

Health behaviour changes during COVID-19 and the potential consequences: A mini-review

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Abstract

The COVID-19 pandemic has brought about profound changes to social behaviour. While calls to identify mental health effects that may stem from these changes should be heeded, there is also a need to examine potential changes with respect to health behaviours. Media reports have signalled dramatic shifts in sleep, substance use, physical activity and diet, which may have subsequent downstream mental health consequences. We briefly discuss the interplay between health behaviours and mental health, and the possible changes in these areas resulting from anti-pandemic measures. We also highlight a call for greater research efforts to address the short and long-term consequences of changes to health behaviours.

Keywords

COVID-19, diet, health behaviours, physical activity, sleep, social changes, substance use

Introduction

The recent COVID-19 outbreak is believed to have originated in Wuhan, China in December 2019. Since then, the virus has spread at a rapid rate, now affecting more than 200 countries and territories around the world. The World Health Organization (WHO) subsequently declared a global pandemic and a range of measures have been implemented in order to minimize the spread of the virus. Some of these include social distancing, self-isolation and quarantine of those who have contracted or potentially contracted COVID-19. Owing to the relative rarity of pandemics, research on the psychological effects of these measures and the current pandemic itself is sparse but is growing rapidly (Bo et al., 2020; Huang and Zhao, 2020; Zhou et al., 2020). Indeed, recent research has called for a focus directed towards the mental health needs of frontline healthcare workers (Zaka et al.,

2020). Others have also emphasized how implementing psychological support systems during the pandemic are fundamental for ensuring emotional stability (Wang et al., 2020).

Attempts are currently underway to understand the nature of the psychological consequences stemming from these measures and initial research efforts are primarily linked to mental health consequences that individuals may experience as a result of isolation and quarantine (Holmes et al., 2020; Huang and

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Zhao, 2020; Li et al., 2020). While such a focus is understandable, it is also necessary to identify related changes in health behaviours that may be occurring at a population level in order to better understand the range of downstream psychosocial consequences of the recent outbreak and its associated containment measures. Indeed, with large segments of the population under conditions of isolation, modifications to lifestyle behaviours are largely inevitable. These are likely to include changes in sleep, alcohol consumption, physical activity as well as dietary habits and even the incidence of domestic violence cases (WHO, 2020). Whilst the long-term effects of COVID-19, and corresponding restrictive social measures, are currently unknown, only limited parallels can be drawn from the research concerning previous pandemics such as SARS in 2003. While a substantial proportion of quarantined individuals during that pandemic reported being distressed, as evidenced by the proportion that displayed symptoms of PTSD and depression, relatively little research addressed impacts on lifestyle or health behaviours, focusing instead on symptoms of mental health disorders (Chua et al., 2004; Hawryluck et al., 2004; Lee et al., 2006; Reynolds et al., 2008).

While identifying changes in mental health resulting from anti-pandemic measures it is equally important to bear in mind that health behaviours are also strongly intertwined with mental health (Parletta et al., 2016). Existing research testifies to the reciprocal nature of interactions between physical well-being, chronic disease and mortality, with key health behaviours such as smoking, physical activity, reduced alcohol consumption, diet and obesity. However, it is also becoming clear that such behaviours have an impact on mental health (Butterly et al., 2006). For example, in one important study, the prevalence of depressive symptoms among people adopting no healthy behaviours was reported to be 2.7 times higher than those adopting four combined healthy behaviours (Harrington et al., 2010). Moreover, physical activity alone has been identified as an important protective factor in reducing the risk

of developing depression (Mammen and Faulkner, 2013). In addition, aspects of social behaviour are increasingly being interpreted as a protective factor, similar to lifestyle behaviours identified above. In one large scale study, it was reported that physical activity, alcohol consumption, smoking, body mass index and regularity of social interaction were all associated with specific mental health outcomes (i.e. depression, anxiety and stress) (Velten et al., 2014). Indeed, there is growing evidence that poor social relationships have an adverse effect on mental health functioning (Santini et al., 2015).

