt them to perform the behaviour. Motivation has to do with an individual's reflective mental processes (e.g., planning) and automatic mental processes (e.g., emotions) that energize the behaviour.

The original 2011 COM-B model is redrawn from Michie's (2011) paper in Figure 1. The model anticipates that all three components influence behaviour. It further specifies that capability and opportunity influence motivation (but not the reverse). And lastly, feedback loops are anticipated, where performance (or non-performance) of a target behaviour may influence ongoing capabilities, opportunities, and motivations. The model is largely used to understand individual behaviour. The present paper extends the model to population level trends.

 doi:10.20944/preprints202407.1877.v1

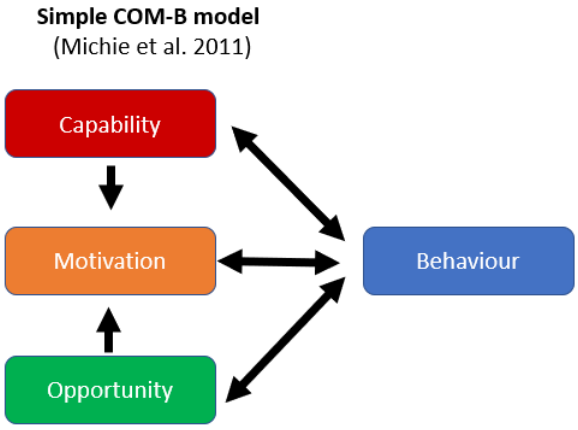

Figure 1. Redrawn COM-B model figures from Michie et al. (2011).

The present paper assesses data collected about people's capabilities, opportunities, and motivations to adhere to government guidance (behaviour) during the first lockdown in Great Britain. First, we assess trends in people's capabilities, opportunities, motivations, and behaviour. A decreasing trend in behaviour could support a descriptive interpretation of behavioural fatigue. Second, we assess the associations between people's capabilities, opportunities, motivations, and behaviour. We anticipate that capability, opportunity, or motivation can be used to forecast behaviour change. If they can, then this could support a call for policymakers to focus on malleable factors that influence whether people adhere to government guidance.

Methods

Study Design

The present study is a retrospective analysis cross-sectional surveys conducted by YouGov. The University of [Anon for peer review] approved this study as a secondary analysis (ID: 110.20-21). Participation was voluntary. Participants provided consent for their anonymised data to be used in future analyses and received points they could redeem for prizes on YouGov's website.

Participants and Setting

The online surveys took place over the first 30 days of the first national lockdown in Great Britain, which started on the 1st of April 2020.[16] YouGov's recruitment strategy aimed for a representative sample each day in terms of age, gender, social class, and education in terms of the most recent census;[17] but, these demographics were not connected to individual responses analysed by the present research team. Participants could only take part in one survey. Eligible participants were at least 18 years old and lived in Great Britain. The sample size for the present study was a convenience sample from this retrospective data.

Variables

The selected survey items and their response options appear in Table 1. Items were chosen by co-author IV in agreement with the research team to capture each COM-B component. IV has over 30 years of experience conducting behavioural science and policy research. Two items capture the capability component regarding how knowledgeable participants felt about social distancing and limiting their risks. Two items capture the opportunity component regarding how easy participants thought it was to follow the social distancing guidelines. Two items capture the motivation component regarding how worried participants felt about the virus generally and personally. Lastly, four items capture the behaviour change component regarding how often participants were seeing

 doi:10.20944/preprints202407.1877.v1

friends, seeing family, going to work, and using public transit. The opportunity items were only featured in the first 21 days. The remaining items were featured in all 30 days.

Table 1. Survey Items.

