Associations between modern life stress, stress eating, emotional eating and the moderating effects of both optimism and signature strengths in adults

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Breanna Keenan

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Abstract

The present study examined the relationships between modern life stress, stress related eating and emotion related eating among Australian and New Zealand adults. The moderation effects of optimism and signature strengths on these relationships was also investigated. Respondents (*N = 465*) completed an online survey assessing their general stress, modern life stress, stress related eating behaviour, emotion related eating behaviour, dispositional optimism, and signature strengths. Those with higher levels of optimism were more likely to score lower on modern life stress measures and identified with a greater number of signature strengths. The interaction between modern life stress and eating behaviour in this sample was not statistically significant. Neither was the moderation effect of optimism or signature strengths on modern life stress and eating behaviour. Further studies could assess the complexity of the relationships between stress, eating behaviour, positive psychology factors and the relevance of stress measures on certain genders and populations.

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Introduction

This research originated from an interest of the relations between stress, well-being, eating behaviours and some of the factors that may buffer present relationships. Preliminary scans of the literature showed the vast documentation of the antecedents, correlates and consequences of stress and well-being on eating behaviour. Further consideration and threads were developed. Thinking about "modern life stress" I reflected on media segments, anecdotes, online comments around the idea that eating behaviour is influenced by stress. Many stories emerged about how people adapted their eating habits during the COVID-19 pandemic and subsequent lockdowns influencing food availability and security. The question for me was raised around the extent of eating behaviour both as a response to felt stress and more generally as an emotional response. I thought further about other 'modern life stress' factors that might be impacting on these relationships – factors such as economic issues and the cost of living, the war in Russia-Ukraine, ongoing concerns about the COVID-19 pandemic, issues around climate change and related concerns for the future. I wanted my research to speak to some real, tangible life concerns. In considering what might potentially buffer this stress and eating relationship, I wanted to draw on the positive psychology literature and sought to identify some key variables that might exert this kind of effect on the stress and eating behaviour relationship. In summary, this thesis considers relationships between modern life stress (financial security, COVID-19, war in Russia-Ukraine, and climate change) general stress, stress related eating and emotion related eating, and whether optimism and signature strengths act as a buffer or protective factor on stress eating behaviours.

The subsequent introduction is organised as follows; beginning with an overview of eating behaviour, followed by the measures used for stress related and eating related

behaviour, measures used for modern life stress, optimism, and signature strengths. Finally, a summary is presented alongside the research goals.

Eating

Food consumption is a part of daily human survival and functioning, influenced by a complex array of internal and external factors (Torres & Nowson, 2007). Nutrition is the process of obtaining foods necessary for optimal health, well-being, and longevity. It also plays an important role in modulating the immune system in individuals with maladaptive or problematic eating behaviours (Gill et al., 2022). How nutrition looks and what foods are consumed is different on a cultural and individual level. It is influenced by a multitude of factors such as dietary requirements, stress, food availability and financial security. For example, the instability of food supply throughout the COVID-19 pandemic has resulted in food insecurity and a major decrease in the purchase of fresh fruit and vegetables (Gill et al., 2022). Critical weaknesses in the global food system have been exposed reinforcing a need to build more resilient food environments to future stressors and to support healthy food consumption (O'Meara et al., 2022). In this study, I am interested in the psychological relationship people have with food and how this influences their eating behaviours. Understanding the patterns and relationships of stress related and emotion related eating behaviours could influence interventions and identify needs for education in this area.

Relationships between Stress and Eating Behaviour

The relationship between stress and eating behaviour has been well established for over twenty-five years, with various theoretical understandings and measures used (Greeno & Wing, 1994; Hill et al., 2022; Meule et al., 2018b; Robbins & Fray, 1980; Stammers et al., 2020; Tomiyama et al., 2015). For example, an early review of non-specific influences on feeding in human and animal literature found that eating was induced by stress but did not act

to reduce stress, thus the relationship was summarised as a learned behaviour that was triggered alongside metabolic reactions when stress occurred (Robbins & Fray, 1980). Greeno and Wing (1994) reviewed two models of stress-induced eating: individual difference model that tested individual differences in vulnerability to stress related eating, and the general effect model that tested whether acute stress increases eating in both human and animal studies as a main effect. They found stronger support for the individual difference model at the time of the study, as it accounted for more variability and the complexity of stress for various situational contexts and outcomes in terms of eating behaviour. A recent meta-analysis of 54 studies found that stress in healthy adults was associated with decreased consumption of healthy foods and increased consumption in unhealthy foods (Hill et al., 2022). A review of 133 studies inclusive of 14 animal studies was conducted to examine stress related eating in regards to how it has been defined and measured, finding the need for standardisation of the measures so studies are more comparable in information and results (Stammers et al., 2020).

Levels of stress have previously been found to affect eating behaviours through increased emotion related and stress related eating. These can be a preliminary factor that can evolve into disordered eating patterns. Emotional eating is when food consumption is used to supress or soothe negative affect. Comparatively, acute stressful events that initiate the “fight or flight” physiological response result in appetite suppression, whereas exposure to chronic life stress is associated with greater consumption of energy and nutrient-dense foods such as those high in sugar and fat (Beukes et al., 2010; Torres & Nowson, 2007). A systematic review of 29 articles that looked at the reported associations between emotions and eating behaviours in normal and overweight adults, found that negative emotions can elicit unhealthy eating behaviour and poor food choices in both normal and overweight populations. Whilst, for positive emotions food may not be used to regulate the emotion, they

may trigger increased food intake through learned behaviour (Devonport et al., 2019). Comparatively a recent systematic review and meta-analysis of stress and eating behaviours in healthy adults found an overall small effect size between stress and overall food consumption, which is in line with previous assumptions that 35-40% of people increase their food intake under stress, while for others they may decrease or not change at all (Hill et al., 2022). Although the effect size was small it still showed that eating behaviour changes as a result of stress in different individuals. Predominantly, psychometric scales combine stress related eating (eating in response to cope with stress) with emotion related eating (eating in response to certain or strong emotions) (Meule et al., 2018b). Other measures of stress related and emotion related eating mainly assess increases in food intake. Thus, largely ignoring responses of decreased food intake, even though it has been estimated that stress eaters are fairly equally divided between those who perceive themselves as eating more or less than usual when stressed. The Salzburg Stress and Emotional Eating Scales have been developed to separate the two parts of behaviour and to assess both increases and decreases in eating behaviour.

Salzburg Stress Eating Scale

Stress appears to alter overall food intake through under or overeating and may be influenced by the severity of the stressor (Hill et al., 2022; Puddephatt et al., 2020; Stammers et al., 2020; Torres & Nowson, 2007). The Salzburg Stress Eating Scale (SSES) was developed in both English and German versions as the first stress related eating scale that focuses solely on stress related eating opposed to stress and emotional related eating combined (Meule et al., 2018b). The scale only includes items that specifically refer to stress without confounding with other emotional/affective states. Individual differences and situational factors can account for increased, decreased, or unchanged food intake, thus these individual differences should be considered through further psychometric assessment. On the

SSES, a tendency to eat more when stressed is indicated by higher scores and eating less with lower scores. From the three studies conducted by the authors, SSES was found to be a psychometrically sound tool for measuring stress related eating (Meule et al., 2018b). The results of these studies suggest a large overlap between stress related overeating and other problematic eating behaviours, which could be considered for future research. In their first study, the authors interestingly found the SSES scores were uncorrelated with perceived stress, suggesting that an individual's experience of stress and the translation to eating are subjectively separable and independent constructs (Meule et al., 2018b). However, the relationship between stress related eating and Body Mass Index (BMI) were moderated by perceived stress, where the relationship between stress related eating and BMI was stronger for those who reported higher levels of perceived stress than those who reported lower levels. This interaction may be explained by perceived stress only increasing stress related eating in those who eat more in response to stress in this study. This could be demonstrating the individual differences that people have in their response to coping to stress and that not everyone will increase in stress related eating behaviour even if their perceived stress is high, also the other relationships at play such as that individual's ability to cope with the perceived stressful situation may also influence their stress related eating behaviours. In the present study, we will look at stress more broadly defined as modern life stress with questions around an individual's worries about recent/current events.

Salzburg Emotional Eating Scale

Emotional eating can be defined as a change (increase or decrease) in food intake to cope with negative emotions and has been associated with poor psychological and physical outcomes (Macht & Simons, 2011; McAtamney et al., 2021). Food intake is often used as a strategy for emotional regulation, although it does not effectively reduce negative affect (Meule et al., 2018a). Multiple factors can moderate the effect that emotions have on food

intake such as individual differences in what emotions, when and how strongly they are felt as well as individual differences in eating behaviour (Macht, 2008). Furthermore, studies have largely focused on eating habits to ease a negative mood and increased food intake, a positive mood can also influence food intake as well as certain emotional experiences can result in decreased food intake (Cardi et al., 2015; Meule et al., 2018a; Van Strien et al., 2012). Some theorise that the emotion itself does not influence the eating behaviour, but rather the individuals previous experiences with the emotion (Altheimer & Urry, 2019; Baumeister et al., 2007). Thus, the experience of any emotion may not elicit eating behaviour, only those emotions that have been associated with eating in the past. Furthermore, they may not always eat more when experiencing the emotion and they may not change their eating behaviour every time they experience the emotion but in only certain contexts (Altheimer & Urry, 2019).

