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Brief report

Coronavirus (COVID-19) in the United Kingdom: A personality-based perspective on concerns and intention to self-isolate

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Objectives. Public behaviour change is necessary to contain the spread of coronavirus (COVID-19). Based on the reinforcement sensitivity theory (RST) framework, this study presents an examination of individual differences in some relevant psychological factors.

Design. Cross-sectional psychometric.

Methods. UK respondents (N = 202) completed a personality questionnaire (RST-PQ), measures of illness attitudes, concerns about the impact of coronavirus on health services and socio-economic infrastructures, personal safety, and likelihood of voluntary self-isolation.

Results. Respondents most concerned were older, had negative illness attitudes, and scored higher on reward reactivity (RR), indicating the motivation to take positive approach action despite prevailing worry/anxiety. Personal safety concerns were highest in those with negative illness attitudes and higher fight–flight–freeze system (FFFS, reflecting fear/avoidance) scores. Results suggest people are experiencing psychological conflict: between the urge to stay safe (FFFF-related) and the desire to maintain a normal, pleasurable (RR-related) life. Ways of ameliorating conflict may include maladaptive behaviours (panic buying), reflecting reward-related displacement activity. Intended self-isolation related to FFFS, but also low behavioural inhibition system (related to anxiety) scores. Older people reported themselves less likely to self-isolate.

Conclusions. Interventions need to consider individual differences in psychological factors in behaviour change, and we discuss relevant literature to inform policy makers and communicators.

Statement of contribution

What is already known on this subject?

- Reinforcement sensitivity theory (RST) personality systems can influence perception of persuasive health messages.

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- However, there is limited evidence for their direct effects on health concerns and behaviours, and none relating to specific infectious diseases.

What does this study add?

- Reward reactivity (RR) is associated with concern about impact of coronavirus on the NHS and other social infrastructures, indicating the motivation to take positive-approach action despite worry/anxiety.
- Personal safety concerns are related to fight–flight–freeze system traits (FFFS, reflecting fear/avoidance).
- Intended self-isolation related to FFFS, but also low behavioural inhibition system (related to anxiety) scores.
- Older people reported themselves less likely to self-isolate.
- Results suggest psychological conflict: between the urge to stay safe (FFFF-related) and the desire to maintain a normal, pleasurable life (RR-related).
- Ways of ameliorating conflict may include maladaptive behaviours (panic buying), reflecting reward-related displacement activity

By 19 March 2020, the time data reported in this paper were collected, 3,300 people in the United Kingdom had tested positive for coronavirus (COVID-19) and 114 of those had died (Public Health England, 2020). To tackle the coronavirus crisis, the UK Government embarked on legislative restrictions and a public health communication campaign. To be most effective, it is imperative to understand not only the socio-economic antecedents of behaviour but also the psychological ones, including how personality influences how individuals differ from one another in their behavioural reactions to messages (Dutta-Bergman, 2003).

Our study examines the role of personality factors in concerns about coronavirus, personal safety, and the intention to self-isolate through the lens of the reinforcement sensitivity theory (RST) of personality. RST assumes personality is underpinned by biologically driven systems of approach and avoidance motivation (Gray & McNaughton, 2000). Approach/avoidance motivational tendencies drive attention to social and environmental cues, manifesting in characteristic patterns of cognition and behaviour (Corr & Krupić, 2017). In the present context, this might be exemplified by an urge to stock up on 'essentials' (approach) or voluntary self-isolation (avoidance). RST is widely recognized, in conceptual and psychometric terms, to represent valid personality traits of widespread application (for a summary, see Corr, DeYoung, & McNaughton, 2013).