The finding that meaningful social connections and social relatedness have a substantial impact on mental health should not come as a surprise in the light of contemporary theories of well-being. Several important theories emphasise the importance of social relatedness as key drivers of human behaviour and optimal psychological functioning, such as the self-determination theory (Deci and Ryan, 2000), Seligman's PERMA model (Seligman, 2011), and Diener's tripartite model of subjective well-being (Diener et al., 1999). Collectively, these theories identify the important constituent elements of subjective well-being (SWB). Evidence from a growing number of studies strongly suggests that SWB is not only a causal factor in better physical health (Diener et al., 2017) but that SWB is itself an independent predictor of health behaviours (Kushlev et al., 2020). It has been proposed that SWB is itself under homeostatic control (Marks, 2018) and that the optimum level of SWB is determined by its set point, and homeostatic devices attempt to return SWB to this set point if it is displaced. Within this framework, disruptions such as those brought about by anti-pandemic measures, including social isolation and reduced activity, will invariably disrupt SWB and associated behaviours that serve to maintain its optimal level for the individual. Here, we briefly discuss how behaviours related to sleep, diet, physical activity and alcohol consumption may be currently affected. However, it is important to recognise the interactional nature of these behaviours with each other, and that changes in one

domain are likely to result in collateral changes in others (Marks, 2018).

Sleep

Researchers have claimed that individuals are sleeping less than they did decades ago (Spiegel et al., 2004). This observed decline in sleep duration has paralleled the rise of lifestyle-driven chronic diseases (Spiegel et al., 2005). More recently, there has been a claim that sleep is absolutely fundamental for optimal health, as evidenced by a growing body of evidence which indicates that sleep plays a pivotal role in the onset and exacerbation of almost all chronic illnesses (von Ruesten et al., 2012). Social isolation and lockdown, may be the silver lining to COVID-19 as it permits most individuals more time at home thus allowing, for some, flexibility in sleep-wake timings and extended sleep duration. Fitbit have recently confirmed this when they reported a change in sleep patterns from their global community. They revealed that people are going to bed later and achieving more sleep than usual since the COVID-19 outbreak (Fitbit, 2020). Thus, when individuals are permitted more time to sleep, preliminary evidence suggests that people take advantage of this opportunity, indicating that individuals are in a state of sleep deprivation under usual circumstances. This is further supported by the suggestion that sleep duration has declined in recent decades.

A recent survey, conducted by King's College London (KCL) with 2250 UK respondents revealed that 38% reported sleeping less or less well than normal before the country was placed on lockdown (KCL, 2020). Given the bi-directional relationship between sleep and psychological health, persistent sleep loss during this unprecedented time is likely to compromise mental health status. The general population are likely to be experiencing higher-than-normal stress levels. Indeed, the KCL survey showed that almost half (49%) of the respondents reported feeling more anxious and depressed, as a direct consequence of COVID-19. Thus, those who are experiencing sleep

loss, alterations to sleep-wake timings, and/or increased night awakenings may be heightening their long-term risk of developing chronic diseases and is likely to also exacerbate existing mental health problems.

The interactions between sleep, diet and physical activity are well documented where imbalances to sleep are known to effect energy homeostasis (Capers et al., 2015). Thus, the complex cycle of inadequate sleep is likely to promote poorer dietary habits, reduce the motivation to exercise, as well as cause disruptions to a range of metabolic hormones that are associated with both obesity and type 2 diabetes mellitus (Spiegel et al., 2004, 2005). Of course, these behaviours are driven by physiological needs but psychological status and social connectedness also play important roles. For example, behaviours such as eating, sleeping and exercising are more enjoyable when undertaken with others and are also affected by an individual's psychological state (Mintzer et al., 2019). Individuals experiencing poorer sleep outcomes and/or anxiety during lockdown may attempt to self-medicate with alcohol, believing that it will help them to improve their sleep. Unfortunately, this is not the case as alcohol is a known disrupter of sleep and can, in some cases, promote the onset of insomnia (Stein, 2005). Sleep loss is known to compromise immune function (Moldofsky, 1995), which is a fundamental factor pertaining to COVID-19. Thus, those who are experiencing poorer sleep during self-isolation need to first recognise and acknowledge this and then take corrective self-help action to maximize immunity in order to protect themselves against contracting Coronavirus. Social isolation provides a window of opportunity to develop and maintain healthy and consistent sleep habits, but only if individuals prioritise this behaviour. In turn, this may help individuals to minimise later development of chronic lifestyle-driven diseases, insomnia and/or alcohol (or other substances) misuse. It would be beneficial to track uptake rates of access and subscriptions to self-help online corrective sleep programmes with subsequent comparisons surrounding the incidence

of physiology and psychological conditions in the post-acute phase of COVID-19.