The Salzburg Emotional Eating Scale (SEES) was developed as a new measure of emotional eating to increase specificity and scope that was not evident in existing self-report questionnaires (Meule et al., 2018a). The SEES is a useful measure that differentiates between specific types of emotions, increasing specificity and differentiates between increases and decreases in food intake, increasing breadth. Eating more than usual in response to emotions is indicated by higher scores and eating less with lower scores (Meule et al., 2018a). The authors found a tendency to report eating more than usual when experiencing feelings of sadness, no changes in food consumption during happiness, and eating less than usual when experiencing feelings of anxiety or anger. It has been argued that these differences in eating behaviour could be due to varying levels of bodily arousal experienced during the different emotions and the neuroendocrine changes that accompany them (Macht, 2008; Meule et al., 2018a; Torres & Nowson, 2007). In terms of gender differences, men reported increasing their food consumption when they felt happy, whereas

women reported this increase when they felt sad. Overall, the results showed that eating more in response to happiness was associated with a lower BMI, lower eating pathology, and higher perceived success in weight regulation (Meule et al., 2018a). Comparatively "unhappy overeating" and "happy undereating" were associated with dysfunctional eating patterns, unfavourable eating behaviours, and weight-related outcomes. Thus, these finding replicate existing findings and support the validity of the SEES.

Stress

Stress has long been studied and accepted within various psychological domains, whilst also carrying criticism around the simplistic use of the term within research and practical contexts (Segerstrom & O'Connor, 2012). Stress has various roles depending on the relationship being investigated, it can be a stimulus, a response or a transaction between an organism and the environment (Hill et al., 2022; O'Connor & Ferguson, 2016). Lazarus and Folkman's (1984) transactional theory defines stress as a unique relationship between an individual and the environment, which is appraised by the individual as taxing or exceeding their resources to cope and placing their health and well-being at risk. Stress appraisal and coping are two critical processes in this model. An appraisal is the way an individual interprets a stressor, challenge or event based on their evaluation of threat (potential risk of harm), challenge (potential for growth from the experience) and centrality (potential significance and concern for stressful life events on health and well-being) for themselves (Lazarus & Folkman, 1984). Appraisals consist of primary and secondary appraisals, whereby primary appraisals involve the evaluation of risks, demands or challenges of the situation, while secondary appraisals evaluate the availability of resources and the probability of influencing the outcome of the situation. Comparatively, coping is the individuals cognitive and behavioural efforts to manage both internal and external demands that are appraised as taxing or exceeding their resources (Lazarus & Folkman, 1984). Therefore, in

this study, informed by the transactional model, stress was considered to have a transactional relationship with the individual, affecting their eating behaviour in efforts to cope with the situation. Thus, a discrete measure of stress was utilised to capture the participants appraisal of recent or current stressors, with the coping resources being optimism and signature strengths.

This study will examine the associations between modern life stress, stress related eating and emotion related eating. Common measures of stress such as the Perceived Stress Scale (PSS) (Cohen et al., 1983) ask about generalised stressful thoughts and feelings. We are interested in an exploratory measure of stress that encompasses the long-term effects of COVID-19, food and financial security, global warming, economic inflation/cost of living, the war in Russia-Ukraine and current affairs. The purpose of this measure is to understand how much, if at all, people residing in New Zealand and Australia think/feel about these topics and whether these thoughts amount to stress and/or influence their eating responses. Currently, there is limited research that measures all these factors together. A recent study has looked at the level of pre-occupation and fears surrounding 21st century stressors (climate change, natural resource depletion, COVID-19 and the Russia-Ukraine war) and the effect these have on psychological well-being for a general adult population in Italy (Barchielli et al., 2022). They found a relationship between these stressors and personal well-being, with both age and gender differences. The authors argued that the 21st Century brings many challenges, both old and new that offer an uncertainty that people need to overcome (Barchielli et al., 2022). We are interested in looking at stress in a similar way in relation to eating behaviours which will allow us to evaluate how much people are thinking about these factors and the effects it can have on an individual's behaviour.

What is going on in the world right now results in a great deal of uncertainty, along with the usual stressors that people have with everyday life. Living in/through a pandemic

has been taxing on a global level and each person will have their own individual experiences and the effects will be individualistic. However, it is something that has affected everyone with the potential of ongoing conscious or unconscious fears of COVID-19. There are other global events such as the war in Russia-Ukraine and global warming that are affecting certain parts of the world more than others and creating immediate risks of harm for some and in others the risk in not imminent but is more around what could happen or the "What if's". Therefore, it is important to also measure the level of stress individuals are experiencing already in their daily lives or their perceived stress levels as a basis or comparison to the effect these other factors are having on their level of stress. Elements of stress are normal and have adaptive functions for example as energy conservation in the "fight or flight" response when an acute life-threatening event occurs. If situations become too stressful, longstanding or people start experiencing distress, these states can be unhelpful, become overwhelming and result in emotional, cognitive, and functional impairment, influencing an individual's eating behaviours.

Through a transactional lens, this study will investigate the relationship between modern life stress and stress related and emotion related eating behaviours. Investigating how individuals appraise their modern life stress and their use of eating behaviours to cope with these stressors. For the purpose of this study, modern life stress will include economic security, the continued effects of COVID-19, climate change and the Russia-Ukraine war.

Modern Life Stress

Modern life stress such as climate change, COVID-19 and the Russia-Ukraine war are considered unprecedented global stressors that could be associated with serious health and psychological consequences (Barchielli et al., 2022; Weierstall-Pust et al., 2022). However, the incidence and direct effect of these stressors are not well understood, making it difficult to

predict their future burden and manifestations in the population. A recent study looked at the Ukraine crisis, COVID-19 pandemic stressors and climate change as stressor groups and the subclinical experiences of stress (Weierstall-Pust et al., 2022). Data was collected through an online survey of 3094 participants from a representative, cross-sectional community sample in Germany, the results showed Ukraine crisis stressors as the most significant stressor group, followed by climate change and COVID-19 pandemic stressors.

It is important to explore the base level of stress the participants are facing. If they are already experiencing high levels of stress in their daily life or in general, then they may be more susceptible to experiencing/feeling stressed about these other factors. For example, already in an anxious state could be more sensitive to catastrophising and stressing about everything. At the same time, if they are experiencing a great deal of stress in their daily life, they may not have time or energy to think or worry about these global events. Similarly, if there are low levels of daily/perceived stressed it may show that these individuals are effective in managing their stress responses and may not worry too much about these other factors or it may offer these people more time to think/worry about the future and what is going on in other parts of the world. These various experiences of stress could influence individual eating behaviours and will be important to measure as a baseline alongside the modern life stress measure to compare the accuracy of the measure.

Economic security

Economic vulnerability can restrict a person's sense of agency and effect mental well-being (Klug et al., 2021). A longitudinal study over 19 years, found that people who reported having low income and increased financial strain resulted in lower health and life satisfaction. The authors found that these relationships were mediated by sense of control for both intra- and interpersonal levels (Klug et al., 2021). These findings highlight the effect of financial

strain on mental well-being and the relationship between a sense of control and the psychological effects of economic vulnerability. Economic vulnerability is not limited to those with low socioeconomic status or people living in poverty. For example, in non-poor households, economically vulnerable individuals may be restricted in their agency due to economic dependency on others (Klug et al., 2021). Economic vulnerability can also limit people's ability to pro-actively shape their future and their preparedness for unforeseen future events such as unplanned expenses or a divorce. Thus, economic security and financial stress may be variable among different populations and could influence an individual's eating behaviour in the foods that they purchase, consume and the amounts that they consume.

COVID-19

Nearly four years since the beginning of the COVID-19 outbreak, globally nations are facing increases in food prices, food insecurities, prolonged behavioural changes and ultimately food related stress (Gill et al., 2022; O'Meara et al., 2022). Lockdown measures brought about the first wave of challenges and studies have found that the perceived stress during lockdown was significantly correlated with emotional eating behaviours (Brooks et al., 2020; McAtamney et al., 2021; Shen et al., 2020). Recent data from a nationwide population-based study in the United States of America (USA) found that 61% of adults reported undesired changes to their weight since the start of the pandemic (Khubchandani et al., 2022). Hyper-palatable foods such as those high in sugar, salt, fat, and simple carbohydrates can reduce stress when consumed through the production of neurotransmitters serotonin and dopamine (Gill et al., 2022). Comparatively, the consumption of nutrient dense foods can prevent overeating. During times of stress and emotional distress, it is important to understand the impact of the pandemic on eating behaviours, emotional and stress eating and the ways these are related to emotional dysregulation and emotion identification (McAtamney et al., 2021). For example, mediation analyses have found that troubles

identifying and describing emotions were predictive factors in emotional eating through emotional dysregulation (McAtamney et al., 2021). In a study of female college students, who were returning to in-person learning after remote learning due to the COVID-19 pandemic, those with higher levels of perceived stress were more likely to engage in disordered eating habits and have higher levels of social anxiety indicators (Lankenau, 2022). A cross-sectional survey of 620 adults in the United Kingdom (UK) investigated self-reported changes in eating patterns and behaviour during lockdown and the associations with coping strategies, food insecurity, health anxiety, eating styles and BMI (Coulthard et al., 2021). The authors found changes in food consumption during lockdown from across the sample, suggesting that changes to eating behaviour could be a coping mechanism for individuals with a history of uncontrolled or maladaptive eating patterns. Even without a diagnosis for an eating disorder, disordered eating habits and maladaptive eating behaviours are associated with serious risk (Ginty et al., 2012). For example, some risks include physical health complications, mental health impairments, autonomic nervous system dysregulation and further development of clinically significant eating disorders. Although this current study does not specifically investigate disordered eating habits, we are interested in the relationship between perceived stress and eating behaviour. Furthermore, the effects of lifestyle changes required to reduce the spread/contraction of COVID-19 are likely to be ongoing with the continued return to in-person and normal activities (Fernández-Aranda et al., 2020). The Worries Emerging from the COVID-19 Pandemic Scale (WECP) was devised to capture the various worries individuals have resulting from the substantial disruptions of the COVID-19 pandemic (Comerford et al., 2022). It was developed to broaden the measurement domain from health to more general responses around day-to-day matters regarding the pandemic. This scale encapsulates worries about the future course of the virus, worries about societal readjustment, feelings of isolation, worries about current and future restrictions, family and

friends, finances, and in regard to the safety and efficacy of COVID-19 vaccinations (Comerford et al., 2022). Ultimately there are three scales, one for worries regarding the disease itself, one for broader worries around the pandemic and the third measures individual resilience. We will use this scale as one of the modern life stress measures to encapsulate present worries related to the COVID-19 pandemic.

