


Comorbidity and COVID-19: investigating the relationship between medical and psychological well-being

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Objective: The unprecedented occurrence of a global pandemic is accompanied by both physical and psychological burdens that may impair quality of life. Research relating to COVID-19 aims to determine the effects of the pandemic on vulnerable populations who are at high risk of developing negative health or psychosocial outcomes. Having an ongoing medical condition during a pandemic may lead to greater psychological distress. Increased psychological distress may be due to preventative public health measures (e.g. lockdown), having an ongoing medical condition, or a combination of these factors.

Methods: This study analyses data from an online cross-sectional national survey of adults in Ireland and investigates the relationship between comorbidity and psychological distress. Those with a medical condition ($n = 128$) were compared to a control group without a medical condition ($n = 128$) and matched according to age, gender, annual income, education, and work status during COVID-19. Participants and data were obtained during the first public lockdown in Ireland (27 March 2020–8 June 2020).

Results: Individuals with existing medical conditions reported significantly higher levels of anxiety ($p < .01$) and felt less gratitude ($p \leq .001$). Exploratory analysis indicated that anxiety levels were significantly associated with illness perceptions specific to COVID-19. *Post hoc* analysis revealed that psychological well-being was not significantly related to condition type (e.g. respiratory disorders).

Conclusion: This research supports individualised supports for people with ongoing medical conditions during the COVID-19 pandemic, and has implications for the consideration of follow-up care specifically for mental health. Findings may also inform future public health policies and post-vaccine support strategies for vulnerable populations.

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Introduction

On 11 March 2020, a global pandemic was declared by the World Health Organization following the spread of a novel strain of coronaviruses labelled as COVID-19 (Smith *et al.* 2020; Xiong *et al.* 2020). Preventative public health measures such as national and regional lockdowns were implemented by governments in order to reduce the fatality and spread of the disease. These preventative measures including containment and quarantine are enforced for public safety and were proven successful in previous epidemics (Reynolds *et al.* 2008). Nonetheless, such measures may result in elevated psychological distress, for example, anxiety, stress, and depression through mediating factors such as social disconnectedness and self-isolation (Özdin &

Bayrak Özdin, 2020; Brooks *et al.* 2020; Santini *et al.* 2020). Previous research indicates that psychological responses to epidemics may remain over time and thus pose an acute threat to mental health (Kelly, 2020). Individual variables such as perceived vulnerability, poor self-rated health, and anxiety proneness may result in psychological vulnerability from pandemic-associated stressors (Asmundson & Taylor, 2020).

Research pertaining to the psychological effects of COVID-19 appears heterogeneous with countries revealing varying health outcomes and psychological responses. A population-based cross-sectional study revealed that symptoms of depression, anxiety, and stress were prevalent amongst a cohort of Spanish individuals in the initial phase of the pandemic, this being most pronounced for anxiety (González-Sanguino *et al.* 2020). These findings were mirrored in a study from China that evaluated the immediate and adverse psychological response of COVID-19 on mental health.

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The study revealed that the most notable expression was found for anxiety, compared to depression and stress, amongst the general population in China (Wang *et al.* 2020; Smith *et al.* 2020). Within Ireland, these findings were also replicated (Burke *et al.* 2020).

It is necessary for the implementation of newly developed health services and public health policies to address the negative burden that COVID-19 may place on individuals and vulnerable populations (Hao *et al.* 2020; Xiong *et al.* 2020). Advanced age and comorbid chronic illness are significant risk factors for developing negative health outcomes and contracting disease, with these cohorts being considered as 'high risk' for contracting COVID-19 (Emami *et al.* 2020; Yu *et al.* 2011; Özdin & Bayrak Özdin, 2020). Not only do patients with comorbidity yield poorer clinical outcomes and prognosis, but they are also more susceptible to greater psychological burden (Guan *et al.* 2020; Wang *et al.* 2020). This burden may be due to compromised immunity, and/or worries about physical health (Xiong *et al.* 2020; Hao *et al.* 2020).

