Locking down behavioural compliance: the role of emotion and emotion regulation in breaches of COVID-19 mitigation measures

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EMOTION REGULATION AND LOCKDOWN COMPLIANCE

Abstract

Although anxiety and worry can motivate engagement with COVID-19 preventative behaviours, people may cognitively reframe these unpleasant emotions, restoring wellbeing at the cost of public health behaviours. New Zealand young adults ($n=278$) experiencing nationwide COVID-19 lockdown reported their worry, anxiety, reappraisal, and lockdown compliance. Despite high knowledge of lockdown policies, 92.5% of participants reported one or more policy breaches ($M=2.74$, $SD=1.86$). Counter to predictions, no relationships were found between anxiety or worry with reappraisal or lockdown breaches. Findings highlight the importance of targeting young adults in promoting lockdown compliance and offer further insight into the role of emotion during a pandemic.

Keywords: quarantine; lockdown; public health behaviour; emotion regulation; pandemic

EMOTION REGULATION AND LOCKDOWN COMPLIANCE

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COVID-19 mitigation measures

While [COVID-19 lockdown] compliance has been generally strong, there are still some who I would charitably describe as idiots. —New Zealand Prime Minister Jacinda Ardern (5th April 2020)

Background

To date, more than 3 million people have died from COVID-19 (novel coronavirus, SARS-Cov-2; World Health Organisation, 2021). Given that mass quarantine measures are effective in controlling outbreaks of infectious diseases (Alfano & Ercolano, 2020), many countries have implemented period of nationwide ‘lockdown’ to mitigate the spread of COVID-19. Lockdown policies aim to halt population movement and interaction, typically mandating that business and educational facilities shut down or requiring employees and students to work from home, banning large gatherings, and requiring that individuals isolate at home and avoid physical interaction with others. Widespread compliance with lockdown policies is critical; any breach risks continuing the chain of viral transmission. Thus, isolating the psychological factors that predict compliance with lockdown policies is vital in order to inform targeted public health interventions to improve compliance and understand the psychology of those in lockdown. This study assesses the role of emotional distress and cognitive reappraisal in breaches of the 2020 lockdown in Aotearoa New Zealand.

The New Zealand context

On March 25th 2020, Aotearoa New Zealand entered a nationwide ‘lockdown’, officially referred to as Alert Level 4. Lockdown policies required people to remain in their homes unless retrieving groceries, pharmaceutical supplies, or exercising within their neighbourhood. In-person social interactions were limited to those within their lockdown ‘bubble’ (i.e., their household or, in instances where people were living alone or sharing custody of children, a limited number of households). Exceptions to these policies were made for essential workers

EMOTION REGULATION AND LOCKDOWN COMPLIANCE

(e.g., grocery clerks, medical professionals, and those whose work related to critical infrastructure). These restrictions were enforced by New Zealand Police for five weeks before the partial re-opening of contactless business operations and slight easing of restrictions under Alert Level 3 on 27th April 2020. On 13th May 2020 New Zealand moved out of lockdown into Alert Level 2, whereby the government judged the risk of COVID-19 community transmission to be contained and the State of National Emergency that had been in place for the lockdown period expired. See Table 1 for a targeted overview of lockdown policies at Alert Level 4 and 3.

[Insert Table 1 approx. here].

Negative emotions as drivers of lockdown compliance

Lockdown and quarantine can be stressful, anxiety- and fear-inducing experiences (Brooks et al., 2020; Castellano-Tejedor, Torres-Serrano & Cencerrado, 2021; Rossi et al., 2020). Research from previous public health crises suggests that disease-specific anxiety and worry predict greater behavioural compliance with public health measures. During the 2003 outbreak of Severe Acute Respiratory Syndrome (SARS) in Hong Kong, anxiety was associated with greater adoption of precautionary measures, such as wearing a facemask (Leung et al., 2005). Several months after the 2009 outbreak of Influenza A (H1N1) in the Netherlands, both anxiety about the virus and compliance with public health measures (e.g., social distancing, wearing a mask) declined in parallel, suggesting a possible relationship between these factors (Bults et al., 2011). In the early stages of the COVID-19 pandemic, British adults with greater anxiety and fear of COVID-19 reported greater compliance with public health regulations (Harper et al., 2020). Within the United States, adolescents with greater anxiety symptoms engaged in more COVID-19 prosocial acts (Alvis et al., 2020) and, among adults, negative emotions due to COVID-19 correlated (albeit weakly) with compliance with COVID-19 mitigation measures (van Rooij et al., 2020). In contrast, a strong correlation between fear of COVID-19 and behavioural compliance was observed in Pakistan (Hongbo et al., 2020). Taken together, these findings suggest that virus-specific anxiety and worry as well as emotions such as

EMOTION REGULATION AND LOCKDOWN COMPLIANCE

anger and fear may play a role in motivating behavioural compliance with public health measures designed to mitigate the spread of COVID-19.