Climate change

Climate change has important implications on the next generation of children and youth; however, they have very little power and education to reduce its impending harm. This can create climate anxiety among the younger generations (Hickman et al., 2021). A large-scale study was conducted to globally assess climate anxiety in children and young people and the relationship with perceived government response. A sample of 10, 000 children/young people were surveyed in ten countries (Australia, Brazil, Finland, France, India, Nigeria, Philippines, Portugal, UK, and the USA). The data collected was on the participants thoughts and feelings about both climate change and the government response to climate change. Across all the countries, participants were worried about climate change (59% were very or extremely worried and 84% were at least moderately worried) (Hickman et al., 2021). Greater than 45% of participants reported difficult emotions and negative thoughts about climate change and their feelings negatively affecting their daily life and functioning. Feelings of betrayal were rated more highly than of reassurance around the governmental response to climate change, which was correlated with climate anxiety and distress (Hickman et al., 2021).

Extreme weather events that result from climate change and global warming have extensive implication on people's physical and mental well-being (Tang, 2021). A recent review aimed to examine the effect of climate change on adult's mental well-being, an area

not largely studied in the literature. The review found that climate change could have an effect on mental health in various ways, through depression, anxiety, stress, distress and sleep disturbances (Tang, 2021). Gradual climate change produces less severe impacts on well-being in comparison to extreme weather events. Climate change highlights vulnerabilities in different parts of society, where the changes to the natural environment directly impact those who depend on natural resources for survival. For example, food security and income security can be impacted when climate change affects property, crops, livestock, fish, and plants. Furthermore, global warming can also create concerns for economic security in outdoor employment and exposure to the elements (Tang, 2021). The authors argued that an individual's vulnerability to climate change is affected by a multitude of factors. These factors could include, location, demographics, income, and education levels further highlighting inequalities and susceptibility to changes in mental well-being.

This research is interested in looking at individual experiences of stress arising from climate change in terms of climate anxiety and/or insecurities and how it influences their perception of modern life stress. As previously mentioned, climate change has a greater impact on vulnerable populations and the effects of climate change are greater for those who have experienced an extreme weather event. This is relevant in society today, as both New Zealand and Australia have been experiencing more frequent extreme weather events in different parts of their countries. For example, the bush fires in Australia and the recent flooding in both Australia and New Zealand. With both countries being islands, there are further climate change risks associated such as cyclones and rising sea levels. Thus, stress around the effects of climate change or of future events could very well be a concern for the adult population in these pacific countries.

War in Russia-Ukraine

A recent study was conducted to evaluate the relationship between sociodemographic factors and Post Traumatic Stress Disorder (PTSD) among civilians affected by the recent war in the Ukraine (Fel et al., 2022). A convenience sample of 314 adults (74 women and 235 men, mean age 34 years) found that PTSD was not only related to the violence and damage caused by war, but also stressful circumstances associated with life such as the social and financial conditions also affected by war. The authors suggested for further research to focus on identifying modifiable protective and risk factors that could be embraced by intervention strategies (Fel et al., 2022).

The greater level of stress and anxiety is for the people who are residing in the country at war, soldiers fighting on the frontline, followed by those who are close but may be indirectly impacted such as relatives or friends of those affected or residents of neighbouring countries. For example, since the start of the Russian-Ukrainian war more than 6.5 million refugees had crossed the Polish-Ukraine border alone (Skwirczyńska et al., 2022). One study has looked at the anxiety levels among Polish university students with a sample size of 510 participants (Skwirczyńska et al., 2022). They found that gender and fear of an armed attack on Poland had a significant relationship with anxiety. Furthermore, the effects of the war have also spread globally in the food and fertiliser industries with both Russia and the Ukraine holding important roles in producing and exporting key agricultural commodities (Ben Hassen & El Bilali, 2022; Lin et al., 2023). As a result, after the first four months of the war, Ukrainian exports had stopped, future harvests are not guaranteed, the prices of agricultural commodities have significantly increased globally and outcomes of the war have had wider impacts on the overall environment (Ben Hassen & El Bilali, 2022; Pereira et al., 2022). These outcomes and future uncertainties will be felt globally and more so in low- and middle – income countries. With the cost of food already increasing in both Australia and

New Zealand because of the COVID-19 pandemic, the effect of the Russia-Ukraine war could further impact the populations food security and introduce additionally stress outcomes.

As previously discussed, there are the daily-life stressors that adults experience as well as the stressors associated with modern life such as economic security, effects of COVID-19, the war in Russia-Ukraine and climate change that will affect individuals differently and to varying levels. The individual behavioural outcomes in response to the stressful events will depend on the individual's appraisal of the stressors, their ability to cope and the resources they have available. Individual differences such as greater resilience or resources available could impact the severity of the stressor outcomes the individual experiences. Positive psychology constructs could buffer the effect these stressors have on the individual through strengthening resilience and offering resources in an individual's ability to cope with the stressor.

Positive Psychology

Historically, psychology had three missions: to cure mental illness, increase productivity and fulfilment in people's lives, and to nurture identified talent (Snyder & Lopez, 2001). The onset of World War II shifted the focus of applied psychology to pathology, whereby assessing and curing individual suffering utilised disease-patient frameworks to treat mental illness. However, the disease model does not aid in the prevention of mental illness or distress. Thus, the new focus of the present century has been on identifying and understanding human strengths so they can be fostered and developed (Carr et al., 2021; Gable & Haidt, 2005; Lomas et al., 2021; Snyder & Lopez, 2001). Positive psychology focuses both on the strengths and the weaknesses of a person, by shifting the focus to individual strengths it does not lessen the importance and pain of human suffering. Focusing on positive individual traits and subjective experiences can support improvements

to a person's quality of life and resistance to pathological experiences when negative life events occur (Carr et al., 2021; Csikszentmihalyi & Seligman, 2000; Lopez et al., 2018; Snyder & Lopez, 2001). The aim of positive psychology is to mobilise a change in psychology from a fixation on repairing the worst things in life to also nurturing the best qualities in life (Lomas et al., 2021; Lopez et al., 2018; Snyder & Lopez, 2001). Furthermore, the underlying goal is to find fulfilment in everyday situations and to flourish or adapt in challenging and distressful situations (Kashdan & Ciarrochi, 2013). This does not necessarily mean always focusing on positive thoughts and emotions. For example, in one instance, positive thoughts and emotions may be optimal in a situation and suboptimal in another. Negative emotional states such as anxiety or guilt, or behaviours such as narcissism and defiance could support the best possible outcome for an individual situationally (Kashdan & Ciarrochi, 2013). This highlights the need for balance amongst individuals and situations, whereby fixations on weaknesses or strengths in isolation will not provide the best outcomes. Psychologists should create an inclusive approach that analysis both the weakness and strengths of an individual, along with the stressors and resources in their environment (Carr et al., 2021; Lopez et al., 2018).

The subjective level of positive psychology involves subjective experiences such as: happiness in the present, hope and optimism for the future, overall life satisfaction, well-being and contentment for the past (Csikszentmihalyi & Seligman, 2000; Snyder & Lopez, 2001). Positive psychology constructs can play a role in how individuals respond to stress by influencing their ability to manage the situation and their resilience. Furthermore, they may play a role in the response to stressful situations in relation to their eating behaviour. As previously mentioned, food can be used as a coping mechanism in stressful situations. Positive psychology constructs such as optimism could influence how an individual experiences the stress, their response, and evaluation of their ability to cope. This study will

look at both optimism and signature strengths as positive psychological constructs and the relationship they have with stress, stress related eating and emotion related eating behaviours and measure whether these constructs buffer the relationship between modern life stress and stress related and emotion related eating behaviour.

Optimism

Over time optimism has been discussed in terms of human nature and individual difference (Peterson, 2000). For example, human nature is thought to provide a baseline optimism along a continuum of optimism and pessimism, with individual differences and experiences influencing their place on the continuum (Peterson, 2000; Tiger, 1979). Optimism is self-evaluated and is influenced by motivational, cognitive, and emotional mindsets about future events. People high in optimism tend to be more persevering, successful, have better moods and greater physical health than those who are more pessimistic (Peterson, 2000). In contrast, pessimism often premeditates depression, failure, passiveness, social discord, morbidity, and mortality. When individuals are trying to cope with stressful events, optimists appear to be more resourceful and problem-solving focused than pessimists (Carver & Scheier, 2002; Lopez et al., 2018). For example, optimists would be more likely to utilise coping strategies such as positive reframing of situations, whereas pessimists would likely use avoidance and denial tactics. Even in uncontrollable situations where the goal may no longer be attainable, optimists tend to accept the situation for what it is, whilst pessimist actively deny and persist with pursuing the unattainable goal (Lopez et al., 2018). Previous findings have shown that optimism is linked to happiness, perseverance, achievement, and health.

Dispositional optimism is the universal expectation of an abundance of good things in the future and the scarcity of bad things (Peterson, 2000; Scheier & Carver, 1985, 1992).