COM-B component	Item	Response options as coded in present analyses
Capability	How well informed, if at all, do you feel you are about what social distancing is and how it applies to you?	Very well informed (4), Fairly well informed (3); Not very informed (2); Not informed at all (1)
Capability	I know what I need to do to limit my risk of contracting coronavirus.	Strongly agree (5); Agree (4); Neither agree nor disagree (3); Disagree (2); Strongly disagree (1)
Opportunity	How easy or difficult are you finding it to stick to social distancing rules?	Very easy (4); Fairly easy (3); Fairly difficult (2); Very difficult (1); Do not know (participants removed from analyses)
Opportunity	How easy or difficult do you think other people around you are finding it to stick to social distancing rules?	Very easy (4); Fairly easy (3); Fairly difficult (2); Very difficult (1); Do not know (participants removed from analyses)
Motivation	Overall, how worried are you about coronavirus?	Extremely worried (5); Very worried (4); Somewhat worried (3); Not very worried (2); Not at all worried (1); Don't know (participants removed from analyses)
Motivation	To what extent do you think coronavirus poses a risk to you personally?	Major risk (5); Significant risk (4); Moderate risk (3); Minor risk (2); No risk at all (1); Don't know (participants removed from analyses)
Behaviour	Please look at the list of activities below and, for each one, say whether you have reduced how much you are doing it: …Seeing Friends	I am still doing this as much as usual (1); I am still doing this, but have cut it down a little (2); I am still doing this, but have cut down a lot (3); I have stopped doing this entirely (4); Not applicable, I did not do this anyway (participants removed from analyses)
Behaviour	…Seeing members of my	I am still doing this as much as usual (1); I am still doing this, but have cut it down a little (2); I am still doing this; but have cut down a lot (3); I have stopped doing this entirely (4); Not applicable, I did not do this anyway (participants removed from analyses)
Behaviour	… Going to your place of work	I am still doing this as much as usual (1); I am still doing this, but have cut it down a little (2); I am still doing this; but have cut down a lot (3); I have stopped doing this entirely (4); Not applicable, I did not do this anyway (participants removed from analyses)
Behaviour	… Using public transit	I am still doing this as much as usual (1); I am still doing this, but have cut it down a little (2); I am still doing this; but have cut down a lot (3); I have stopped doing this entirely (4); Not applicable, I did not do this anyway (participants removed from analyses)

Statistical Methods

The items composing each COM-B component were aggregated using means. Participants responding, "don't know" (for the opportunity or motivation items) or "not applicable, I did not do this anyway"(for the behaviour items) were omitted from all analyses. Response scales for opportunity and behaviour ranged from 1 to 4, for motivation ranged from 1 to 5, and for capability from 1 to 4.5. Higher scores for capability and opportunity indicate that participants felt more informed about or had more opportunities to comply with social distancing guidelines. Higher scores for motivation indicate that participants felt more concerned about the coronavirus. Higher scores for behaviour change indicate greater changes in behaviour compared to before the lockdown commenced.

Tests for Overall Trends

For each COM-B component, graphs displaying the daily mean component scores were visually examined and fitted for best-fit model trend lines. Seven models were compared, including exponential, linear, or polynomial (2nd -6th degree fits). The model with the largest Adjusted R

 doi:10.20944/preprints202407.1877.v1

Square and/or the smallest Akaike Information Criterion (AIC)/Bayesian Information Criterion (BIC) scores was selected. When there was a discrepancy between criteria, the BIC was used because it better protects against overfitting.[18] These tests were conducted using Microsoft Excel.

Tests for relationships

The relationships between the COM-B components were analysed using the Granger's causality test with tests for stationarity and cointegration using eViews.[19] Note that assessments for Granger 'causality' are not equivalent to randomized controlled trial assessments of causality. Granger's causality establishes whether the necessary temporal order for causation is present for retrospective data analyses. Specifically, it tests whether the preceding levels of two factors, say X and Y, better predict later levels of Y, than preceding levels of Y alone; If so, then X is said to 'granger-cause' Y.[20] For example, if preceding levels of capability and behaviour change are better predictors of behaviour change than behaviour change alone, then capability could be said to 'granger-cause' behaviour change. Granger's causality test is a particularly powerful associative analysis because the temporal order of granger-causes need not be the same in the reverse. That is, while X could granger-cause Y, Y might not granger-cause X.