In response to COVID-19, the current study investigated the relationship between comorbid health conditions and psychological well-being during COVID-19 amongst a cohort of Irish adults. It was hypothesised that the threat of COVID-19 to one's health would lead individuals with ongoing medical conditions to have lower self-reported subjective well-being, experience increased psychological distress, have higher levels of personal distress, report lower levels of gratitude, and have elevated scores of illness perception when compared to those without medical diagnoses. Variables such as age, gender, annual income, and education have been found to affect symptoms of anxiety and depression and thus were used to select the matched groups (Albert, 2015; Smith *et al.* 2020; Özdin & Bayrak Özdin, 2020).

Methods

Inclusion and exclusion

Participants were required to be over the age of 18, living in Ireland during the period of quarantine (27 March 2020–8 June 2022), and to confirm the presence or absence of a medical health diagnosis. Participants were required to read an information sheet and provide consent prior to completing the questionnaire. Individuals who did not meet the inclusion criteria were excluded from the study.

Participants

This study is a secondary analysis of data obtained in an online national survey, whereby a public sample was recruited through the use of media outlets in Ireland (see Burke *et al.* 2020). The original study provided a

sample of $n = 847$ participants; however, data were screened in order to capture the cohort of individuals needed for this study ($n = 256$). Participants who reported having a medical condition ($n = 128$) formed one group, whilst the control group ($n = 128$) was created by purposively matching participants on age, gender identity, annual income, educational attainment, and work status during COVID-19. In selecting the control participants, outcomes from each participant in the medical group was blinded from their demographics and then purposively matched with an individual of similar demographic information who reported not having a medical condition. When matching, all participant outcome data were blinded. In this sample, the average age for the medical condition group was 39 years (± 11.41), and 83.6% of participants were female. Similarly, the purposively matched control cohort had a mean age of 39 years (± 11.3), and 83.6% of participants were female.

Measures

The Warwick–Edinburgh Mental Well-being Scale (WEMWBS; Tennant *et al.* 2007) is a 14-item measure, which covers both hedonic and eudaimonic facets of mental health. The positively worded items capture various concepts of well-being including positive affect, psychological functioning, and interpersonal relationships. It is proposed that higher scores are indicative of greater well-being.

The Depression, Anxiety, and Stress Scale – 21 (DASS-21; Lovibond & Lovibond, 1995) is composed of three varying subscales, with each scale measuring self-reported depression, anxiety, and stress.

The Effects of COVID-19 Questionnaire (ECQ; Burke *et al.* 2020) is a 34-item tool that is designed to measure individuals' perception of COVID-19-related stresses and associated gratitude. This measure contains four subscales: Personal Stress (items 1–13), Parenting Stress (items 14–21), Older Aging Parent Stress (22–25), and Gratitude (26–34) in which respondents must choose from five response options (see Supplementary Material 1). Within the ECQ subscales, the ranges for Personal Distress are Normal 0–12; Mild 13–19; Moderate 20–26; Severe 27–33; Extremely Severe >34.

The Brief Illness Perception Questionnaire (BIPQ; Broadbent *et al.* 2006) is a 7-item scale designed to rapidly assess both the emotional and cognitive representation of illness, and has been adapted for use with COVID-19 (see supplementary information for BIPQ questions).

Data analysis plan

An independent samples *t*-test was used to analyse scores of the WEMWBS and the ECQ, whilst multivariate analyses of variance (MANOVA) were conducted to

analyse scores of the DASS-21 and BIPQ. Multiple linear regressions were conducted as an exploratory analysis to determine whether levels of anxiety were predicted based on responses of the WEMWBS and the BIPQ. Participants with medical conditions were further stratified based on the number of medical morbidities that were present and the associated clinical features (Guan *et al.* 2020), see Supplementary Fig. 1. A *post hoc* MANOVA analysis was conducted to determine if there was a differential effect present based on condition type with Bonferroni correction. An alpha level of .05 was set for significance testing, with Bonferroni adjustment considered where relevant (adjusted *p*-value for significance threshold is $p < .025$). Outliers were removed when preliminary analyses indicated violations of the assumptions of linearity, multicollinearity, and homogeneity of variance-covariance matrices. The assumption of homogeneity of variance was satisfied.