Scheier and Carver (1985) assumed that when an individual holds a sufficient value to a goal, they produce an expectancy about attaining that goal. For example, expectancies could include perceptions around being able to move towards desirable goals or to move away from undesirable goals. This definition of optimism is grounded in the individuals' expectancies around goal attainment, as opposed to where the expectancies were derived (Scheier & Carver, 1985). Furthermore, in the self-regulatory model, optimistic individuals tend to continue to strive towards their goals and pessimistic individuals ultimately give up when faced with difficult situations. Positive and negative expectancies have been measured using the Life Orientation Test (LOT) (Scheier & Carver, 1985, 1992). The revised version (LOT-R) removed items to eliminate neuroticism overlap concerns (Lopez et al., 2018). The LOT-R measurement tool is a pure measure of expectation, where an optimistic expectation leads to the belief that goals can be achieved. It is neutral regarding how the beliefs come about, in contrast to the Attributional Style Questionnaire (ASQ) where the measures reflect causality (Peterson et al., 1982; Scheier & Carver, 1985). Thus, the ASQ measure is further influenced by people's beliefs about how goals are brought about to accommodate optimistic explanatory style.

Optimism can predict satisfaction with life and a higher satisfaction could be associated with greater resilience to stressful events or the long-term effects of stress. Previous research found that optimism significantly predicts several aspects of subjective well-being, including less perceived stress and mood disturbances (Hulbert & Morrison, 2006; Hyde & White, 2009; Vollmann et al., 2011). Optimists are more likely to adopt coping strategies that are problem focused and in support of emotional regulation (Hirsch et al., 2007). Previous studies have found dispositional optimism to significantly moderate the relationship between stress and psychological well-being (Chang, 1998). Optimists experiencing or perceiving a high level of stress, will be better adjusted or more resilient than

their pessimistic counterparts. For example, a more recent study of 331 college students in Turkey investigated the mediating role of optimism and hope on covid 19 stress and subjective well-being (Genç & Arslan, 2021). The authors found that optimism and hope mediated the impacts of stress on the student's well-being during the pandemic and that students experiencing higher levels of Covid-19 stress had lower optimism and less subjective well-being. This suggests that optimism could affect the relationship between modern life stress and behavioural outcomes or experiences such as eating behaviour. Furthermore, a study in the USA of 738 college students found that optimism along with hope and gratitude moderated the effects of negative life events (Gungor et al., 2021). The present study hypothesised that the interaction between both stress related and emotion related eating and modern life stress can also be influenced by optimism. Participants with higher emotional eating and stress eating scores will have a higher level of stress and have a low level of optimism.

Signature Strengths

Signature strengths are the strengths that matter to an individual most and that are the most central to their personal identity (Peterson & Seligman, 2004; Seligman, 2002). Deep emotional satisfaction and successful living can come from developing and using an individual's signature strengths (Seligman, 2002). Developing these strengths involves self-discovery, creation and ownership as opposed to learning, training, and conditioning. Signature strengths are a subcategory of character strengths, that are highly typical of an individual, with individuals usually having three to seven of these signature strengths (McGrath, 2019; Peterson & Seligman, 2004; Wagner & Ruch, 2022). The Values-in-Action (VIA) classification identifies twenty-four character strengths: social intelligence, perspective, creativity, bravery, humour, leadership, fairness, kindness, teamwork, modesty, forgiveness, self-regulation, prudence, persistence, open-mindedness, honesty, spirituality,

gratitude, zest, hope, love, love of learning, curiosity, and appreciation of beauty and excellence (Peterson & Seligman, 2004). Cross cultural research has found that the presence of character strengths is universal to some degree (Park et al., 2006; Schutte & Malouff, 2019). The level of various character strengths differs among individuals and have been found to be an important predictor for individual well-being (Azañedo et al., 2021; Proctor et al., 2011). The use of character strengths as a strength-based intervention has been found to increase happiness, positive affect, life satisfaction and optimism whilst decreasing depressive symptoms and hopelessness (Azañedo et al., 2021; Drozd et al., 2014; Duan et al., 2014; Gander et al., 2013; Huffman et al., 2014; Proyer et al., 2015; Rust et al., 2009; Seligman et al., 2005). Character strengths could buffer the negative effects of cognitive vulnerabilities that could impact on psychological well-being, whilst utilising health promoting behaviours (Azañedo et al., 2021; Huta & Hawley, 2010; Peterson et al., 2006; Proyer et al., 2015).

The Macro Theory of Positive Functioning is a recent theory, which integrates positive affect found in both the Self-Determination Theory and the Broaden and Build Theory (Deci & Vansteenkiste, 2003; Fredrickson, 2004; Stanley & Schutte, 2023). The authors have theorised that a high level of intrinsic motivation and basic needs satisfaction from the Self-Determination Theory, results in higher levels of positive affect and the subsequent consequences of this positive affect as described in the Broaden and Build Theory (Deci & Vansteenkiste, 2003; Fredrickson, 2004). Both the Self-Determination Theory and the Broaden and Build Theory focus on positive affect, but in their own contexts of the their proposed theory, the Macro Theory of Positive Functioning merges the concepts together (Stanley & Schutte, 2023). For example, increased positive affect may result in building on beneficial resources and skills that can be used when stressors occur, increasing an individual's resilience to the stress. These resources and skills may manifest as various

positive characteristics such as self-efficacy, empathy, emotional intelligence and signature strengths (Stanley & Schutte, 2023). Previous studies have found that identification and intentional activities that focus on signature strengths have been effective in increasing well-being (Proyer et al., 2015). Thus, signature strengths could influence an individual's resources to cope or their level of resilience when faced with modern life stressors. In turn, this could affect how they appraise the stressful situation and their ability to manage it effectively. The identification of signature strengths could act both as an awareness of one's own strengths and abilities to cope with stress and could act as coping strategies on their own. For example, the use of creativity could be a strategy on its own in terms of problem solving. This awareness of one's signature strengths and their ability to cope could reduce their likelihood to turn to stress related and emotion related eating behaviours when faced with modern life stressors and utilise more effective coping strategies instead.

The current study will use signature strengths to identify an individual's core strengths in a convenient manner and assess whether these strengths are associated with experiences of modern life stress and subsequent stress related or emotion related eating behaviour. The Signature Strengths Survey (SSS) was developed to detect an individual's strengths (McGrath, 2019). An important consideration with the use of this measure is the potential influence of self-enhancement bias from the individual to accommodate social desirability of the results. Previous research did not find the self-reports to be disproportionally inflated by self enhancement (Wagner & Ruch, 2022). The identification of signature strengths or greater recognition of one's own strengths could buffer the relationship between stress and eating behaviour. Individuals who can identify their strengths, actively utilise, and build their strengths are likely to be more resilient to stressful events and/or adopt appropriate coping strategies to stressful situations. This study will assess whether those who identify multiple or fewer signature strengths have a stronger relationship with both modern

life stress and eating behaviour. Those who identify fewer signature strengths may have a greater understanding of their core strengths and abilities to utilise these strengths, comparatively those who identify multiple strengths may be aware of a broader range of strengths they can utilise for various experiences.

Summary

As previously mentioned, stress is related to many negative outcomes including maladaptive relationships with food and changes in food consumption. The distinction between emotion related and stress related eating is important as people may hold different relationships with these eating behaviours Optimism and signature strengths may be important aspects of positive psychology that could buffer the relationships between stress and both emotion related and stress related eating behaviours. This study aims to contribute to the literature through replicating relationships of emotion related eating, stress related eating and stress measured as modern life stress. The identification of relationships between these eating behaviours, individual identification of signature strengths and levels of optimism will also be investigated.

The Current Study

The current study aimed to examine the relationships between stress related eating and emotion related eating as measured by the Salzburg Stress Eating Scale and Emotional Eating Scale, to:

(1) examine the relationship between modern life stress on stress related eating and emotional related eating among adults in New Zealand and Australia,

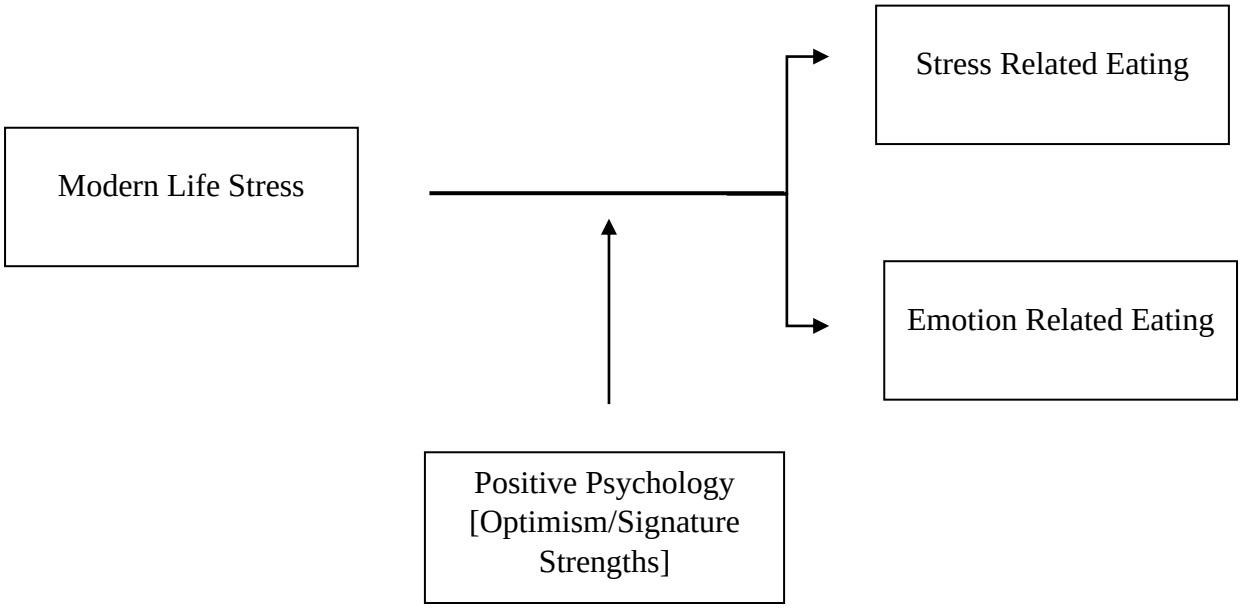
(2) identify the relationship between optimism and signature strengths on stress and eating behaviours and

(3) analyse the effect optimism and signature strengths have on the relationship between stress and eating behaviours.