The role of cognitive reappraisal in lockdown compliance

Behavioural compliance also appears related to the way people choose to manage their emotional experiences. Emotion regulation is our ability to shape what, when, and how we experience and express emotion (Gross, 1998). In particular, cognitive reappraisal is an emotion regulation strategy that involves the active reassessment of emotional stimuli or situations in order to alter one's emotional response in accordance with one's goals (Gross & John, 2003). Emotion regulation research has persistently identified positive outcomes as a result of reappraisal use. Engaging in reappraisal successfully reduces negative emotion (e.g., Mauss et al., 2007) and habitual reappraisal use is associated with less psychopathology symptoms (e.g., Aldao & Nolen-Hoeksema, 2012).

However, recent literature has highlighted the importance of considering the context in which reappraisal is used (Ford et al., 2017; Tamir et al., 2007; Troy et al., 2013). In contexts where negative emotions are necessary to motivate goal-consistent behaviour, using reappraisal to decrease negative emotions may, in fact, result in a trade-off between current short-term psychological wellbeing and longer-term instrumental aims. When Hillary Clinton lost the 2016 US presidential election, Clinton voters who used reappraisal to decrease their negative emotions regarding the election were less likely to engage in political action subsequently (Ford et al., 2018). That is, effective reappraisal was beneficial in the short-term in restoring emotion wellbeing after a distressing event but came at the cost of achieving long-term goals by reducing engagement in subsequent goal-consistent behaviours.

Initial research suggests that this trade-off may extend to engagement in COVID-19 mitigation measures. Individuals who appraised the threat of COVID-19 as less severe also reported better mental health, less negative emotion, and lower psychological distress (van Rooij et al., 2020; Wang et al., 2020). Similarly, use of reappraisal and acceptance emotion regulation

EMOTION REGULATION AND LOCKDOWN COMPLIANCE

strategies correlated with lower COVID-19 specific anxiety (Jungmann & Witthöft, 2020).

Appraisals of COVID-19 also appears to impact longer term engagement in COVID-19 mitigation measures. Appraising COVID-19 as less severe was associated with less behavioural compliance with social distancing and hygiene measures (Briki & Dagot, 2020; van Rooij et al., 2020), whereas youth who appraised COVID-19 as more severe were more likely to engage in social distancing and disinfecting behaviours (Oosterhoff & Palmer, 2020). A recent study following US adults over three months found that COVID-19 specific reappraisal subsequently predicted lower COVID-19 fear, which in turn subsequently predicted fewer COVID-19 mitigation efforts (Smith et al., 2020). Taken together, these studies suggest that, although engaging in reappraisal may successfully decrease negative emotions surrounding COVID-19 to restore emotional wellbeing, doing so risks a trade-off with the instrumental goal of engaging in important virus mitigation measures.

To date, research investigating the impact of emotion regulation and negative emotions on behavioural compliance has been limited to the United States. COVID-19 responses and mitigation measures have been inconsistently enforced across the United States, thus limiting the scope of mitigation behaviours measured to only a few behaviours recommended (but not legally required) by the Centers for Disease Control and Prevention, such as wearing a face mask, practicing hygiene, and maintaining social distancing and social isolation (Smith et al., 2020; van Rooij et al., 2020). Aotearoa New Zealand provides an alternative context for research, in which COVID-19 lockdown policies were legally enforced and accompanied by clear, consistent governmental messaging promoting engagement with mitigation behaviours.

The current study

This study first describes the extent to which university students breached the policies enforcing the 2020 Aotearoa New Zealand lockdown, before investigating the hypothesised trade-off between using reappraisal to achieve short-term emotion goals against long-term instrumental public health goals in the context of the 2020 Aotearoa New Zealand lockdown. We

EMOTION REGULATION AND LOCKDOWN COMPLIANCE

assessed emotional distress using three measures: (i) current state worry about COVID-19; (ii) worry about how COVID-19 may impact one's future, and (iii) anxiety symptoms during lockdown. If successful reappraisal of emotional distress comes at the cost of less motivation to comply with COVID-19 mitigation measures, then anxiety and worry about COVID-19 should mediate the relationship between reappraisal and behavioural compliance. That is, greater reappraisal use should predict less worry and anxiety about COVID-19, which in turn should predict greater lockdown breaches. Thus, we aimed to investigate the relationships between:

- (a) reappraisal use and emotional distress (mediation a-path),
- (b) emotional distress and behavioural compliance (mediation b-path), and
- (c) reappraisal use and behavioural compliance (mediation c-path).

Lastly, we assess whether demographic characteristics, lockdown characteristics, anxiety, COVID-19 current and future worries, and whether lockdown reappraisal uniquely predicts lockdown breaches.

Method

Participants

Two-hundred and seventy-eight young adults (M age = 18.93, SD = 3.27) distributed across New Zealand¹ took part in the study as part of an undergraduate research participation course requirement. Of these participants 76.1% were female, 23.5% were male, and <1% were non-binary². The majority (71.2%) of participants identified as New Zealand European/Pākehā, with the remainder identifying as Māori (indigenous New Zealander, 11.4%), Pasifika (1.8%), Asian (9.6%), or a non-listed ethnicity (5.9%). 10.4% of participants reported that they were at higher risk of negative health complications resulting from COVID-19, and 8.6% reported that they were essential workers continuing to work in face-to-face conditions during lockdown.