Reinforcement sensitivity theory defines a behavioural approach system, sensitive to appetitive stimuli and activating goal-directed behaviours – people who are especially responsive to reward cues are driven to seek situations that stimulate dopaminergic reward pathways in the brain. Striving towards rewards/goals requires a number of distinct processes: Reward interest (sensitivity to opportunity and novel experiences) and goal-drive persistence (planning and motivation) characterize the early stages of approach. These can be distinguished from reward reactivity (RR; sensitivity to imminent reward and pleasure) and impulsivity (risk taking to attain reward), processes closer to the final reinforcer. Activation of these approach systems leads to the experience of hopeful excitement, persistence to reach desired goals, and elation on goal attainment (Corr & Cooper, 2016; Corr *et al.*, 2013). A second system, the fight–flight–freeze (FFFS) system, mediates reactions to immediately aversive stimuli, leading to fear, avoidance, and escape behaviours. Thirdly, a behavioural

inhibition (BIS) system is sensitive to goal conflict, for example, a combination of BIS (fear and trepidation) and behavioural activation (the urge to act). Activation of the BIS system motivates caution and contributes to risk assessment, rumination on the past and worry about the future – cognitive-emotional processes leading to anxiety and depression (Katz, Matanky, Aviram, & Yovel, 2020; Levita *et al.*, 2014; Vergara & Roberts, 2011). Activation of the FFFS and BIS systems results in defensive behaviour and negative affect; accordingly, we would expect people with high activation of these systems (as indicated by questionnaire scores) to show a high level of concern about coronavirus.

That personality can influence health behaviours in general is well documented, with most research focussed on the Big Five model (Strickhouser, Zell, & Krizan, 2017), although we know relatively little about personality in the context of infectious disease or pandemic. RST is a useful framework in the present context because it emphasizes the roles of emotional and motivational personality traits known to influence perception of health-related persuasive communications. Behavioural inhibition system emotions (fear and emotional conflict) make individuals more receptive to loss messages, while emotions related to behavioural approach systems (including anger) are more receptive to gain messages (Yang, Dillard, & Shen, 2012). However, despite the potential to explain intentional and actual behaviours, there has been very little health-related research on RST in general and none in the context of pandemic-related behaviour. What research exists has focused on mental health (e.g., Harnett, Reid, Loxton, & Lee, 2016) and addiction (e.g., Emory & Simons, 2017). The present research is, therefore, both novel and timely.

We examined the relationships between RST personality variables, specific concerns about coronavirus, personal safety, and the intention to self-isolate. We further considered individual differences in general illness attitudes and behaviours, such as fear of illness/death and overreaction to bodily sensations. As coronavirus is an intense aversive stimulus, individuals high in the FFFS system should be more likely to self-isolate as an avoidance/escape response. We also predicted a role for the BIS system, reflecting a conflict between behaviours aimed at avoiding contagion and the behavioural activation system driven goal of continuing with normal life.

Methods

Participants

UK respondents (N = 202) were recruited via Prolific – an online research participants' platform, representative of the general population (Woods, Velasco, Levitan, Wan, & Spence, 2015): 127 identified as female, 74 male, and one as other (M_{age} = 33.79, SD = 12.48, range 18–75). Socio-economic status (SES) was assessed with the MacArthur Ladder Scale, which ranks self-reported social class on a ladder with 10 rungs (Adler, Epel, Castellazzo, & Ickovics, 2000) – the higher rungs represent individuals who have more money, education, and prestigious jobs. The mean report was 5.27 (SD = 1.61) with 31 people (15%) placing themselves on the bottom three rungs and 10 (5%) on the top three rungs. Data were collected on 18 and 19 March 2020, at which time just nine respondents (5%) reported that either they or someone close to them had tested positive for the virus. One hundred and twelve participants (55%) reported themselves as already self-isolating or highly likely to do so. At the time of data collection, there were no mandatory restrictions in the United Kingdom. All participants were UK residents and aged 18 or over. There were no other inclusion criteria.

Materials and procedures

University ethics committee approval was obtained. Participants accessed the study via a weblink. Details of the research were given and informed consent obtained before participants completed the following measures. Further details are available at: http://www.philipcorr.net/includes/asp/download_file.asp?id=442.

Beck Depression Inventory II (BDI-II; Beck, Steer, & Brown, 1996) is a 21-item self-report questionnaire which assesses the severity of depressive symptoms (e.g., sadness, crying, or losing interest in life). In our sample, reliability of 'Depression' was excellent (α = .82).

Generalized Anxiety Disorder-7 (GAD-7; Spitzer, Kroenke, Williams, & Löwe, 2006) is a 7-item self-administered questionnaire used as a screening tool and severity measure for generalized anxiety disorder (GAD). In our sample, reliability of 'Anxiety' was very high (α = .92).