Given previous findings of the effects of stress on eating behaviours, it is predicted that increased modern life stress will be associated with higher levels of stress related and emotion related eating. Furthermore, that the positive psychology factors of optimism and signature strengths will act as a buffer between increased levels of stress and eating behaviours. Finally, that these positive psychology factors will moderate the effects of general stress and lessen the association with stress and emotional eating. Figure 1 demonstrates the relationships of modern life stress hypothesised for this study.

Figure 1

Model of Modern Life Stress



Method

Participants and Procedure

This study used a cross-sectional survey design with a convenience sample of New Zealand and Australian participants from the Prolific crowd-sourcing platform. Prolific has been demonstrated to yield satisfactory data quality (Comerford et al., 2022; Palan & Schitter, 2018). All data were collected on 8th May 2023 between 1600h (when the survey was scheduled to be released) and 2330h. Participants who already held membership for Prolific and who met the pre-screening criteria were led to a consent form on Qualtrics where they were provided with information about the study's voluntary nature, confidentiality, the aims, procedures, data storage, and data use. After an informed consent page, respondents were asked a series of demographic questions: age, gender, ethnicity, and country currently residing in. Questions also addressed current stress, stress eating, emotional eating, optimism, and signature strengths. The estimated sample size is 385. This is based on a sample size calculation for New Zealand and Australian adult (18 years and above) populations (24,256,325 people), with a 95% confidence level and 5% margin of error. The sample size was increased by 20% to buffer against potential attribution and/or incomplete responses. This gives a total sample size of 465.

Completion of the survey took approximately 10 to 15 minutes. Participants were reimbursed GBP1.5 ($2.98 NZD/$2.81 AUD) for the survey based on one hour costing rates on the Prolific site. The original sample (*N = 466)* comprised of adults residing in Australia and New Zealand, one participant chose to not consent to the survey, was redirected to the end of the survey and was excluded from the analysis. The remaining participants (*N = 465)* were adults aged 18 – 60+ *(mean = 34.97; SD = 11.49).* The mean excluded one participant who did not answer this question; however, participants must be at least 18 years of age to

hold membership and therefore met the pre-screening criteria to participate. Demographic characteristics of the 465 participants who took part in the current study are shown in Table 1. Most participants were men *(49.7%, n = 237)*, resided in Australia *(82.4%, n = 383)* and identified their ethnicity as Other European *(38.53%)*; the remaining ethnicities were Asian *(20.41%)*, Australian *(19.04%)*, Other Ethnicity *(8.48%)*, Pacific Peoples *(2.98%)*, Aboriginal (*2.98%*), New Zealand European *(8.49%)*, New Zealand Māori *(0.69%)*, and just under 10% of the participants did not state their ethnicity (*9.89%*). In the present sample less than 10% of the participants identified as New Zealand European or Māori.

To increase inclusivity with the questionnaire, gender was categorised into seven options; Male *(49.7%, n = 231)*, Female *(48.4%, n = 225)*, Transgender Female *(0%, n = 0)*, Transgender Male *(0.4%, n = 2)*, Gender Variant/Non-Conforming *(0.9%, n = 4)*, Not Listed *(0.4%, n = 2)* and Prefer not to answer *(0.2%, n = 1)*. For the Not Listed option, one person identified as genderfluid *(0.2%, n = 1)* and another as a woman *(0.2%, n = 1)*. As most participants identified as male and female, the remaining responses were grouped together as Other for the demographic statistics. For ethnicity, participants were invited to write the ethnic groups that they belong to/identify with. As expected, numerous answers were produced and upon initial analysis twenty-seven ethnic groups were identified along with one group identified as not stated *(9.89%, n = 46)* where they wrote ‘none’, ‘mixed’, unspecified answers, or invalid answers. The remaining twenty-seven ethnic groups were coded down into eight: Australian, Aboriginal, NZ European, NZ Māori, Asian, Pacific Peoples, Other European and Other Ethnicity. This was to highlight the main ethnic groups residing in these countries along with native populations to identify the representativeness of this sample to the overall Australian and New Zealand populations.

Table 1

Sample Demographics (N = 465)

Variable		Mean or *N*	Standard Deviation or %
Age		34.97	11.97
Gender	Male	231	49.7
	Female	225	48.4
	Other	9	1.9
Ethnicity*	Australian	83	19.04
	Aboriginal	6	1.38
	NZ European	37	8.49
	NZ Māori	3	.69
	Asian	89	20.41
	Pacific Peoples	13	2.98
	Other European	168	38.53
	Other Ethnicity	37	8.48
	Not Stated	46	9.89
Country	Australia	383	82.4
	New Zealand	82	17.6

Note. *Participants could identify with more than one ethnic group.

Ethics

The study was evaluated by peer review and judged to be low risk by Massey University. Therefore, it has not been reviewed by one of the University's Human Ethics Committees. All research was performed in accordance with relevant low risk regulations and informed consent was obtained from all participants. The following statement was provided to each participant on the survey documentation:

"This project has been evaluated by peer review and judged to be low risk. Consequently, it has not been reviewed by one of the University's Human Ethics Committees. The researchers named on this document are responsible for the ethical conduct of this research. If you have any concerns about the conduct of this research that you want to raise with someone other than the researchers, please contact Professor Craig Johnsons, Director (Research Ethics) email humanethics@massey.ac.nz"

Measures

The following measurement tools were used to assess perceived general stress (Parks et al., 2012), long term stress of COVID-19 (Comerford et al., 2022) along with a questionnaire assessing modern life stress. To measure eating behaviours, the Salzburg Stress Eating Scale (Meule et al., 2018b) and the Salzburg Emotional Eating Scale (Meule et al., 2018a) were used. Dispositional optimism was measured using the Revised Life Orientation Test (LOT-R) (Scheier et al., 1994) and Signature Strengths were measured using the Signature Strengths Survey (SSS) (McGrath, 2019). Full format of the survey questions can be found in Appendix A.

Salzburg Stress Eating Scale (SSES; Meule et al., 2018d)

The SSES consists of 10 items, where participants rate them based on how they generally respond to stressful situations on a 5-point Likert scale, ranging from *I eat much*

less than usual (1 point) to *I eat much more than usual* (5 points). The scale captures individual differences in eating behaviours related to stress. For example, a couple of the items asked the following: "When I am overwhelmed with things I have to do, …" "When I feel things are out of control, …". Average scores are calculated, and higher values represent eating more than usual when stressed and lower values represent eating less than usual when stressed. Cronbach's alpha was used to measure internal consistency, a coefficient of .92 was obtained in the present study.

Salzburg Emotional Eating Scale (SEES; Meule et al., 2018c)

The SEES consists of 20 items (5 items for each subscale: happiness, sadness, anger, anxiety), where participants respond to different emotions on a 5-point Likert scale, ranging from *I eat much less than usual* (1 point) to *I eat much more than usual* (5 points). The scale captures individual differences in eating behaviours in relations to different emotions. For example, a sample item from the happiness and anger subscales successively, asked the following: "When I am cheerful, …" "When I am irritated, …". Average scores are calculated and higher values represent eating more than usual in response to emotions and lower values represent eating less than usual in response to certain emotions (Meule et al., 2018a). Cronbach's alpha was used to measure internal consistency, a coefficient of .83 was obtained for the overall measure. For the subscales the internal consistency coefficients were as follows: happiness .85, sadness .73, anger .75, and anxiety .84.

General Stress (GS; Parks et al., 2012)

A single item pre-existing stress measure was used as a validation for individual stress. Perceived stress was measured by a general stress question asking how stressful their life has been in the past four weeks using a 10-point sliding scale ranging from *Not stressful at all* (1 point) to *Extremely stressful* (10 point). This frame of reference was used as a

comparison to the individuals scores on other measures of stress, to assess whether their perceived stress was comparable to actual stressors or whether they were independent form each other.

Worries Emerging from the COVID-19 Pandemic Scale (WECP; Comerford et al., 2022)

The WECP scale consists of 14 statements, where participants rate them bases on how they generally feel on a 5-point Likert scale, ranging from *strongly disagree* (1 point) to *strongly agree* (5 points). The scale captures individual differences in worries and resilience related to the COVID-19 pandemic and comprises of the following dimensions: worries about the future course of the virus; worries about readjusting to society; feelings of isolation; worries about the continuation or reintroduction of restrictions; worries for family and friends; financial worries and worries regarding the safety and efficacy of Covid vaccines (Comerford et al., 2022). For example, a couple of the items asked the following: “The pandemic has caused me to feel disconnected form the world around me” and “I am worried that the Covid-19 virus will never disappear from the population”. Three items were removed for this survey to adjust to the current societal conditions, there items were: “I worry that I won’t be able to cope if Covid-19 restrictions go on much longer ”, “I am worried about being in quarantine or lockdown for a long time”, and “I am concerned about how I will adjust when society opens up after the pandemic”. Cronbach’s alpha was used to measure internal consistency, a coefficient of .78 was obtained for the overall measure. For the subscales internal consistency coefficients were as follows: worries about lockdown .87, long-term worries .66, financial worries .81, worries for family and friends .84, and worries about the safety and efficacy of the Covid-19 vaccines .93.