¹ As New Zealand lockdown policies were enforced nationwide, no inclusion/exclusion criteria regarding participant location were used.

² Gender was measured with an open-text box and responses were coded according to best-practice guidelines (Fraser et al., 2019). Due to a lack of statistical power with which to test differences between participants of binary and nonbinary genders, the nonbinary participant was excluded from all analyses involving gender.

EMOTION REGULATION AND LOCKDOWN COMPLIANCE

Approximately half (53.2%, $n = 148$) of participants took part during Level 4 lockdown, and the remainder took part during Level 3 lockdown (46.8%; $n = 130$). No relationship was found between the Alert Level during which participation occurred and age ($t(273) = 0.04$, $p = .968$), gender ($\chi^2(2) = 2.76$, $p = .251$), ethnicity ($\chi^2(4) = 6.19$, $p = .186$), high-risk status ($\chi^2(1) = 0.32$, $p = .572$) or essential worker status ($\chi^2(1) = 0.58$, $p = .447$).

Procedure

Participants completed the survey online via Qualtrics. Data were collected during Alert Level 4 (20th – 27th April 2020) and Alert Level 3 (6–13th May), constituting the 26th – 33rd and 42nd – 49th day of a nationwide lockdown. The pause in data collection (28th April – 5th May) meant that participants could respond in regard to either Level 4 or Level 3 only, rather than the transitional period between the two levels during which restrictions changed. Participants provided informed consent and were provided with a list of support services available during lockdown following participation. Ethical approval was granted by the [university name redacted for review] Human Ethics Committee.

Measures

Lockdown characteristics: Participants were given the following two descriptions: ‘Some people are at higher risk of negative health complications resulting from COVID-19/coronavirus’ and ‘Essential workers are continuing to work in face-to-face conditions during Alert 4 lockdown’ and asked to indicate if these definitions of ‘high-risk individual’ and ‘essential worker’ (respectively) applied to: ‘Me’, ‘Someone in my family or whānau, or a close friend who is inside my bubble’, ‘Someone in my family or whānau, or a close friend who is outside my bubble’, and ‘Someone else in my lockdown bubble’. We coded participants’ high-risk status and essential worker status, as well as whether their lockdown bubble included high-risk people or essential workers (in all instances, 0 indicated the absence the absence of a high-risk person or essential worker and 1 indicated the presence). Participants were also asked how many people

EMOTION REGULATION AND LOCKDOWN COMPLIANCE

were included in their lockdown bubble, with the response options: '1 (just me)', '2', '3–4', '5–6', '7–10', '11 or more', and 'I don't know'.

Breaches of lockdown policies were assessed using items developed with reference to government recommendations and nationwide public advertising surrounding acceptable and restricted behaviour during lockdown. Each item began with 'In the week before, or during, [appropriate Alert Level] lockdown, I have...' and included descriptions of behaviours such as '...organised to meet friend(s) and/or family from outside my lockdown bubble at a communal place (e.g., at the park, supermarket) so that I could socialise'. Response options were 'Yes', 'No', and 'Not Applicable'³. During Alert Level 4, behaviours were deemed non-compliant if they breached the 3rd April 2020 government order of Section 70(1)(f) of the Health Act 1956 (Ministry of Health, 2020a) or were counter to the government-approved COVID-19 messaging (New Zealand Government, 2020; e.g., '...taken care to wash my hands more thoroughly than before COVID-19', reverse coded), with a maximum of 18 possible policy breaches. At Alert Level 3, behaviours were deemed to be non-compliant if they breached the 27th April 2020 government order of Section 70(1)(f) and (m) of the Health Act 1956 (New Zealand Legislation, 2020) or were counter to the government approved COVID-19 messaging. Five of the behaviours prohibited Alert Level 4 were permitted at Alert 3, resulting in a maximum of 13 possible policy breaches. See Supplementary Materials for all items. The correlation between items were generally weak (r_s range from $<.01$ to $.45$, $Mdn = .02$), suggesting items were relatively independent and thus a total score was created rather than an average. Reports of engagement in or endorsement of policy breach items received a score of one each, for a total possible score of 18 at Alert Level 4 and 13 at Alert Level 3, with greater scores indicating poorer compliance with lockdown policies.

³ The 'Not applicable' response option was included as some items relied on specific circumstances that may not apply to all participants (e.g., '...Gone to buy groceries or pharmacy supplies with other people in my lockdown bubble' only applies to participants with others in their lockdown bubble). 'Not Applicable' responses were coded as policy compliant.

EMOTION REGULATION AND LOCKDOWN COMPLIANCE

Knowledge of lockdown policies was assessed with eight factual statements. Each item began with ‘During the Alert Level [4 or 3, as appropriate] Lockdown period, people are allowed to...’ and included descriptions of behaviours such as ‘have more than one household within their bubble’ to which participants could respond with ‘True’ or ‘False’. Each correct answer received 1 point, for a maximum score of 8. See Supplementary Materials for all items.