A flow chart is provided in Figure 2 showing how the data were processed. Each pair of COM-B components were assessed separately. The first series of tests assess whether the data in each pair are stationary, i.e., an assumption for the most straightforward Granger's causality test. Stationarity is tested for with the Augmented Dickey-Fuller (ADF) with an alpha value of 0.05 (top diamond in Figure 2); the null hypothesis is that the data has a single root, i.e., is not stationary. In many retrospective data sets, particularly in finance and macroeconomics, this assumption is often not met as the data are integrated (Granger, 2003, p. 361).[21] Here, data were not stationary and, is common practice, we transform non-stationary time series data by first differencing to make the series stationary, i.e., or 'cointegrated' (Baker, al., 2015, p. 145).[22]

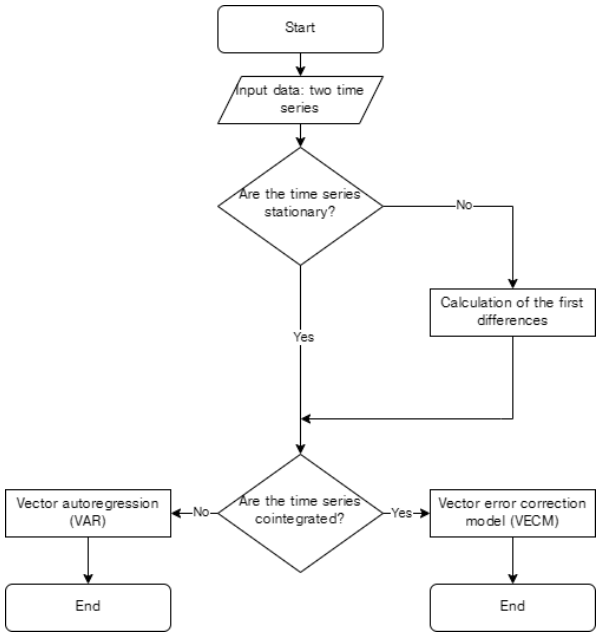

Figure 2. General algorithm of the relationship analyses.

The next series of tests assess whether the transformed data in each pair are cointegrated using the Johansen Cointegration Test with an alpha value of 0.05 (bottom diamond in Figure 2); the null hypothesis is that there is no cointegration. Where data are not cointegrated, a vector autoregression model is used to assess relationships. Where data are cointegrated, we generate a vector error-correction model (left side of the bottom diamond in Figure 2). In the vector error correction model, the change of one of the series is explained in terms of the lag difference between the series. If a pair

 doi:10.20944/preprints202407.1877.v1

of series is cointegrated at least one lag, one variable is said to be a [granger-]cause the other (Granger, 2003, p. 366). In the present analyses a lag of one day is applied.

Results

Participants

Of the 49,321 responders who took part in YouGov's original surveys, 31,359 (63.6%) were omitted from analyses. Nearly half were omitted (49.0%) for responding "not applicable" to at least one behaviour item; this response was most common for the behaviour item about using public transportation (41.11% of all responders), followed by items about going to work (36.2% of all responders), seeing friends (6.7% of all responders) and seeing members of my family they did not live with (6.0% of all responders). Fewer responders were removed for saying "I don't know" to an opportunity (5.6% of all responders) or a motivation (2.2% of all responders) item.

For the remaining 17,962 participants (36.4%), the average number of participants each day was 598.73, with a standard deviation of 28.92.

Outcome of Trend Tests

A summary of the trend analyses for each component of the COM-B model is provided. Tables of the results for the six models compared are in Supplementary Files 1.

Capability—Trends Significantly Increasing and Decreasing

The mean daily capability scores are in Figure 3a. Visual examinations of the graph show participants' capabilities scores starting and ending at about 4 out of 4.5. Descriptively, the mean participant had a high sense of knowledge over the first 30 days of lockdown. Statistical tests locate significant increasing and decreasing trends. A third-degree polynomial was the best-fit model (Adjusted R square=0.39; AIC=-130.64; BIC=-126.43). In the first 7 days, capability increases. Then, it decreases from days 8 to 24. Lastly, from days 25 to 30, capability increases again.