To end on a more optimistic note, one group who are most likely to benefit from lockdown with respect to sleep, are adolescents. Circadian rhythms are usually delayed in this age group, thus their preference is to sleep late and wake late, when permitted to do so. However, early school start times leave adolescents suffering from sleep deprivation leading to poorer health and adverse academic outcomes, thus minimising actual abilities of the next generation (Wheaton et al., 2016). For adolescents who are home-schooled during lockdown, providing they can keep their own schedule and are not required to attend live early morning classes, there may be positive downstream effects on a range of cognitive outcomes. These include heightened levels of alertness, attention, memory, decision-making as well as problem-solving (Walker, 2008). At the very least, schools should be incorporating sleep hygiene advice into the curriculum to promote consistent sleep-wake routines that are aligned to the individual's natural circadian rhythmicity in order to maximize the greatest benefits.

The long-term positive outcomes of these cognitive improvements may result in enhanced academic outcomes, which may be focal area of investigation for education-focused researchers. Moreover, as adolescents are the most likely group to modify sleep behaviours researchers should aim to first identify potential sleep changes and subsequently investigate a range of academic and health outcomes.

Dietary behaviours

Energy intake is one of the most fundamental behaviours pertaining to health. Since the outbreak of COVID-19, there have been multiple media reports of panic buying and stockpiling of household items. If the population is buying more food items, then they may be preparing more home-cooked meals. Indeed, Kantar Worldpanel estimated a 38% increase in the number of meals consumed at home during the lockdown period (AHDB, 2020). Given that

many may attempt to replicate meals that they usually consume outside of the home, this may be a good indicator as meals may be cooked using items with fewer preservatives/additives. On the other hand, snacking behaviours are likely to increase with stress and other psychological issues driving this. Previous work has revealed a variety of reasons for snacking including opportunity induced eating and coping with negative emotions (Verhoeven et al., 2015), with women more affected than men. As previously noted, foods that activate the brains reward system and motivational (striatal region) pathways strengthen snacking behaviour leading to persistent food cravings as well as over-eating, thus creating positive energy balance (Sinha, 2018). Snacking behaviour can, of course, be driven by emotions such as boredom and with an increased amount of food being purchased, paired with increased levels of perceived stress, the long-term consequence of weight gain and obesity may be inevitable. Another factor that undoubtedly promotes poor dietary habits is electronic device use and increased screen time exposure, through the effects of sedentariness (Biddle et al., 2017). Given that this is likely to increase with home-schooling and lockdown restrictions, the probability of food advertising campaigns, snacking behaviour, increased levels of sedentariness are all likely to contribute to weight gain. Indeed, one group has already predicted a rise in childhood obesity levels as a direct consequence of the COVID-19 pandemic (Rundle et al., 2020). Of course, poor diet and positive energy balance does not only lead to weight gain and obesity, but an array of other diet-driven chronic diseases including coronary heart disease, type 2 diabetes mellitus, hyperlipidaemia as well as stroke. Given that poor diet promotes the onset and exacerbation of multiple chronic diseases, it is paramount for researchers to first identify alterations to dietary patterns during the pandemic. Subsequently, the long-term consequences of these modified dietary habits during social isolation need to be examined across all age groups. This type of research agenda would ensure that societies are better equipped with

appropriate knowledge and prepared for future global epidemics.

Physical activity

The beneficial effects of regular physical activity on many health outcomes are well established (Pedersen and Saltin, 2015). Furthermore, studies have consistently identified a range of specific benefits such as improved physical and physiological health and positive health outcomes in areas of mental health and well-being (Chekroud et al., 2018). Changes in physical activity are known to affect other key health behaviours which underlines its importance for overall well-being. For instance, systematic reviews point to the positive role of both acute and regular exercise on sleep quality (Kredlow et al., 2015) and impaired sleep appears to affect levels of physical activity (Kline, 2014). Unfortunately, the restrictions surrounding social interaction and outdoor activities, including regular physical activity and exercise, will inevitably result in disruption to the daily activities of millions of people (Chen et al., 2020). However, the importance of physical activity during lockdown has been recently emphasised with the authors arguing that exercise can help to rebalance physical and mental health and wellbeing. It was concluded that exercise should be promoted as much as social distancing measures during these challenging times (Matias et al., 2020).

A number of longitudinal studies have documented the associations between social isolation and risk of mortality, as well as the development of major chronic illnesses, independently of other sociodemographic factors and pre-existing health conditions (Schrempft et al., 2019). One pathway proposed to underpin this relationship is that specific health behaviours contribute to increased health risk, with socially isolated and lonely individuals having less favourable lifestyles, such as the absence of physical activity (Malcolm et al., 2019). However, evidence exploring the association between physical activity and sedentary behaviour with social isolation and loneliness

is, surprisingly, relatively limited. It is inevitable that, for large numbers of individuals, quarantine and self-isolation measures will have a dramatic negative impact on levels of physical activity with gyms, parks, and a host of other recreational facilities closed off. However, many individuals may also maintain, or even increase, their level of physical activity at this time which is likely serve as a protective factor against the onset of symptoms of mental health difficulties. As such, one line of research that may be beneficial would involve an examination of physical activity and its relationship with mental health in this context.