Illness Attitudes Scale (IAS; Kellner, 1986) is a 27-item self-report measure that assesses fears, attitudes, and beliefs associated with health concerns and abnormal illness behaviours. Reliability of 'Ill-Attitude' was very high in our sample (α = .92).

Reinforcement Sensitivity Theory of Personality Questionnaire (RST-PQ; Corr & Cooper, 2016) is a 65-item questionnaire yielding scores on RST traits, all of which showed good reliability with our sample: FFFS α = .79; BIS α = .95; BAS-RI α = .80; GDP α = .87; RR α = .83, and impulsivity α = .78.

Respondents also answered the following questions:

1. How concerned are you about the effect on the NHS and health services generally? Response on a 10-point scale where 1 = not at all concerned and 10 = extremely concerned.
2. How concerned are you about the virus in terms of its effect on other aspects of the UK infrastructure in general (e.g., transport, economy, education)? Response on a 10-point scale, as previously.
3. How concerned are you about your own personal safety and that of people close to you in terms of the virus? Response on a 10-point scale, as previously.
4. Are you, or do you intend to, voluntarily self-isolate because of the virus? (yes/no).
5. Have you, or someone close to you, tested positive for the virus? (yes/no).

Results

Bivariate correlations are shown in Table 1. Negative attitude to illness was positively associated with all RST factors, especially BIS and FFFS. Concerns about NHS/health services and about other aspects of UK infrastructure showed positive associations with behavioural approach system factors of reward interest and RR, and with FFFS, but not BIS. Concern about personal safety was positively associated with BIS and FFFS, and likelihood of self-isolation with FFFS only. Both depression and anxiety were highly correlated with FFFS and BIS. For each concern, responses ranged from 1 to 10, pointing to marked individual differences.

Table 2 presents regression analyses on each area of concern and likelihood of self-isolating. We entered age, sex (0 = female; 1 = male), SES, testing positive for the virus (0 = no; 1 = yes), and illness attitude score alongside the RST variables. We did not include depression and anxiety due to their high intercorrelations with BIS and FFFS. For concerns about the NHS, older people, higher socio-economic groups, those with more

Table 1. Descriptive statistics and correlations between RST personality factors, attitudes to ill health (Ill-attitude), concerns about health services (NHS), other national infrastructure (infra), personal safety (safety), likelihood of self-isolation (isolate; coded as yes = 1 and no = 0), depression, and anxiety scores

	Mean/*SD*	GDP	RR	Imp	BIS	FFFS	Ill-attitude	NHS	Infra	Safety	Isolate	Depression	Anxiety
RI	16.45/4.40	.60**	.44**	.36**	−.10	−.04	.14*	.18*	.19**	−.04	−.002	−.001	−.03
GDP	18.54/4.59	–	.49**	.33**	.01	.10	.18**	.13	.17*	.01	.01	.06	.05
RR	25.96/3.65		–	.57**	.18*	.34**	.24**	.32**	.35**	.14	.01	.14*	.17*
Imp	17.81/4.88			–	.31**	.26**	.19**	.16	.15	.05	.05	.25**	.25**
BIS	58.05/15.46				–	.47**	.47**	.07	−.03	.14*	.08	.69**	.81**
FFFS	23.33/6.61					–	.41**	.19**	.18*	.31**	.24**	.27**	.40**
Ill-att	83.20/25.12						–	.24**	.11	.28**	.27**	.49**	.51**
NHS	7.64/1.99							–	.55**	.50**	.24**	−.01	.12
Infra	7.88/1.98								–	.41**	.08	−.03	.06
Safety	6.95/2.57									–	.27**	.07	.26**
Isolate	–										–	.15*	.11
Depression	47.62/11.82											–	.77**
Anxiety	15.05/5.82												–

Notes. BIS = behavioural inhibition; FFFS = fight–flight–freeze; GDP = goal-drive persistence; Ill-att = negative attitudes to illness; Imp = impulsivity; infra = levels of concern about other infrastructure; isolate = intention to self-isolate (yes/no); NHS = level of concern about health services; RI = reward interest; RR = reward reactivity; RST = reinforcement sensitivity theory; safety = level of concern about personal safety.
*Significance at .05; ** Significance at .01.