COVID-19 worry was assessed regarding current and future worries⁴. Current worry was assessed with two items: ‘I feel anxious about COVID-19/coronavirus’, and ‘COVID-19/coronavirus is one of the things I worry about the most’. Future worry was assessed with four items: ‘COVID-19/coronavirus has left me feeling uneasy about my future’, ‘Since being in lockdown, I feel less in control of my future’, ‘Since being in lockdown, I have more negative thoughts about my future’, and ‘I am afraid to plan for the future’. Participants responded to each item on a 5-point Likert-type scale ranging from ‘1-Strongly disagree’ to ‘5-Strongly agree’. Items assessing current and future worry were positively correlated (Current worry: $r = .73$; Future worry: $\alpha = .88$) so average scores were calculated to index current and future COVID-19 specific worry.

Anxiety during lockdown was measured using the 7-item Anxiety subscale of the 21-item version of the Depression Anxiety Stress Scale (DASS-21; Lovibond & Lovibond, 1995). Participants indicated the extent to which items such as ‘I felt I was close to panic’ applied to them over the previous week, on a 5-point scale ranging from ‘0-Did not apply to me at all’ to ‘4-Applied to me very much or most of the time’. As the original scale uses ‘the previous week’ as a frame of reference and participants had been in lockdown for over three weeks at the time of data collection, the data collected are indicative of anxiety during lockdown. The seven items were averaged to calculate a total Anxiety score. The DASS-21 has displayed strong validity and reliability (Henry & Crawford, 2005), and internal consistency of the anxiety subscale in the current sample was adequate ($\alpha = .87$).

⁴ Items were developed in consultation within our broader research team which is comprised of clinical psychologists and experts in youth mental health.

EMOTION REGULATION AND LOCKDOWN COMPLIANCE

Lockdown specific reappraisal was measured using the reappraisal subscale of the Emotion Regulation Questionnaire (ERQ; Gross & John, 2003), modified to refer specifically to the lockdown context (for similar context-dependent modifications, see Ford et al., 2018; Smith et al., 2020). This subscale comprises six items, such as ‘When I want to feel more positive emotion during lockdown, I change the way I’m thinking about the situation’. Participants responded to each item on a 7-point Likert scale ranging from ‘1-Strongly Disagree’ to ‘7-Strongly Agree’. Items were averaged to create an index of COVID-19 specific cognitive reappraisal. Internal consistency was adequate ($\alpha = .86$).

Analysis

First, we describe the characteristics of participants’ lockdown and the extent to which they reported breaching lockdown policies. We assessed the impact of demographic and lockdown characteristics on lockdown knowledge, lockdown breaches, reappraisal, anxiety, and current and future COVID-19 worry using Whitney tests. Secondly, we examined the zero-order associations between lockdown knowledge, reappraisal use, anxiety, COVID-19 current and future worry, and lockdown breaches using Pearson’s correlations, to evaluate the evidence of our proposed mediational analysis. Finally, linear regression tested whether demographic characteristics, lockdown characteristics, anxiety, COVID-19 current and future worries, and lockdown reappraisal were uniquely associated with lockdown breaches. Anxiety was not normally distributed ($Skew = 1.55$, $SE = 0.15$, $kurtosis = 2.22$, $SE = 0.29$), so analyses including anxiety are nonparametric. Significance was set at $p = .05$, with statistical trends at $p = .07$. Analyses were conducted using Jamovi. Deidentified data and analysis scripts are available at (Anonymized link for review:

https://osf.io/pa4n3/?view_only=e7afa52b48904757bc97e2e02619b4b6).

EMOTION REGULATION AND LOCKDOWN COMPLIANCE

Results

Lockdown characteristics

The majority (78.1%) of participants had 3-6 people in their lockdown bubble; 1.4% were the only person in their bubble, 7.6% had two people, 10.8% had 7–10, 1.4% had 11 or more, and 0.7% of participants did not know how many people were in their lockdown bubble. 10.4% of participants reported that they were at high risk of health complications from COVID-19, and 43.9% reported that someone in their lockdown bubble was at a high risk. 8.6% of participants were essential workers continuing to work in face-to-face conditions during lockdown, and 33.5% reported someone one in their lockdown bubble was an essential worker. Notably, 14.8% of participants reported that their bubble included both an essential worker and a high-risk person.