Perceived Distress Related to Stressor Groups (PDSG; Weierstall-Pust et al., 2022)

In this study, 20 items related to the population stressors were generated (5 items - climate change, 8 items - COVID-19 pandemic stressors, 7 items - Ukraine crisis stressors) to assess current population fears. A 5-point Likert scale was used, ranging from *Not at all* (0 point) to *Extremely* (4 point). The original scale was adapted for this study where 12 items were generated to assess the modern life stress related to New Zealand and Australian populations. There was an overlap with the WECP scale as well, therefore similar questions were removed to avoid repetitive questioning. The 12 items were as follows: climate change (3 items: "I'm worried that the number of natural disasters in New Zealand/Australia will increase", "I'm worried that future generations might suffer from the consequences of climate change", and "I'm worried that climate change will lead to an increase in geopolitical conflicts"), COVID-19 (3 items: "Due to the Covid-19 pandemic, I'm worried about my own health", "Due to the Covid-19 pandemic, I'm concerned about my own economic situation", and "I'm worried about social erosion in New Zealand/Australia , due to the Pandemic"), War in Russia-Ukraine (3 items: "I'm worried about the Ukrainian people", "I'm worried about the economic consequences of the war, for example an increase in energy costs ", and "I'm worried that the war might have an impact on geopolitical safety, for example in terms of a third world war"), financial stress (3 items: "I'm worried about the cost of living in New Zealand/Australia", "I'm worried about the cost of food in New Zealand/Australia", and "I'm worried about my own financial situation"). The financial stress questions were added to assess the participant economic security in relation to their modern life stress. Average scores were calculated, where higher scores indicate greater stress and worry. Cronbach's alpha was used to measure internal consistency, a coefficient of .86 was obtained for the overall measure. For the subscales, internal consistency coefficients were as follows: climate change .84, COVID-19 .72, war in Russia-Ukraine .77, and financial stress .85.

Revised Life Orientation Test (LOT-R; Scheier et al., 1994)

The LOT-R was used to measure dispositional optimism. It consists of 10 items that are recorded on a 5-point Likert scale, ranging from *strongly disagree* (0 point) to *strongly agree* (4 point). Three items (1, 4, and 10) measure optimism, three items (3, 7, and 9) assess pessimism, and the remaining four items are filler items. The scores of the optimism and pessimism subscales are the sum of the scores on the corresponding items. A total score is calculated by adding the optimism and inverted pessimism score (i.e., items 3, 7 and 9 were reverse scored before scoring and analysis). Cronbach's alpha was used to measure internal consistency, a coefficient of .84 was obtained in the present study.

Signature Strengths Survey (SSS, McGrath, 2019)

The Signature Strengths Survey can be used to directly measure signature strengths in a quick manner. From a list of 24-character strengths and their descriptions, participants are asked to identify strengths "that are *absolutely essential* to you, that define *who you are as a person*, that are *part of who you are*." This is considered Round 1 and in Round 2, participants are asked to review the strengths they have already checked and to tick any of the strengths that "stand out as more important to who you are then the others". This test is scored by adding the number of items checked in both Round 1 and Round 2. Each score counts as 1 in both round 1 and 2, after summing the score for the two rounds a signature strength is defined as an item where the score is 2. With the narrowness of the 0-2 scale, the SSS should only be used for the identification of signature strengths as the criterion-related validity of this scale will be less that that found for other instruments (McGrath, 2019). The mean validity correlation with behavioural criteria was .34 in the present study.

Data Analysis

The data were analysed in IBM *SPSS* (version 29) on a sample of 465 participants from the Prolific recruitment platform. Initially, the participants' scores were examined for missing values, there was only one missing value in the demographic section for age. There were no missing data for any of the attention checks or for the different measurement tools. The assumptions required to conduct the various statistical tests were verified and *p* values below .05 were considered as indicating statistically significant results. Skewness and kurtosis values indicated acceptable ranges on most measures, the exception was 2.87 kurtosis statistic for SEES, indicating that the distribution is too peaked to be considered a normal distribution. No outliers were established. Means and standard deviations for the total Salzburg Stress Eating Scale (SSES), Salzburg Emotional Eating Scale (SEES), General Stress measure (GS), Worries Emerging from the COVID-19 Pandemic Scale (WECP), Perceived Distress related to Stressor Groups (PDSG), Revised Life Orientation Test (LOT-R) and the Signature Strengths Survey (SSS) are presented in Table 2, together with the intercorrelations between all variables.

Table 2

Means, standard deviations, skewness, internal consistency, and inter-correlations of the variables (N = 465)

Variables	1	2	3	4	5	6	7
1. SSES							
2. SEES	.67*						
3. GS	.07	.03					
4. WECP	.06	.00	.30**				
5. PDSG	0.6	.05	.34**	.52*			
6. LOT-R	-.10*	-.12*	-.32**	-.32**	-.25**		
7. SSS	-.04	-.06	.01	-.06	.05	.18**	
Mean	2.99	2.98	5.80	2.83	2.29	2.19	2.48
SD	.77	.38	2.19	.69	.76	1.05	2.42
Skewness	.17	.59	-.34	-.38	-.26	-.23	
Cronbach's alpha	.92	.83	-	.78	.86	.84	

Note. All values are computed using means except SSS which is based on the number of Signature Strengths based on the Signature Strengths Survey. SSES, Salzburg Stress Eating Scale; SEES, Salzburg Emotional Eating Scale; GS, General Stress; WECP, Worries Emerging from the COVID-19 Pandemic Scale; PDSG, Perceived Distress related to Stressor Groups; LOT-R, Revised Life Orientation Test; SSS, Signature Strengths Survey. *$p < 0.05$, two-tailed, **$p < .01$, two-tailed

Bivariate Correlation

Bivariate correlations between measures of stress eating, emotional eating, stress measures and optimism are presented in Table 2. There was a significant moderate-strong positive relationship between stress related eating (SESS) and emotion related eating (SEES). All three measures of stress were significantly, positively correlated with each other. General stress (GS) and the Worries Emerging from the COVID-19 Pandemic (WECP) showed a weak-moderate correlation. Perceived Distress Related to Stressor Groups (PDSG) showed a moderate relationship between both GS and WECP. There was a significant negative correlation between optimism (LOT-R), stress related eating, emotion related eating, and the various measures of stress. The relationship between optimism and the two eating measures was weak. Between general stress and worries emerging from COVID-19, the negative correlation with optimism was moderate and the relationships between optimism and perceived distress was weak-moderate. On average after the first round of the SSS, participants identified 6.65 signature strengths (*SD = 4.23)*, after the second round on average participants identified 2.48 signature strengths *(SD = 2.42)*. Three most common signature strengths after round 2, Judgement/Critical Thinking, Kindness, and Humour. The three least common after round 2, Teamwork, Zest and Bravery/Courage. Six initial responses for none of these characteristics is more essential to who I am than any of the others, and four after round 2 for none of these characteristics is more essential to who I am than any of the others. The round two of signature strengths were significantly positively correlated with dispositional optimism.

Subscales were calculated for multi-item scales, means and standard deviations were then calculated for each of these scales. Salzburg Emotional Eating Scales are presented in Table 3, Worries emerging from the COVID-19 Pandemic scales are presented in Table 4.

Perceived Distress Related to Stressor Groups presented in Table 5. Correlation matrices were computed for all the stress variables and eating variables are presented in Table 6.

Table 3

Descriptive Statistics, internal consistency, and correlations between the four subscales of the Salzburg Emotional Eating Scale (N = 465)

Subscales	1	2	3	4
1. Happiness				
2. Sadness	- .20**			
3. Anger	- .15**	.53**		
4. Anxiety	- .23**	.55**	.58**	
Mean	3.15	3.22	2.81	2.75
Range	3.6	4.0	4.0	4.0
SD	.43	.62	.55	.69
Cronbach's alpha	.85	.73	.75	.84

Note. All values are computed using means. ** $p < 0.01$, two-tailed.

Correlations between the subscales of the Salzburg Emotional Eating Scale (SEES) are presented in Table 3. Subscale scores of sadness, anger, and anxiety were significantly positively correlated with each other, while scores on happiness were inversely correlated with sadness, anger, and anxiety scores. Similar to the initial study for validation of the SEES, all the mean scores on the subscales differed from each other in the following order: sadness (*mean = 3.22; SD = .62*) > happiness (*mean = 3.15; SD = .43*) > anger (*mean = 2.81; SD = .55*) > anxiety (*mean = 2.75; SD = .69*) (Meule et al., 2018a).

Table 4

Descriptive statistics, internal consistency, and correlations between the five subscales of the Worries Emerging from the COVID-19 Pandemic Scale (N = 465)

Subscales	1	2	3	4	5
1. Worries about lockdown					
2. Long-term worries	.40**				
3. Financial worries	.37**	.42**			
4. Worries for family and friends	.46**	.58**	.44**		
5. COVID-19 vaccines	.03	- .21**	- .02	- .18**	
Mean	3.04	2.84	3.08	3.31	1.88
Range	4.0	4.0	4.0	4.0	4.0
SD	1.16	.98	1.21	1.07	1.12
Cronbach's alpha	.87	.66	.81	.84	.93

Note. All values are computed using means. ** $p < 0.01$, two-tailed.