Results

Effects of COVID-19 Questionnaire (ECQ)

An independent samples *t*-test was conducted to compare levels of gratitude between groups. There was a significant difference in scores ($t(243) = 3.46, p \leq .001$) with participants in the medical condition group ($M = 17.21, SD = 6.69$) scoring lower than those in the control ($M = 20, SD = 5.91$). The magnitude of the differences in the means (mean difference = 2.79, 95% CI: 4.38–1.2) was small (Cohen's $d = .43, 95\% \text{ CI: } .18-.68$).

An independent samples *t*-test was conducted to compare levels of personal stress between groups. There was no significant difference in scores ($t(249.61) = 1.13, p = .260$).

Depression, Anxiety, Stress Scale (DASS-21)

A one-way between-groups MANOVA was conducted to determine if participants with a medical condition and in the control group differed in scores of the DASS-21. There was a statistically significant difference between groups on the combined dependent variable (Wilks' Lambda = .96, $F(3, 226) = 3.35, p < .05$, partial eta squared = .043). As can be seen in Table 1, individuals with a medical condition reported significantly higher levels of anxiety compared to the control group. According to the DASS-21 classification, mean anxiety scores fall within the mild (8–9) to moderate (10–14) clinical ranges in the control and medical groups, respectively.

Brief Illness Perception Questionnaire (BIPQ)

A one-way between-groups MANOVA was conducted to determine if participants with a medical condition and in the control group differed on measures of self-reported

illness perception. There was a statistically significant difference between groups on the combined dependent variable (Wilks' Lambda = .94, $F(7, 246) = 2.06, p < .05$, partial eta squared = .056). As can be seen in Table 1, individuals with a medical condition scored significantly higher on items 5 (concern) and 7 (emotional representation) of the BIPQ (see supplementary material 2).

Multiple linear regression

As significant differences were found between groups on BIPQ subscales, a standard multiple regression analysis was performed as an exploratory analysis to assess whether being concerned about the pandemic (concern), peoples' perception of how COVID-19 has affected them emotionally (emotional representation), and measures of self-reported well-being were significantly associated with scores of the DASS-21 Anxiety subscale. The ECQ subscales were considered as outcome variables, and therefore not included. In the medical condition group, participants' concern of how COVID-19 was affecting them emotionally and scores of self-reported well-being revealed significance, as shown in Table 2. However, only well-being scores revealed a significant association with the criterion variable in the control group (see Table 2). The model as a whole explained 15.4% of the variance in anxiety scores in the medical condition group ($F(3,108) = 6.58, p < .001$) and 10.7% of the variance in the control group ($F(3,104) = 4.14, p < .01$).

The Warwick–Edinburgh Mental Well-Being Scale (WEMWBS)

An independent samples *t*-test was conducted to compare total scores of the WEMWBS between groups. There was no significant difference in scores ($t(254) = 1.14, p = .255$).

Post hoc analyses

One-way ANOVA analyses were conducted for the WEMWBS and the ECQ subscales to compare whether participants' scores varied based on condition type. A multiple regression was also conducted to examine whether condition type was a significant predictor of DASS-21 anxiety scores. Within the medical group, 16.8% have more than one medical condition. There were no statistically significant findings nor differential effects found based on condition type. Supplementary Fig. 1 shows the distribution of medical conditions within the group. Of note, respiratory disorders were the highest self-reported medical morbidity.

Discussion

Adverse psychological effects are commonly expressed at the beginning of a lockdown and in response to a

Table 1. MANOVA results for the DASS-21 and BIPQ

Variable	Group	N	M	SD	F	p	η^2
DASS-21							
Depression	Medical	113	11.27	3.43	0.51	0.48	0.002
	Control	116	10.95	3.46			
Anxiety	Medical	113	10.26	2.89	8.48*	0.004	0.04
	Control	116	9.22	2.52			
Stress	Medical	113	13.12	3.67	1.55	0.21	0.005
	Control	116	12.59	3.67			
BIPQ							
Item 1 (consequences)	Medical	128	6.88	1.97	0.08	0.79	0
	Control	125	6.95	2.06			
Item 2 (timeline)	Medical	128	6.65	1.53	1.38	0.24	0.005
	Control	125	6.42	1.51			
Item 3 (personal control)	Medical	128	5.01	2.09	1.61	0.21	0.006
	Control	125	5.36	2.32			
Item 4 (treatment)	Medical	128	4.13	2.08	2.15	0.14	0.008
	Control	125	4.52	2.21			
Item 5 (concern)	Medical	128	7.77	1.71	6.76**	0.01	0.026
	Control	125	7.15	2.08			
Item 6 (identity)	Medical	128	8.9	1.68	0.43	0.51	0.002
	Control	125	8.76	1.66			
Item 7 (emotional representation)	Medical	128	7.55	2.11	4.67**	0.03	0.018
	Control	125	6.96	2.27			

η^2 , partial eta squared. Item brackets (e.g. consequences) refer to each dimension of illness perception the BIPQ assesses.
* $p < .01$, ** $p < .05$.