Breaches of lockdown policies

Across participants, knowledge of lockdown policies was high. Participants correctly identified 80% ($M = 6.40$ out of a possible 8, $SD = 1.13$) of lockdown policies, with 51.1% of the sample correctly identifying 88–100% of policies. See Supplementary Materials for the proportion of the sample who answered incorrectly to each item. Knowledge test scores were greater at Alert Level 4 ($M = 6.64$, $SD = 1.02$) than at Alert Level 3 ($M = 6.13$, $SD = 1.18$; $t(276) = 3.87$, $p < .001$, $d = .47$). In terms of demographic differences, Pākehā/New Zealand European participants ($M = 6.53$, $SD = 1.10$) demonstrated greater knowledge of lockdown policies than members of other ethnicity groups ($M = 6.13$, $SD = 1.12$; $t(276) = 2.70$, $p = .007$, $d = .36$), and age was negatively associated with knowledge test score ($r = -.12$, $p = .047$). No differences in knowledge test score were found by gender ($t(269) = -0.38$, $p = .708$, $d = -.05$), or whether participants shared a lockdown bubble with individual(s) at high risk of COVID-19 health complications ($t(276) = 0.31$, $p = .760$, $d = .04$) or essential worker(s) ($t(276) = -0.06$, $p = .952$, $d = -.01$).

Despite high overall knowledge of lockdown policies, participants also reported breaching lockdown rules. On average, participants broke 2.74 ($SD = 1.86$) lockdown rules,

EMOTION REGULATION AND LOCKDOWN COMPLIANCE

with only 7.6% of participants reporting compliance with all policies we assessed. See Supplementary Materials for the proportion of the sample who reported breaching of each lockdown policy. Although participants reported a similar number of lockdown breaches at Alert Levels 4 and 3, ($t(276) = 1.67, p = .096, d = 0.20$), compliance with specific behaviours changed across alert levels. A greater proportion of participants reported having bought additional non-perishable food and supplies at Alert 4 than at Alert 3. In contrast, breaching lockdown rules by going shopping as a reason to go outside or into town, visiting older family members, or organizing to physically socialize at a communal place with people outside one's bubble was more common at Alert Level 3 than at Alert Level 4. No differences in the number of overall rule breaches were found by gender ($t(269) = 0.14, p = .890$), age ($r = -.04, p = .505$), ethnicity ($t(269) = 0.61, p = .542, d = .08$), or whether participants had a high risk person in their lockdown bubble ($U = 8415, p = .092, d = .24$). Those with an essential worker in their lockdown bubble ($M = 2.31, SD = 1.69$) reported breaking fewer rules than those without ($M = 2.96, SD = 1.91; t(276) = 2.78, p = .006, d = .35$).

Associations between anxiety, worry, reappraisal, and lockdown breaches

Next, we tested the hypothesis that emotional distress mediates the relationship between reappraisal and lockdown breaches whereby reappraisal predicts lower COVID-19 worries and anxiety, which in turn predicts more lockdown breaches. Table 3 shows the zero-order correlations between lockdown breaches, knowledge of lockdown policies, reappraisal, current anxiety, current COVID-19 worry, and future COVID-19 worry. As expected, current COVID-19 worry, future COVID-19 worry, and anxiety were all positively correlated, reflecting an interrelated sense of general concern surrounding the virus. However, counter to predictions reappraisal was unrelated to current or future COVID-19 worries or anxiety symptoms, providing no evidence for the mediation a-path. Likewise, current and future COVID-19 worries, and anxiety symptoms were also unrelated to the number of lockdown breaches, providing no evidence for the mediation b-path. Lastly, reappraisal was unrelated to the number of lockdown

EMOTION REGULATION AND LOCKDOWN COMPLIANCE

breaches, providing no evidence for the mediation c-path. Given that significant a- and b-path relationships are required for mediation analyses (regardless of the presence of a significant c-path correlation; Rucker et al., 2011), the proposed mediation was abandoned.

[Insert Table 2 approx. here].

Unique predictors of lockdown breaches

Finally, we tested whether demographic characteristics, lockdown characteristics, anxiety, COVID-19 current and future worries, and lockdown reappraisal were uniquely associated with lockdown breaches. The linear regression model was significant ($F(11, 258) = 2.10, p = .021$), explaining a small proportion of the variation in lockdown breaches (Adjusted $R^2 = .04$). Table 4 provides the standardised estimates. Overall, the only predictor variable uniquely associated with lockdown breaches was whether participants had essential worker(s) within their bubble; participants whose bubble contained essential worker(s) reported fewer lockdown breaches than those in bubbles without essential worker(s).

[Insert Table 3 approx. here].

Discussion

Countries implementing lockdown periods have experienced success in limiting the spread of COVID-19 to vulnerable populations and precluding strain on public health resources (Alfano & Ercolano, 2020). We investigated whether the use of cognitive reappraisal to achieve the immediate goal of reducing anxiety and COVID-19 worry during a nationwide lockdown would result in a trade-off with the instrumental goal of compliance with lockdown rules. Within our sample, lockdown-specific reappraisal was unrelated to current or future worries about COVID-19, anxiety, or breaches of lockdown policies. These findings stand in contrast to previous research, particularly preliminary findings identifying a trade-off of participation in preventative health behaviours when utilising reappraisal to regulate fear of COVID-19 (Smith et al., 2020).