Table 2. Results of regression analyses

	NHS/health services				Other infrastructure				Personal safety				Likelihood of self-isolation			
			95% CI				95% CI				95% CI				95% CI	
	β	*p*	Lower	Upper	β	*p*	Lower	Upper	β	*p*	Lower	Upper	β	*p*	Lower	Upper
Sex	−.05	.43	−.78	.33	−.07	.34	−.83	.29	−.04	.55	−.98	.53	−.06	.40	−.21	.08
Age	.24	.001	.02	.06	.29	<.001	.02	.07	.12	.08	−.00	.05	−.15	.04	−.01	−.001
SES	.23	.002	.11	.45	.12	.10	−.03	.32	.05	.51	−.16	.31	−.12	.12	−.08	.01
Virus	−.11	.11	−2.31	.24	−.05	.49	−1.72	.83	−.14	.06	−3.40	.04	−.09	.19	−.56	.113
Ill-att	.19	.02	.003	.03	.07	.41	−.01	.02	.21	.01	.01	.04	.23	.01	.001	.01
RI	.05	.55	−.05	.10	.03	.71	−.06	.09	−.09	.31	−.16	.05	.01	.91	−.02	.02
GDP	−.10	.25	−.12	.03	−.03	.71	−.09	.06	−.05	.61	−.12	.07	−.03	.76	−.02	.02
RR	.27	.003	.03	.16	.31	.001	.05	.17	.09	.31	−.04	.13	−.11	.24	−.03	.01
Imp	−.03	.73	−.08	.06	−.02	.85	−.07	.06	−.01	.87	−.10	.08	.08	.38	−.01	.03
BIS	.08	.40	−.01	.03	−.03	.75	−.03	.02	−.02	.84	−.03	.02	−.20	.04	−.01	−.001
FFFS	.08	.34	−.02	.07	.13	.09	−.01	.09	.24	.004	.03	.16	.25	.003	.01	.03
Adj. R^2	.24				.23				.17				.16			

Notes. BIS = behavioural inhibition; FFFS = fight–flight–freeze; GDP = goal-drive persistence; Ill-att = negative attitudes to illness; Imp = impulsivity; RI = reward interest; RR = reward reactivity; virus = whether tested positive (yes/no); SES, socio-economic status.

negative illness attitudes, and higher RR scores were most concerned. Concerns about other aspects of UK infrastructure were also positively associated with age and RR. Personal safety concerns were significantly associated with illness attitude and FFFS. Finally, higher likelihood of self-isolation was related to being younger, having negative illness attitude scores, and higher FFFS scores. The opposite effect, found in the negative association with BIS, suggested that goal-conflicted (i.e., anxious) individuals are less inclined to self-isolate, perhaps as a coping mechanism, aiming to maintain a normal lifestyle, driven by approach processes inherent in RR.

Discussion

Results cast new theoretical light on coronavirus-related concerns and intended self-isolation. Personality factors were relevant, after controlling for generally negative attitudes to illness, and this has potential implications for interventions to influence behaviour.

Level of concerns about impact on NHS/health services and other national infrastructure were greatest in older and higher SES respondents. Of the RST traits, only RR was independently significant, reflecting a positive-approach orientation and the urge to take action, motivated by reward-related activities (Gray & McNaughton, 2000). Reward reactivity is important in the neural processing of emotional stimuli, both positive and negative (DePascalis, Fracasso, & Corr, 2017). Coronavirus is a negative stimulus writ large and displacement activity, such as hoarding toilet rolls, may alleviate concern by maintaining a sense that a semblance of a normal lifestyle can be maintained – and queuing behaviour may suggest one way to cope is to emulate the behaviour of others (i.e., following social norms). Personal safety concerns were associated with higher freeze–fight–flight scores, and older age was close to statistical significance. This indicates the likelihood of worry, fear, and avoidance behaviour amongst older people, perhaps understandable given their potential susceptibility.