Correlations between the subscales of the Worries Emerging from the COVID-19 Pandemic Scale (WECP) are presented in Table 4. Subscale scores for the worries about lockdown, long-term worries and worries for friends and family were significantly positively correlated with each other. Worries about the safety and efficacy of the COVID-19 vaccines scores were inversely correlated with long-term worries, financial worries, and worries for family and friends and significantly correlated with long term worries and worries for family and friends. All the mean scores on the subscales differed from each other worries about lockdown (*mean = 3.04; SD = 1.16*), long-term worries (*mean = 2.84; SD = .98*), financial worries (*mean = 3.08; SD = 1.21*) and worries around the vaccines (*mean = 1.88; SD = 1.12*).

Table 5

Descriptive statistics, internal consistency, and correlations between the four subscales of the Perceived Distress Related to Stressor Groups Scales (PDSG) (N = 465)

Subscales	1	2	3	4
1. Climate Change stressors				
2. COVID-19 Stressors	.38**			
3. Ukraine Crisis Stressors	.52**	.41**		
4. Financial Stressors	.34**	.51**	.36**	
Mean	2.35	1.51	2.40	2.91
Range	4.0	4.0	4.0	4.0
SD	1.08	.99	1.00	.98
Cronbach's alpha	.84	.72	.77	.85

Note. All values are computed using means. ** $p < 0.01$, two-tailed.

Correlations between the subscales of the Perceived Distress Related to Stressor Group Scales (PDSG) are presented in Table 5. Subscale scores for the climate change stressors, COVID-19 stressors, Ukraine crisis stressors and financial stressors were significantly positively correlated with each other. All the mean scores on the subscales differed from each other: climate change stressors (*mean = 2.35; SD = 1.08*), COVID-19 stressors (*mean = 1.51; SD = .99*), Ukraine crisis stressors (*mean = 2.40; SD = 1.00*) and financial stressors (*mean = 2.91; SD = .98*).

The correlations between the various stress measures and the SSES and SEES are presented in Table 6. As show in this table none of the stress measures were significantly correlated with stress eating scores as scored on the SSES. The scores on the SSES were

strongly correlated with each of the subscales of the SEES. The overall scores for the SEES and the sadness subscale were both significantly correlated with the vaccination subscale on the WECP scale. This was an inverse relationship suggesting that those who scored more highly around their confidence/agreeableness for the vaccines scored lower on the SEES and for the sadness measures.

Table 6

Correlations of stress variables and Salzburg scales (N = 465)

Variable	Subscale	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1. SSES																			
2. SEES		.67**																	
	3. Happiness	-.30**	.04																
	4. Sadness	.67**	.80**	-.20**															
	5. Anger	.45**	.80**	-.15**	.53**														
	6. Anxiety	.69**	.82**	-.23**	.55**	.58**													
7. GS		.07	.03	.05	.08	-.04	-.01												
8. WECP		.06	.00	-.03	.01	-.04	.04	.30**											
	9. Lockdowns	.08	-.02	-.05	.02	-.05	-.00	.19**	.72**										
	10. Long-term	.07	.07	.01	.03	.02	.10*	.21**	.75**	.40**									
	11. Financial	.06	.03	.01	.05	-.03	.04	.32**	.72**	.37**	.42**								
	12. Family/Friends	.04	.00	-.03	.01	-.00	.01	.20**	.74**	.46**	.58**	.44**							
	13. Vaccines	-.09	-.10*	-.04	-.10*	-.07	-.04	-.01	.17**	.03	-.21**	-.02	-.18**						
14. PDSG		.06	.05	.04	.05	-.03	.07	.34**	.52**	.33**	.48**	.45**	.49**	-.15**					
	15. Climate Change	.08	.04	-.01	.07	.00	.04	.21**	.24**	.17**	.34**	.16**	.34**	-.31**	.76**				
	16. COVID-19	.02	.03	.04	-.03	-.01	.07	.26**	.61**	.39**	.51**	.50**	.52**	-.05	.76**	.38**			
	17. Ukraine Crisis	-.03	.02	.08	.01	-.06	.03	.12**	.22**	.15**	.23**	.17**	.25**	-.13**	.76**	.52**	.41**		
	18. Financial	.09	.07	-.01	.10*	-.02	.10	.43**	.52**	.28**	.36**	.56**	.36**	.10	.73**	.34**	.51**	.36**	

Note. SSES, Salzburg Stress Eating Scale; SEES, Salzburg Emotional Eating Scale; GS, General Stress; WECP, Worries Emerging from the COVID-19 Pandemic Scale; PDSG, Perceived Distress related to Stressor Groups. *$p < 0.05$, two-tailed, **$p < .01$, two-tailed.

Results

Assessing the Moderating Effects of Dispositional Optimism

To approach whether optimism moderated the relationship between modern life stress and stress related eating, a hierarchical linear regression analysis was conducted to evaluate the relative contributions of optimism and modern life stress in predicting stress related eating. To understand modern life stress using both measures, separate analysis were conducted to include both the Worries Emerging from the COVID-19 Pandemic Scale (WECP) and Perceived Distress related to Stressor Groups (PDSG) scales, for the different analysis PDSG has been labelled 1, and WECP has been labelled 2. The full regression model 1 included analysis of modern life stress (PDSG), optimism (LOT-R) and the interaction term (PDSG x LOT-R) as predictors of stress related eating, these were conducted via PROCESS (Model 1) computational macro (Hayes, 2012). These variables accounted 12% of the variance in stress related eating, $F(465) = 2.22$, $p < .08$ see Table 7. The model was not statistically significant. To determine the form of the interactions, regression lines were plotted to illustrate the regression of optimism on stress related eating as a function of modern life stress. The effect of optimism on eating behaviour appears to be dependent on the level of modern life stress, see Figure 2. At low levels of modern life stress, individuals with low dispositional optimism have higher stress related eating scores, and those with greater optimism have lower stress related eating scores. As modern life stress scores increase, scores for stress related eating also increase for low and moderate levels of dispositional optimism. High optimism shows stable eating scores, suggesting that higher levels of dispositional optimism mitigated the effect of modern life stress has on peoples eating behaviour.

Table 7

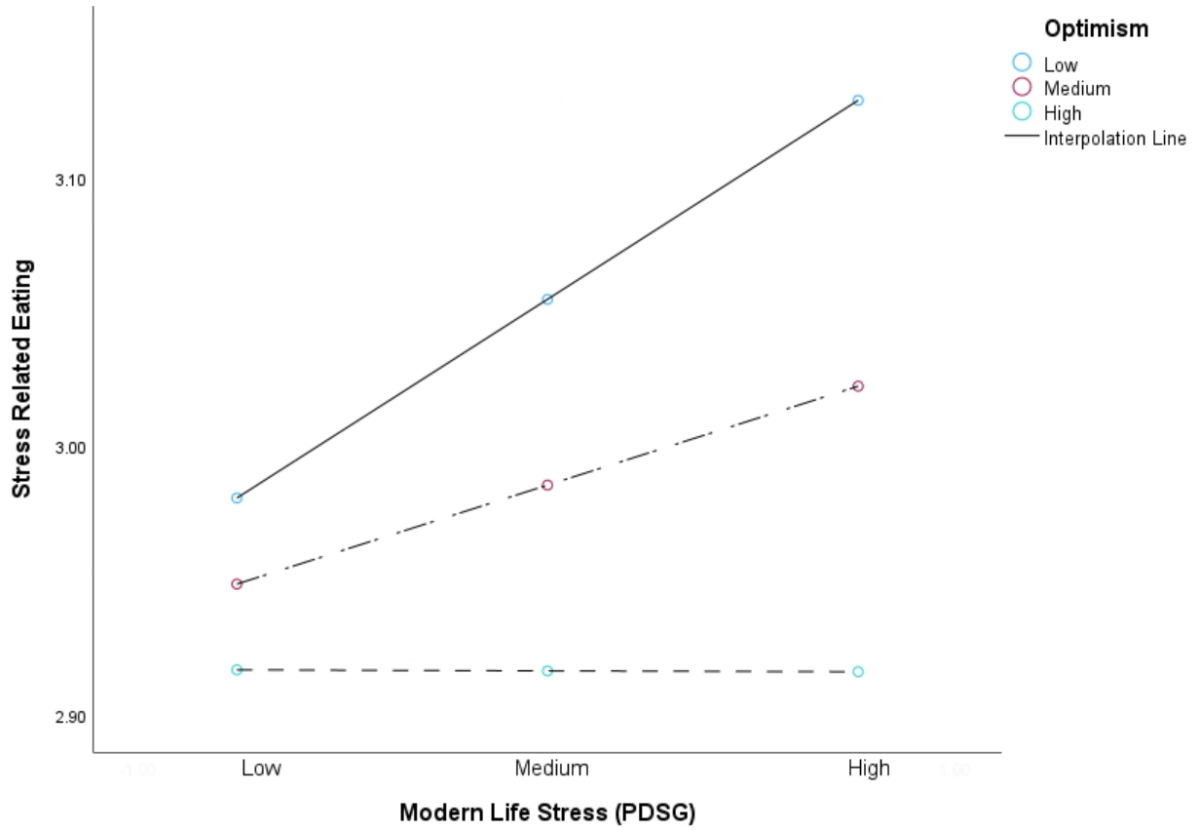
Correlations of stress variables and Salzburg scales (N = 465)

Variables	Coeff.	SE	*t*	*p*
1. PDSG	.05	.05	.99	.32
LOT-R	- .08	.04	- 1.89	.06
PDSG x LOT-R	- .06	.06	- 1.02	.31
Constant	2.99	.04	81.75	.00
2. WECP	.03	.05	.56	.57
LOT-R	- .08	.04	- 1.91	.06
WECP x LOT-R	- .01	.06	- .23	.82
Constant	2.99	.04	80.80	.00
Model Summary	R	ΔR^2	F	*p*
1.	.12	.01	2.22	.09
2.	.11	.01	1.76	.16

Note. WECP, Worries Emerging from the COVID-19 Pandemic Scale; PDSG, Perceived Distress related to Stressor Groups.