The role of emotion regulation in lockdown

EMOTION REGULATION AND LOCKDOWN COMPLIANCE

Knowledge of lockdown policies was positively associated with reappraisal use, suggesting that people's understanding of government responses to mitigate the spread of COVID-19 was related to how they chose to manage their emotional experiences while in lockdown. Across other health domains, seeking health information functions to provide reassurance and down-regulate worry (Brown et al., 2020). Our findings suggest that health knowledge may be associated with greater regulation use in general. Counter to hypotheses, no relationship was found between the extent to which participants reported reappraising their lockdown emotional experience, their anxiety, and how worried they were about COVID-19, both currently and regarding the future impact. The lack of relationship between reappraisal and emotional wellbeing may suggest that reappraisal differs under a high intensity, enduring, shared emotional context such as nationwide lockdown compared to typical, everyday stressors. During a series of national disasters in Japan in 2011, an emotionally intense period characterised by its spatial and temporal proximity to those involved, cognitive reappraisal *use* was found to be unrelated to both negative emotions and reappraisal *success* (Cavanagh et al., 2014). Although cognitive reappraisal use in everyday situations can be effective at restoring emotional wellbeing after emotional challenge (Mauss et al., 2007), choosing reappraisal as a strategy during an ongoing crisis scenario may not be as effective at reducing negative emotions. In comparison, other coping strategies may be more effective in restoring wellbeing *and* following public health recommendations. Among Mexican adults, active coping and cognitive-focused coping strategies predicted engagement in COVID-19 preventative behaviours (Javier & Roberto, 2021). The shared experience of lockdown may also contribute, with regulation perhaps occurring as a collective, through mutual support and feedback from others.

However, other preliminary research *has* identified a relationship between reappraisal use and negative emotions during the COVID-19 pandemic, particularly in decreasing experiences of fear (Harper et al., 2020; Hongbo et al., 2020; Smith et al., 2020). Perhaps the emotional experience of *fear* is specifically targeted by cognitive reappraisal. Although anxiety and worry are closely

EMOTION REGULATION AND LOCKDOWN COMPLIANCE

related to fear, they are conceptually distinct constructs, with worry defined as a cognitive process and anxiety as a global term (Szabó, 2007; Zebb & Beck, 1998).

Predictors of lockdown breaches

Again, counter to hypotheses, no relationship was found between the extent to which participants reported reappraising their lockdown emotional experience, their anxiety, and how worried they were about COVID-19, and their number of lockdown policy breaches. One potential explanation for this apparent lack of relationship may be linked to high public trust in the government response to COVID-19. In a nationally representative sample of New Zealanders, trust and satisfaction with the government's performance increased during the lockdown period (Sibley et al., 2020). Preliminary evidence suggests that, particularly for those experiencing lower levels of negative emotions, trust in government significantly predicted compliance with preventative health behaviours (Min et al., 2020). Similarly, both low tolerance for uncertainty within a pandemic context and confidence in diagnosis and preventative measures are linked to psychological distress (Domínguez-Salas et al., 2020; Taha et al., 2014). As our participants reported low anxiety scores and worry clustered around the midpoint, it may be that trust in government played a significant role in reducing negative emotions predicting compliance with lockdown rules, eclipsing the effect of negative emotions on compliance.

Similarly, the relationship between negative emotions and compliance may be eclipsed by the role of social norms. Preliminary research has identified that those who report more social norms surrounding compliance behaviour tend to follow more regulations (van Rooij et al., 2020). Compared to other countries and contexts in which uptake of compliant behaviour was largely voluntary, perhaps the severity of lockdown in Aotearoa New Zealand directly contributed to greater compliance by creating strong social norms through legal enforcement and clear public health messaging, thus eclipsing a role of negative emotions in predicting compliance.

In terms of demographic variables and descriptive findings, the only significant predictor of behavioural compliance during lockdown was the presence of an essential worker within the

EMOTION REGULATION AND LOCKDOWN COMPLIANCE

lockdown bubble. Research has identified that those working during the COVID-19 pandemic are exposed deeply to increased health and safety regulations, taking them seriously both for the sake of themselves and their family members (Hu et al., 2020). It is perhaps possible that heightened awareness of safety protocol enforced in the workplace thus generalised to the home environment for essential workers, and the heightened understanding of risk for these individuals and their bubble members as they regularly leave their bubbles for work throughout lockdown.

Limitations, implications, and future directions

Our findings should be interpreted in the context of several limitations. First, data are cross-sectional and unable to inform causal inferences about the temporal nature of the relationship between reappraisal, worry, anxiety and lockdown compliance. Second, this study was conducted in a quickly evolving context. Changing restrictions meant that not all behaviours restricted at Alert Level 3 were assessed, and so some lockdown breaches may not have been captured. Third, our sample was comprised of university students, the majority of whom were young adults who likely had no children or dependents and may have had greater flexibility to adapt to lockdown conditions than many other population groups. Previous research has demonstrated that, compared to other occupations, students engaged in more COVID-19 preventative behaviours (Javier & Roberto, 2021). In addition, the university our participants attended declared a 'pause' on all teaching and assessment during Alert Level 4, perhaps impacting on the negative emotions they experienced in a unique way compared to individuals from other universities or those in employment. This may have also resulted in a response bias, such that only students motivated (and able) to continue studying during this pause participated.