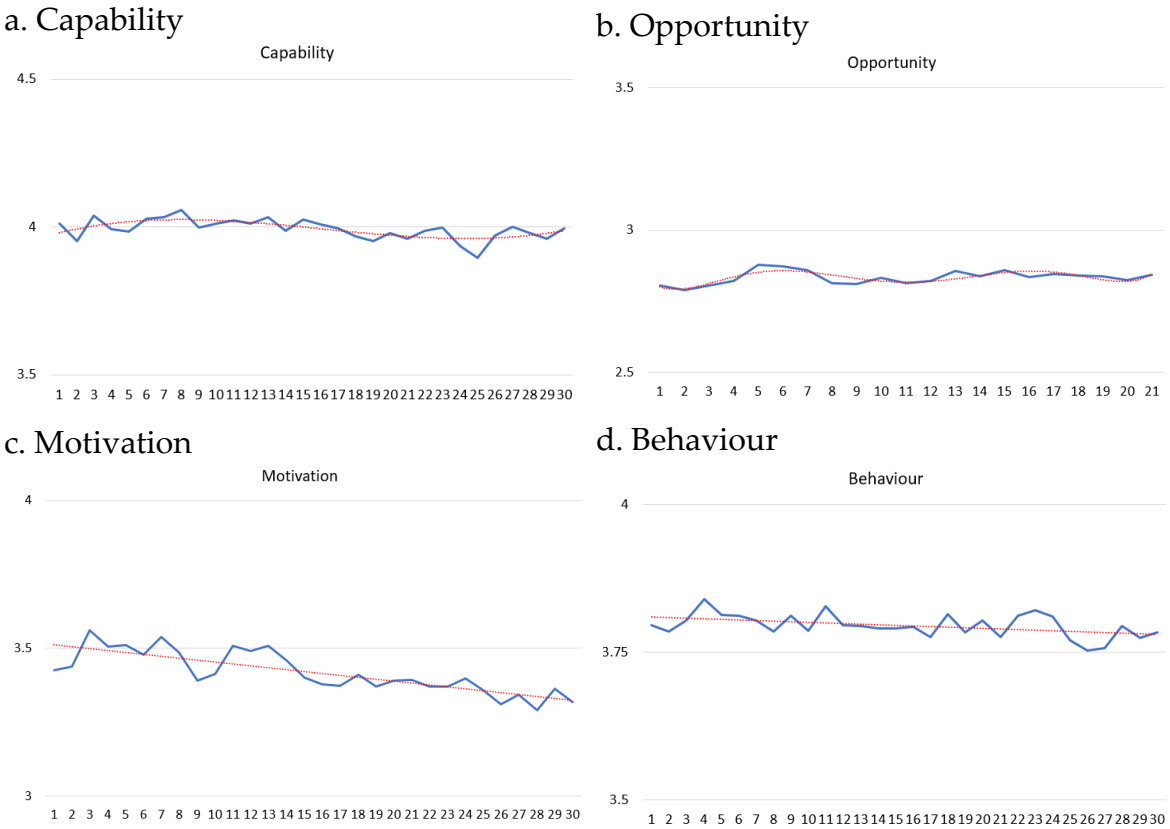

Figure 3. The mean daily scores with a best-fit model line for each COM-B component.

 doi:10.20944/preprints202407.1877.v1

Opportunity—Trends Significantly Increasing and Decreasing

The mean daily opportunity scores are in Figure 3b. Visual examinations of the graph show participants' opportunity scores starting and ending at slightly under 3 out of 4. Descriptively, the mean participant thought it was fairly easy to follow the guidelines over the first 30 days of lockdown. Statistical tests locate several significant increasing and decreasing trends. The sixth-degree polynomial was the best-fit model (Adjusted R square=0.47; AIC=-108.17; BIC=-101.90). Participants reported opportunity decreases from days 1 to 2. Then, it increases from days 3 to 6 before decreasing from days 7 to 11. Then, opportunity increases again from days 12 to 16 before again decreasing from days 17 to 20. Lastly, on the 21st day, opportunity again increases.