Younger participants and those higher on FFFS tendencies reported they were more likely to self-isolate. These findings make sense in terms of fear/avoidance behaviours associated with FFFS. However, it is interesting that older people reported themselves as less likely to self-isolate even though they are the most concerned in other respects (see above). This finding suggests that an increased level of concern does not necessarily lead to intention to self-isolate – indeed, the opposite may be true in some cases. Lower BIS was also a significant factor in this analysis, which may reflect the motivation to resolve goal conflict (the urge to take action along with feelings of trepidation) by maintaining as normal a life as possible. Younger people who choose to self-isolate may care less about maintenance of normality and, instead, take actions that are overtly preventative – they may also feel less isolated as they are higher users of social media.

Our results can explain the potential influence of factors such as those described within social cognitive theories (e.g., Bandura, 1986), which argue that cognitions such as outcome expectancies, self-efficacy, and self-regulation mediate the relationship between environmental stimuli and behaviour. Individuals with tendencies towards FFFS and/or BIS are likely to adopt behaviours which carry expectancies of tension reduction, as has been shown in RST-based studies of alcohol dependency (e.g., Booth & Hasking, 2009). In the present context, hoarding 'necessities' can be one such behaviour, possibly in response to negative expectancies around impending government driven lifestyle restrictions (which were not yet in place when the data were collected). Furthermore,

individuals higher in FFFS traits often attend most to negative aspects of their environment. As such, they may be more susceptible to fear contagion (Hatfield, Cacioppo, & Rapson, 1993), internalizing the negative emotions and behaviours around them and perceiving them as social norms.

Overall, our findings point to both approach-related and defensive personality traits being involved in concerns about coronavirus. It seems that while some people will address their fears by isolating themselves, others are in a state of psychological (goal) conflict and their behaviour may reflect this as they attempt to relieve uncertainty through approach behaviours, such as panic buying. Health information/communications should consider both sides of this emotional-motivational coin and not assume a 'one-size-fits-all' approach – personality differences matter. Of special concern is the lower likelihood of older people to self-isolate, who we suggest maybe resolving psychological conflict by trying to maintain a 'normal' lifestyle. If found to be robust/replicable, health information/communications will need to target accordingly.

Reinforcement sensitivity theory systems are found to influence perceptions of persuasive health messages (Yang *et al.*, 2012). Schnelle, Brandstratter, and Knopfel (2010) showed that an effective approach is to enhance the perception that goal-relevant personal resources, such as self-efficacy, are available in order to encourage positive outcome expectancies and subsequently increase approach behaviour. In the present context, these would be purposeful health-related behaviours such as an active approach to safety hygiene stimuli. Alongside self-efficacy, RST factors can also help to explain and alleviate deficits in motivation as highlighted in the capability, opportunity, and motivation (COM-B) system of health behaviour change (Mitchie, van Stralen, & West, 2011).

Furthermore, RST traits are associated with preferences for different forms of social support, another important resource. High and Soloman (2014) showed that while individuals scoring highly on behavioural approach traits prefer problem-focused support, those with tendencies towards BIS or FFFS behaviours prefer emotion-focused support. More broadly, we can use RST constructs to understand better the perception of risk (Logan, Kay, & Lewis, 2019) and how to frame appropriate messages to reduce specific risky health behaviours and increase/maintain well-being (Goodwin, Browne, Hing, & Russell, 2017), alleviating uncertainty by framing health behaviours as social norms.

Limitations include a relatively small sample size and we assumed a basic level of health literacy in wording our coronavirus behaviour-related questions, which might have influenced responses. We also did not differentiate between individuals already self-isolating and those intending do so which might have been an interesting comparison given that health behavioural intentions do not always result in behaviour. In addition, the study is cross-sectional and although personality traits are considered to be fairly stable, it is possible that concerns and responses to the virus may change over time as the situation evolves, for instance, compulsory 'lockdown' was not in place when our data were collected. Longitudinal studies of public responses to the situation would be potentially valuable. Nevertheless, our study presents a useful preliminary investigation of individual differences in the psychological dynamics of concerns, attitudes, and (potential) behaviours in the face of the one of the worst health crisis in living memory.

Conflicts of interest

All authors declare no conflict of interest.

Author contributions

Alison M. Bacon (Data curation; Formal analysis; Investigation; Methodology; Writing – original draft; Writing – review & editing); Philip J. Corr (Data curation; Methodology; Writing – review & editing).

Data availability statement

Data and Supporting Information are available at http://www.philipcorr.net/includes/asp/download_file.asp?id=442.

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