Despite these limitations, our findings emphasise the importance of targeting young adults when promoting compliance with mitigation measures. Credited as main vectors for COVID-19 within Aotearoa New Zealand, young adults aged 20–29 had the highest rates of COVID-19 cases (Ministry of Health, 2020b), often experiencing only mild symptoms while spreading the virus to those more vulnerable (Cooke, 2020). Spread by younger adults has also been observed overseas,

EMOTION REGULATION AND LOCKDOWN COMPLIANCE

particularly in university-based case clusters (Cai et al., 2020; Wilson et al., 2020). Targeting compliance in young people specifically is particularly important for governments to consider when looking to limit spread of viral diseases.

However, this study was unable provide much guidance for predicting *who* is more likely to break lockdown policies, raising avenues for future research. Given the lack of relationship between emotion and reappraisal during lockdown, future research should target emotion regulation in high-intensity, shared crisis experiences. To date, most emotion regulation research is centred on individual emotional experience, leaving the impact of collective emotional experience on regulation functioning uncertain (Krueger, 2015). Further research should investigate emotion regulation in high-intensity, on-going, shared crisis experiences in order to better understand the psychological experience during crises such as lockdown. Although lockdown enforced nationwide rules and restrictions, people's unique circumstances, resources, and responsibilities likely influenced their wellbeing and behaviour during lockdown. Future research could take an in-depth qualitative approach to investigate how people understood what it meant to be mentally well in the context of lockdown, and what aspects of their experience contributed to their own positive wellbeing. As trust in government may have influenced compliance and anxiety in our sample (Domínguez-Salas et al., 2020; Min et al., 2020), the impact of trust and confidence in government responses to crises may also be of particular interest in further research. Similarly, how our results generalise beyond New Zealand's nationwide lockdown – in which the government response was transparent and legally enforced with restrictions gradually eased – is uncertain, with further research in differing contexts required.

Conclusion

This study investigated the possible trade-off between achievement of immediate emotion regulation goals and longer-term instrumental goals when utilising cognitive reappraisal as a strategy to regulate anxiety and worry about COVID-19. Despite high knowledge of lockdown policies, 92.5% of participants reported breaching one or more policies. We found no relationship

EMOTION REGULATION AND LOCKDOWN COMPLIANCE

between reappraisal with current or future COVID-19 worries, or current anxiety. Likewise, no relationship was found between reappraisal, current or future COVID-19 worries, or anxiety and the number of lockdown policies breaches reported. Findings highlight the importance of targeting young people when promoting compliance with virus mitigation measures and offer further insights into the role of emotion during a pandemic.

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EMOTION REGULATION AND LOCKDOWN COMPLIANCE

Table 1

Targeted overview of lockdown policies across Alert Level 3 and 4.

	Alert Level 4	Alert Level 3
Date range	25 th March – 26 th April 2020	27 th April – 13 th May 2020
Risk assessment	Likely COVID-19 is not contained. Sustained and intensive community transmission of COVID-19 with widespread outbreaks.	High risk that COVID-19 is not contained. Multiple cases of community transmission occurring and multiple active clusters in multiple regions.
Bubble restrictions	<ul style="list-style-type: none"> • People instructed to stay at home in their bubble other than for essential personal movement — including safe local recreation. 	<ul style="list-style-type: none"> • People instructed to stay home in their bubble other than for essential personal movement — including to go to work or school if they have to, or for local recreation. • Physical distancing required. • Can expand bubble (e.g. to support isolated people), but this extended bubble should remain exclusive.
Travel restrictions	<ul style="list-style-type: none"> • Travel severely limited. • All gatherings cancelled and all public venues closed. 	<ul style="list-style-type: none"> • Inter-regional travel highly limited. • Gatherings of up to 10 people are allowed but only for wedding services, funerals, with physical distancing and public health measures maintained. • Public venues closed.
Occupational and education restrictions	<ul style="list-style-type: none"> • Businesses closed except for essential services (e.g., supermarkets and pharmacies). • Educational facilities closed. 	<ul style="list-style-type: none"> • People must work from home unless that is not possible. • Children should learn at home if possible. • Schools (5-14 years old) and early childhood education centres can open, with limited capacity. • Businesses can open premises but cannot physically interact with customers.

Note. Summary drawn from 'About the Alert System' (New Zealand Government, 2020). Bubble refers to the exclusive and closed group of people that an individual could physically interact with during lockdown (i.e., their household or, in instances where people live alone or share custody of

EMOTION REGULATION AND LOCKDOWN COMPLIANCE

children, a limited number of households). A thelockdown ‘bubble’ (i.e., their household or, in instances where people live alone or share custody of children, a limited number of households).

EMOTION REGULATION AND LOCKDOWN COMPLIANCE

Table 2

Descriptive statistics and zero-order correlations between lockdown breaches, knowledge of lockdown policies, reappraisal, worry, and anxiety.