Motivation—A Significantly Decreasing Trend

The mean daily motivation scores are in Figure 3c. Visual examinations of the graph show participants' motivation scores starting at around 3.5 out of 5 and slightly decreasing thereafter. The mean participant's motivations were between being very and somewhat worried, and slightly decreasing towards being less worried over the first 30 days of lockdown. A linear model was the best-fit model (Adjusted R square=0.64; AIC=-104.60; BIC=-103.20). The average daily decrease is 0.007.

Behaviour—Trend Significantly Changing

The mean daily behaviour change scores are in Figure 3d. Visual examinations of the graph show participants' scores starting slightly under 4 out of 4 and slightly decreasing thereafter. The mean participant was becoming slightly less likely to report completely stopping the indicated behaviours over the first 30 days of lockdown. The linear model was the best-fit model (Adjusted R square=0.17; AIC=-155.79; BIC=-154.39). The average daily decrease was 0.001.

Outcome of Relationship Tests

A summary of the Granger analyses for each pair of COM-B components is provided here. Tables of the results for all tests are provided in Supplementary Files 1.

The results of the Augmented Dickey-Fuller test for stationary suggest that capability ($p<0.05$) and behviour ($p<0.05$) do not have a unit root, i.e., they are stationary. However, the time series of opportunity ($p=0.12$) and motivation ($p=0.43$) do. Therefore, following the flow chart in Figure 1, the data were transformed into first differences for the cointegration tests.

The results of the Johansen Cointegration tests suggest that there is no cointegration in four pairs: capability and motivation ($p=0.62$), capability and behaviour ($p=0.76$), opportunity and behaviour ($p=0.30$), and motivation and behaviour ($p=0.23$). For the remaining two pairs, there is cointegration: capability and opportunity ($p<0.05$) and opportunity and motivation ($p<0.05$). Following the above algorithm, the vector autoregression is used for pairs that are not cointegrated. The vector error correction model is used for pairs that are cointegrated.

The relationships revealed in the final analysis are pictured in Figure 4. The direction of the errors indicates the direction of influence. A summary of the effects is provided here: capability forecasts opportunity ($t=-3.13$, $p<0.01$), but not the reverse; capability forecasts behaviour ($t=-2.41$, $p<0.05$), but not the reverse; and motivation forecasts opportunity ($t=-3.91$, $p=0.001$), but not the reverse. No other relationships were significant.

 doi:10.20944/preprints202407.1877.v1

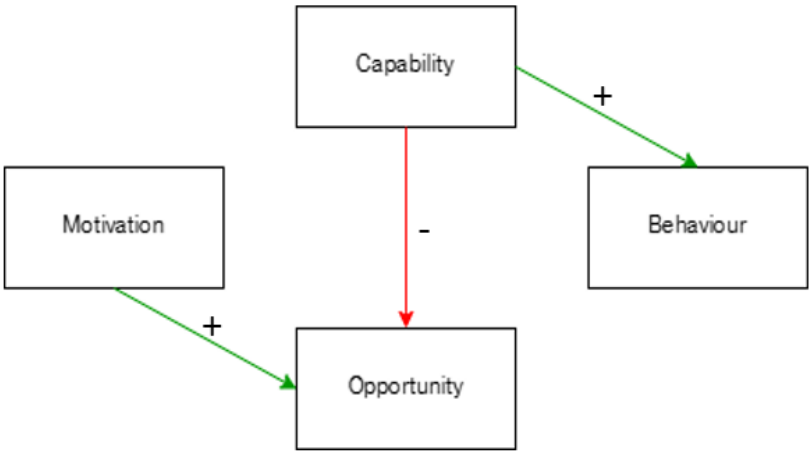

Figure 4. Significant relationships between COM-B components with directionality. Plus-signs (green lines) indicate positive relationships and negative-signs (red lines) indicate inverse relationships.

Discussion

Across the first lockdown in Great Britain, the current study examines people's capabilities, opportunities, motivations, and behaviours. Slight decreases in behaviour change occurred, which could support a descriptive existence of behavioural fatigue. Granger's causality tests suggest that behaviour change could be forecast by capability at the population level. Rather than viewing behavioural fatigue as inevitable, policymakers could look to people's capabilities, opportunities, and motivations to better understand public behaviour and improve public health.