Table 2. Multiple regression model predicting DASS-21 anxiety scores

	Group	R ²	Adj R ²	β	B	SE	p	CI 95% (B)
Model	Medical Control	.154***	.131***					
		.107**	.081**					
BIPQ Q5	Medical			-.02	-.03	.18	.86	-.39/.33
	Control			.06	.08	.15	.58	-.22/.39
BIPQ Q7	Medical			.29**	.42	.16	.008	.11/.73
	Control			.16	.23	.16	.14	-.08/.54
WEMWBS	Medical			-.24**	-.09	.03	.009	-.16/-.02
	Control			-.22*	-.07	.03	.02	-.14/-.01

R², R-squared; Adj. R², Adjusted R-squared; β , standardised beta value; B, unstandardised beta value; SE, Standard errors of B; CI 95% (B), 95% confidence interval for B; $n = 398$; Statistical significance: * $p < .05$; ** $p < .01$; *** $p < .001$.

pandemic (Xiong *et al.* 2020; Xiao *et al.* 2020). This can be due to a number of factors such as the lockdown itself or the risk of contagion. Significant group differences in anxiety scores were of small effect size ($\eta^2 = .04$) with mean scores in the medical group (10.26 ± 2.89) falling at the lower end of the moderate range (10–14) for clinical severity. The medical condition cohort reported lower feelings of gratitude and also had higher levels of concern about COVID-19 and how the pandemic was affecting them emotionally. Of note, when compared to healthy controls, participants with a medical condition did not

significantly differ on measures of subjective well-being and personal distress. Participants' perception of how the pandemic affects them emotionally was significantly associated with anxiety, over and above stress, and depression. This pattern of findings is consistent with previous research indicating that worry of a novel virus is related to psychological distress; however, it is important to acknowledge that participants with a medical condition appear relatively psychologically healthy, with the exception of anxiety and gratitude subscales (Xiong *et al.* 2020). Grateful individuals often report greater

physical health, however, further research is recommended to better interpret the direction of results found in this study (Hill *et al.* 2013). Anxiety and depression are common in a wide range of medical conditions; however, *post hoc* analyses revealed that there was no significant differential effect between participant scores based on the condition type, despite the majority of participants with a medical condition having respiratory-related illnesses, as shown in Supplementary Fig. 1 (Lenzo *et al.* 2020; Swartz & Jantz, 2014).

This study contributes to, and supports, existing research showing that those with an ongoing medical condition are more prone to worry and concern (Wheaton *et al.* 2012; Özdin & Bayrak Özdin, 2020; Hao *et al.* 2020). However, the findings of this study have to be seen in the light of some limitations. The unequal gender amount in both groups makes it difficult to generalise results, furthermore, the cross-sectional design is limited to a single time point and thus research is needed to evaluate whether these effects are sustained over time, and/or fluctuate with the pandemic infection and mortality rates. *Post hoc* analyses may also have been underpowered and therefore unable to capture group effects based on the low sample size available when participants were stratified by condition type.

It is evident that a pandemic brings uncertainty and fear in peoples' lives (Taylor & Asmundson, 2004; Taylor, 2019). In spite of inflated changes in anxiety levels, those with existing medical conditions appear psychologically healthy when compared to those without a medical diagnosis at this time. It is important for research to evaluate perpetuating, protective, and predictive factors in order to consider specific interventions for vulnerable populations and those who require them most.

Conflicts of interest

The authors declare no conflict of interest.

Ethical standards

The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional committee on human experimentation with the Helsinki Declaration of 1975, as revised in 2008.

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Supplementary material

To view supplementary material for this article, please visit <https://doi.org/10.1017/ipm.2021.37>

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