Existing research does, however, indicate that increased social isolation is associated with higher rates of sedentary behaviours, even when age, sex, living arrangements, employment status, body mass index, educational background, marital status, and self-reported general health are controlled for (Tully et al., 2019). Of course, social isolation may not directly map onto self-isolation but research, such as that above, gives rise to concern. Whilst a number of projects are underway to quantify the mental health effects of quarantine and exposure to contagion risk factors around the world, there is also a related need to identify the factors affecting levels of physical activity during social isolation, what the short and long-term effects of these may be, along with their interactions with mental health.

Alcohol consumption

Of the substances most vulnerable to abuse, alcohol is overwhelmingly the most commonly abused substance in many countries (Manthey et al., 2019). Though substance abuse is technically a mental health disorder, moderation in alcohol consumption is frequently identified as a factor contributing to physical and subjective well-being (Burton and Sheron, 2018). Existing research suggests that one factor implicated in problematic drinking is that of social or interpersonal isolation (Fairbairn and Sayette, 2014). Measures such as quarantine and self-isolation, in the wake of the COVID-19 pandemic, may have a profound effect on levels of

alcohol consumption in many countries around the world. Indeed, many countries are reporting a rise in the purchased volumes of alcohol. For example, in Australia, compared with the same time last year, and in the week to 27 March 2020, spending at liquor stores in Australia was up by 86% (Delaney, 2020). The United Kingdom and the United States have witnessed rises of up to 22% and 27%, respectively in March alone, suggesting that similar patterns of increases are being replicated in other countries (BBC, 2020). Such rises may be the initial sound of alarm bells for future consequences. Habitual and binge drinking may become the norm for substantial numbers of individuals as a response to boredom, inactivity, isolation, and as a means to combat anxiety, stress and/or sleep loss resulting from the measures introduced to minimise the spread of the virus. Indeed, some have already called upon governments to increase public health warnings about excessive alcohol consumption during isolation (Clay and Parker, 2020). It is also possible that increased alcohol consumption during this period may become normalised and may serve to push, already vulnerable individuals, towards more dangerous patterns of alcohol consumption.

Research on social isolation has already indicated a range of negative effects in the realm of substance use. Socially isolated individuals are more likely to abuse drugs (Hawkley and Cacioppo, 2010), smoke cigarettes (Dyal and Valente, 2015; Nino et al., 2016), be diagnosed with substance use disorder (Chou et al., 2011), and use alcohol, in the forms of both inebriation and binge drinking (Canham et al., 2016). One particular source of worry, in respect of the rise in sales of alcohol at this time, is that alcohol has a range of damaging short and long-term effects. In the short-term, alcohol abuse has a suppressive effect on the immune system with particular effects on the lungs capacity to fight off infectious diseases like COVID-19. A weakened immune system therefore, not only means a heightened risk for becoming infected with the coronavirus but may also intensify severity and recovery to the virus. Another

unfortunate immediate consequence is likely to be a rise in the occurrence of domestic violence. Research typically finds that between 25% and 50% of domestic abuse perpetrators have been drinking at the time of assault (Fonseca et al., 2009), although in some studies the figure is as high as 70% (Wilson et al., 2014). Some countries are already reporting dramatic increases in indices such as calls to dedicated abuse hotlines. For example, Lebanon has witnessed a doubling of such calls in March of 2020 alone and France has experienced a 32% rise in incidents of domestic abuse (Euractiv, 2020).

The experience of quarantine also seems to be linked to longer term negative effects with respect to alcohol. Studies conducted following the 2003 SARS outbreak found a greater likelihood of alcohol abuse as well as symptoms of dependence 3 years later that were associated with quarantine or working in high-risk settings, such as wards dedicated to treating patients with the respiratory illness (Wu et al., 2008).

Conclusion

The majority of psychological research on the COVID-19 pandemic has been on mental health outcomes. It is fundamental to produce a better understanding of the likely behavioural alterations in the general population and their impact upon physiological and mental health, which are likely to be mostly negative. Public health policies, measures and media are needed to promote greater self-awareness, self-help and self-care within the home setting to prevent later strains on the healthcare system. Systematic research on health-related behaviours, similar to that of mental health, is needed to better understand the short- and long-term outcomes of the current crisis affecting so many individuals.

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