While our trend analyses suggest decreases in behaviour change, this was not independent of other factors. Behaviour change was anticipated by capability, which is a factor that policy could influence. In this case, communications created about the lockdown rules likely influence public knowledge that could influence adherence (up or down). Other examples exist supporting the notion that policy communications can change behaviour. For example, in August 2020, Parliament announced their 'eat out to help out scheme', which aimed to help protect jobs in the hospitality sector by encouraging the public to eat out.[23] Despite little changes in the virus threat from July to August (people's motivation to stay at home) more people went out to eat in August and fewer did after the policy stopped in September. Rather than positing an immutable individual construct that influenced eating-out behaviour, the policy enacted and removed provides a more straightforward and malleable explanation for the changes in public behaviour.

Conceptualising behavioural fatigue as an immutable factor supports a narrative emphasizing individual responsibility and blame Such a conceptualisation suggests that public health initiatives fail to work because individuals lack sufficient grit to stick out adverse conditions. Grit is thought of as a personality construct with potential genetic dispositions.[24] Belief in grit could foster fatalistic beliefs that there is little policy can do to change people's behaviour. But, this would be a mistake. Even where individual differences exist (even genetic differences) it does not follow that individuals cannot change (at least within some range).[25]

Despite the government and media commonly expressing concerns about people not following lockdown guidance, many people did. King's College London conducted a cluster analysis that grouped 2,250 residents into three segments, including those Accepting, Suffering, and Resisting government actions during the pandemic.[26] Even amongst the Resisting, over 70% reported following government guidance to stay 2 meters away from people outside their home and avoiding places were people gather. One area that received lower adherence across all three segments involved self-isolation. Another study conducted during the first lockdown found that residents with less than £100 in savings were three times less likely to report self-isolating than those with £25,000 or more pounds in savings.[27] Thus factors beyond individual choice likely contribute to following

 doi:10.20944/preprints202407.1877.v1

government guidance. Not considering those factors could decrease the public trust on which public policy must rest.[28]

Strengths and Limitations

Strengths of the current study include the timing of the surveys and the large number of participants. This is a unique data set collected at a pivotal time that can inform policymaking. That said, the data involve participants' self-reports or perceptions. Other measurements could reveal different relationships. Additionally, the dataset only included the response from the initial first month of the lockdown period. Further changes may have occurred throughout the pandemic. Demographic information was not available for the research team to analyse and many responders were not included in our analyses. Inferences can be made about those not included. For instance, nearly half of those omitted reported not using public transit before the lockdown. Therefore, we can infer that those removed are more likely to live in areas without reliable public transit (e.g., more rural locations) and are more likely to own a car. Our findings may not generalize to such people.

In our analyses, changes in behaviour were not predicted by changes in motivation or opportunity. Policy actions taken before the lockdown directly impacted opportunities but did not change greatly over the 30 days these surveys. For example, the Coronavirus Job Retention Scheme was announced on the 20th of March 2024, ten days before the lockdown.[29] This scheme provided grants to employers to pay 80% or up to 2,500 pounds of furloughed employee's wages. Employees using that scheme before the lockdown were less likely to experience changes in their opportunities during the lockdown. Changes in perceived opportunities were predicted by changes in motivation, suggesting that motivation influences how easy people find it to adhere to social distancing rules. More motivated individuals perceive following the rules as easier, which resonates with the evidence.[30]

Also not predicted by the original COM-B model, behaviour did not feedback to predict capability and opportunity. As a cross-sectional series of surveys, different individuals completed each survey. While our data show population-level reports of behaviour change each of the 30 days, we do not have information about individual-level behaviour change across those 30 days. A repeated measures method could be better suited to assess the feedback loops predicted by the COM-B model.

Conclusion

The current retrospective data analysis examined the relationships between people's capabilities, opportunities, motivations, and behaviour change, i.e., adherence to lockdown guidelines across the first 30 days of the lockdown in Great Britain. Though slight, trend changes were identified in all COM-B components. These changes include a decreasing trend in the levels of behaviour change. Our relationship analyses suggest that the decreases in behaviour change were not necessarily inevitable. Changes in capability could be used by policymakers to forecast behaviour change. Rather than positing immutable factors to explain why residents do (or do not) adhere to government guidance, policymakers could focus on supporting their capabilities, opportunities, and motivations to improve public health.