	<i>M (SD)</i>	Possible range	Number of lockdown policy breaches	Knowledge of lockdown policies	Reappraisal	COVID-19 Current Worry	COVID-19 Future Worry
Number of lockdown policy breaches	2.74 (1.86)	Level 4: 0-18 Level 3: 0-13	-				
Knowledge of lockdown policies	6.40 (1.13)	0-8	-.05	-			
COVID-19 Cognitive Reappraisal	4.81 (0.87)	1-7	.08	.13*	-		
COVID-19 Current Worry	2.74 (1.11)	1-5	-.04	-.04	.05	-	
COVID-19 Future Worry	3.27 (1.04)	1-5	.07	.01	.05	.47**	-
Anxiety ^a	0.53 (0.61)	0-4	.07	-.06	.06	.34**	.36**

Note. * $p < .05$, ** $p < .001$. ^a Anxiety was non-normally distributed so Spearman's rho correlations are reported. Significant relationships bolded.

Table 3*Linear regression of predictor variables on total lockdown breaches.*

Predictors	β	95% CI	<i>p</i>
<i>Demographic characteristics</i>			
Age	-.04	-.17, .08	.482
Gender (0 = Male, 1 = Female)	-.03	-.15, .09	.606
Ethnicity ^a	-.03	-.16, .09	.617
<i>Lockdown characteristics</i>			
Alert level (0 = Level 4, 1 = Level 3)	-.08	-.20, .05	.212
High risk individual(s) in bubble (0 = no, 1 = yes)	-.10	-.23, .02	.087
Essential worker(s) in bubble (0 = no, 1 = yes)	-.15	-.27, -.03	.016
Knowledge of lockdown policies	-.08	-.21, .04	.194
<i>Psychological characteristics</i>			
Anxiety	.11	-.02, .24	.086
Current COVID-19 worry	-.12	-.26, .02	.103
Future COVID-19 worry	.09	-.05, .23	.188
Reappraisal	.06	-.06, .18	.336

Note. ^a Given the low numbers of those who identified as an ethnicity other than Pākehā ($n = 77$), we collapsed across these ethnicities to protect from spurious claims, comparing all non-Pākehā to Pākehā. Significant relationships are bolded for ease of interpretation.

SUPPLEMENTARY MATERIALS

Table A*Knowledge of Lockdown Alert Level 4 and Alert Level 3 policies.*

Knowledge item	Correct answer	Proportion who answered incorrectly
During the [current alert level] lockdown period, people are allowed to...		
... leave the house.	True	7.2%
... go for a walk in their neighbourhood.	True	1.8%
...go for a drive to pass the time in their neighbourhood.	False	24.8%
...visit their friends and family, as long as they keep two meters distance from them.	False	29.5%
... bring groceries to people outside their bubble.	True	22.7%
...talk to people outside their bubble.	True	28.8%
...travel within New Zealand during the Easter break.	False	4.3%
...have more than one household within their bubble.	True	40.6%

Table B*Proportion of lockdown breaches by policies at Alert Level 4 and Alert Level 3.*

Policy breach	Alert Level 4	Alert Level 3
Taken care to avoid touching my face (<i>reverse coded</i>)	48.0%	47.7%
Gone to buy groceries or pharmacy supplies with other people in my lockdown bubble	41.9%	42.3%
Traveled outside of my neighbourhood to exercise	24.3%	-
Bought additional non-perishable food, cleaning supplies, or toiletries just in case grocery stores run out	24.3%*	14.6%*
Gone shopping for just a few items as a reason to go outside or into town	23.0%*	33.8%*
Gone walking or hunting in the bush	20.0%	-
Bought more groceries or pharmacy supplies than I would typically need in two weeks	16.2%	12.3%
Attended in person events held instead of cancelled events or celebrating before lockdown (e.g., moving out of halls or flats, [cancelled music festival])	13.5%	-
Pet a cat or dog belonging to someone outside of my lockdown bubble	12.2%	18.5%
Gone to visit older member(s) of my whānau/ family	11.5%^	20.0%^
Taken care to wash my hands more thoroughly than before COVID-19 (<i>reverse coded</i>)	8.1%	14.6%
Organized to meet friend(s) and/or family from outside my lockdown bubble at a communal place (e.g., at the park, supermarket) so that I could socialize	8.1%*	16.2%*
Gone to visit older member(s) of my community	6.1%	6.9%
Taken care to keep two meters of distance between myself and people outside of my lockdown bubble (<i>reverse coded</i>)	4.7%	5.4%
Taken care to sneeze or cough into my elbow (<i>reverse coded</i>)	2.7%	6.9%
Gone swimming, surfing, fishing, or boating at the beach	2.0%	-
Gone ahead with in-person plans with people outside of my lockdown bubble (e.g., birthday parties, weddings, travel within New Zealand).	2.0%	-

Note. Difference across alert levels, * $p < .05$, ^ $p < .07$. Empty cells at Alert Level 3 indicate that the behaviour was permissible at Alert Level 3.