Author Contributions: All authors roles were tantamount to the ultimate publication and may be recognized as first author. Conceptualization IV; Methodology IV and KH; Formal Analysis KH; Resources IV; Data Curation SK; Writing—Original Draft Preparation KAS; Writing—Review & Editing, all authors coordinated by KAS.

Funding: This work was supported by the National Recovery and Resilience Plan of the Republic of Bulgaria under contract SUMMIT BG-RRP-2.004-0008-C01.

 doi:10.20944/preprints202407.1877.v1

Institutional Review Board Statement: The study was conducted according to the guidelines of the Declaration of Helsinki and approved by the Institutional Review Board (or Ethics Committee) of University of [ANON FOR PEER REVIEW] (ID: 110.20-21).

Informed Consent Statement: YouGov receives informed consent for all participants who take part in their surveys.

Data Availability Statement: Data would be made available upon the request with corresponding authors.

Conflicts of Interest: The authors declare no conflict of interest.

References

[1] Bharti, N. Linking human behaviors and infectious diseases. *Proc Natl Acad Sci USA* **2021**, 118, :e2101345118. doi: 10.1073/pnas.2101345118

[2] West, R., Michie, S., Rubin, G.J., Amlôt, R. Applying principles of behaviour change to reduce SARS-CoV-2 transmission. *Nat Hum Behav* **2020**, 4, 451-59. doi: 10.1038/s41562-020-0887-9

[3] Rose, G. Sick individuals and sick populations. *Int J Epidemiol* **1985**, 14, 32-38. doi: 10.1093/ije/14.1.32.

[4] Patiño-Lugo, D.F., Vélez, M., Velásquez Salazar, P., Vera-Giraldo, C.Y., Vélez, V, Marín, I.C., Ramírez, P.A., Quintero, S.P., Castrillón Martínez, E., Pineda Higuita, D.A., & Henandez, G. Non-pharmaceutical interventions for containment, mitigation and suppression of COVID-19 infection. *Colomb Med* **2020**, 51, e4266. doi: 10.25100/cm.v51i2.4266

[5] Mahase, E. Covid-19: Was the decision to delay the UK's lockdown over fears of "behavioural fatigue" based on evidence? **BMJ 2020**, 370, m3166.

[6] Open letter to the UK Government regarding COVID-19. Available online: https://sites.google.com/view/covidopenletter/home (accessed on June 15 2024

[7] Ferguson, N.M., Laydon, D., Nedjati-Gilani, G., Imai, N., Ainslie, K., Baguelin, M., Bhatia, S., Boonyasiri, A., Cucunubá, Z., Cuomo-Dannenburg, G., Dighe, A. Impact of non-pharmaceutical interventions (NPIs) to reduce COVID-19 mortality and healthcare demand. Imperial College COVID-19 Response Team, London. 16 March 2020. https://www.imperial.ac.uk/media/imperial-college/medicine/sph/ide/gida-fellowships/Imperial-College-COVID19-NPI-modelling-16-03-2020.pdf (accessed on 15 July 2024)

[8] Prime Minister's statement on coronavirus (COVID-19): 23 March 2020. https://www.gov.uk/government/speeches/pm-address-to-the-nation-on-coronavirus-23-march-2020 (accessed on 15 July 2024)

[9] Harvey, N. Behavioral fatigue: Real phenomenon, naïve Construct, or policy contrivance? *Front Psychol* **2020**, 11, e589892. doi: 10.3389/fpsyg.2020.589892

[10] Michie, S., West, R., Harvey, N. The concept of "fatigue" in tackling covid-19. *BMJ* **2020**, 371, m4171. doi:10.1136/bmj.m4171

[11] Michie, S., van Stralen, M.M., West, R. The behaviour change wheel: a new method for characterising and designing behaviour change interventions. *Implement Sci* **2011**, 6, 42. doi:10.1186/1748-5908-6-42

[12] Cane, J., O'Connor, D., Michie, S. Validation of the theoretical domains framework for use in behaviour change and implementation research. *Implement Sci* **2012**, 7, 37. doi:10.1186/1748-5908-7-37

 doi:10.20944/preprints202407.1877.v1

[13] Rosenstock, I.M., Strecher V.J. Becker, M.H. Social learning theory and the health belief model. *Health Education & Behavior* **1988**, 15, 175-183. doi:10.1177/109019818801500203

[14] Ajzen, I. The theory of planned behavior. *Organ Behav Hum Decis Process* **1991**, 50, 179-211. doi:10.1016/0749-5978(91)90020-T.

[15] "Michie S, Atkins L, West R. (2014) *The Behaviour Change Wheel: A Guide to Designing Interventions.* London: Silverback Publishing. www.behaviourchangewheel.com

[16] YouGov. Panel Methodology. https://yougov.co.uk/about/panel-methodology/ (accessed on 15 July 2024)

[17] Office for National Statistics. 2011 Census. https://www.ons.gov.uk/census/2011census (accessed on 15 July 2024)

[18] Atanasov, A. (2018). Statistical methods for dynamic series analysis. Sofia: Publishing complex - UNSS

[19] Granger, C.W.J. Investigating causal relations by econometric models and cross-spectral methods. *Econometrica* **1969**, 37, 424-438. doi:10.2307/1912791

[20] Thurman, W.N. and M.E. Fisher. Chickens, Eggs, and Causality, or Which Came First? *Am J Agric Econ* **1988**, 70, 237-238.

[21] Granger, C. (December 8th 2003). Time Series Analysis, Cointegration, and Applications. Nobel Lecture, pp. 360-366. https://www.nobelprize.org/uploads/2018/06/granger-lecture.pdf (accessed on 15 July 2024)

 doi:10.20944/preprints202407.1877.v1

[22] Baker, D., Merkert, R., Kamruzzaman, M. Regional aviation and economic growth: Cointegration and causality analysis in Australia. *J Transp Geogr* **2015**, 43, 140-150.

[23] UK Parliament. House of Commons Library Eat Out to Help Out Scheme. https://commonslibrary.parliament.uk/research-briefings/cbp-8978/ (accessed on 15 July 2024)

[24] Duckworth, A.L., Peterson, C., Matthews, M.D., Kelly, D.R. Grit: Perseverance and passion for long-term goals. *J Pers Soc Psychol* **2007**, 92, 1087-1101. doi:10.1037/0022-3514.92.6.1087

[25] Anders, E.K., Pool, R. *Peak: Secrets from the new science of expertise.* Boston: Houghton Mifflin Harcourt. 2016. pp. 167–168. ISBN 9780544456235. OCLC 913923802.

[26] Duffy, B., Allington, D. The accepting, the suffering, and the resisting: the different reactions to life under lockdown. Policy Institute, King's College London. 2020. www.kcl.ac.uk/policy-institute/assets/Coronavirus-in-the-UK-cluster-analysis.pdf (accessed on 15 July 2024)

[27] Atchison, C., Bowman, L.R., Vrinten, C., Redd, R., Pristera, P., Eaton, J., Ward, H. Early perceptions and behavioural responses during the COVID-19 pandemic: a cross-sectional survey of UK adults. *BMJ Open* **2021**, 11, e043577. doi:10.1136/bmjopen-2020-043577

[28] Reicher, S., Drury, J. Pandemic fatigue? How adherence to covid-19 regulations has been misrepresented and why it matters. *BMJ* **2021**, 372, n137. doi:10.1136/bmj.n137

 doi:10.20944/preprints202407.1877.v1

[29] UK Government. Corona Virus Job Retention Scheme. https://www.gov.uk/government/collections/coronavirus-job-retention-scheme.

[30] Almeida-Silva, M., Andrade, G., Luis, T., Santos, M., Grilo, A. Influence of cognitive factors on adherence to social distancing and the use of masks during the COVID-19 pandemic by young adults: A systematic review. *Social Sciences* **2024**, 13, 275. doi:10.3390/socsci13050275