Figure 2

Relationship between Perceived Distress Related to Stressor Groups and stress related eating scored at different levels of optimism

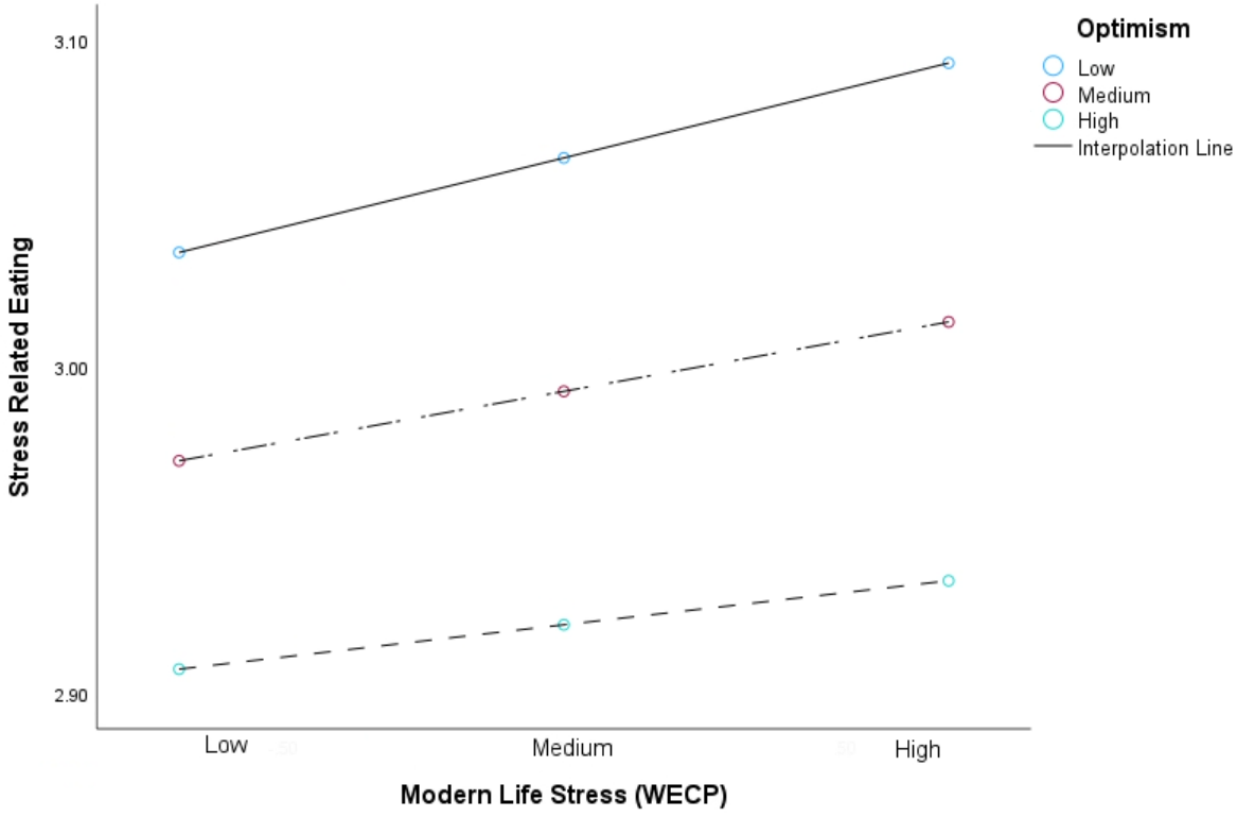


The full regression model 2 included analysis of modern life stress (WECP), optimism (LOT-R) and the interaction term (WECP x LOT-R) as predictors of stress related eating, these were conducted via PROCESS (Model 1) computational macro (Hayes, 2012). These variables accounted 11% of the variance in stress related eating, $F(465) = 1.76$, $p < .16$ see Table 7. The model was not statistically significant. To determine the form of the interactions, regression lines were plotted to illustrate the regression of optimism on stress related eating as a function of modern life stress. The effect of optimism on eating behaviour appears to be dependent on the level of modern life stress, see Figure 3. At low levels of

modern life stress, individuals with low dispositional optimism have higher stress related eating scores, and those with greater optimism have lower stress related eating scores. As modern life stress scores increase, scores for stress related eating also increase for low, moderate, and high levels of dispositional optimism. The higher the optimism level, the lower the scores on stress related eating, suggesting that higher levels of dispositional optimism mitigated the effect of modern life stress has on peoples eating behaviour.

Figure 3

Relationship between Worries Emerging from the COVID-19 Pandemic Scale and stress related eating scores at different levels of optimism



To approach whether optimism moderated the relationship between modern life stress and emotion related eating, a hierarchical linear regression analysis was conducted to evaluate the relative contributions of optimism and modern life stress in predicting emotion related eating. To understand modern life stress using both measures, we conducted separate analysis to include both the Worries Emerging from the COVID-19 Pandemic Scale (WECP) and Perceived Distress related to Stressor Groups (PDSG) scales, for the different analysis PDSG has been labelled 1, and WECP has been labelled 2. The full regression model 1 included analysis of modern life stress (PDSG), optimism (LOT-R) and the interaction term (PDSG x LOT-R) as predictors of emotion related eating, these were conducted via PROCESS (Model 1) computational macro (Hayes, 2012). These variables accounted 14% of the variance in emotion related eating, $F(465) = 3.02$, $p < .03$ see Table 8. The model was not statistically significant. To determine the form of the interactions, regression lines were plotted to illustrate the regression of optimism on stress related eating as a function of modern life stress. The effect of optimism on eating behaviour appears to be dependent on the level of modern life stress, see Figure 4. At low levels of modern life stress, individuals with low dispositional optimism have higher emotion related eating scores, and those with greater optimism have lower emotion related eating scores. As modern life stress scores increase, scores for stress related eating also increase for moderate and high levels of dispositional optimism. For high optimism, the stress related eating scores decreased as modern life stress scores increased.

Table 8

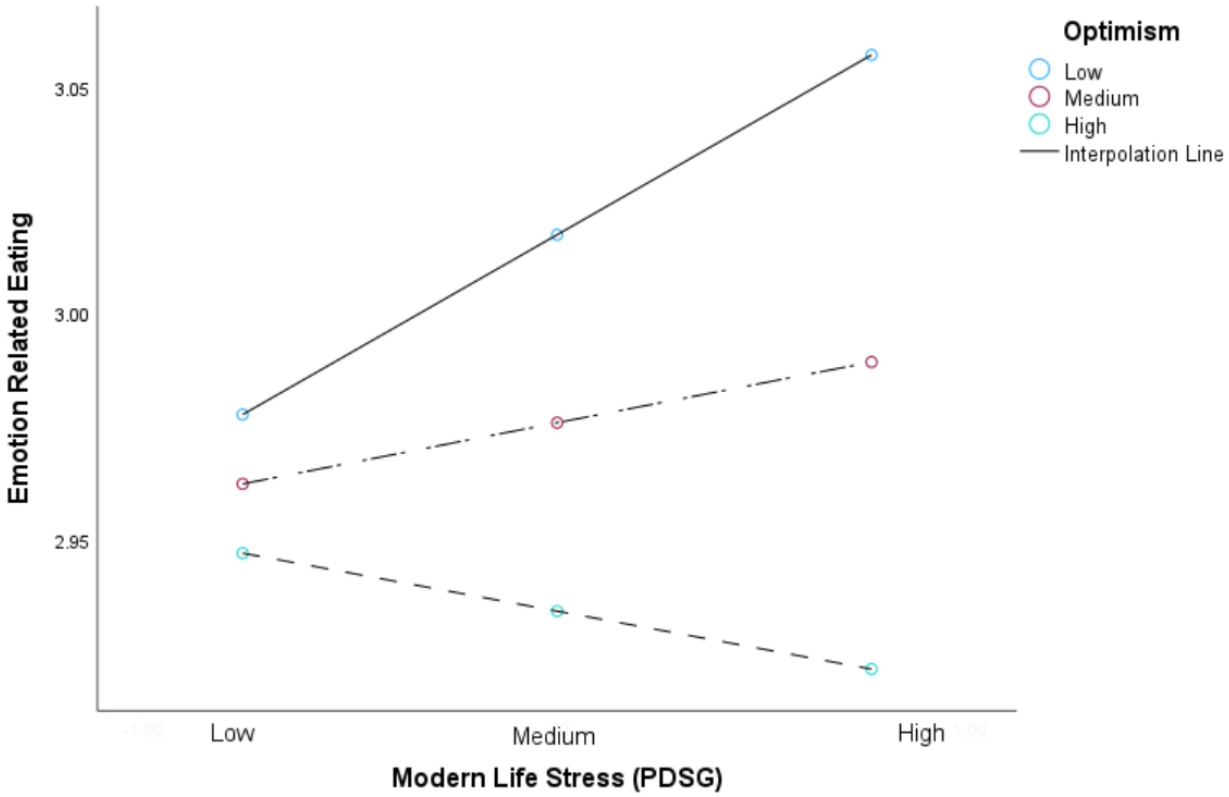
Summary of hierarchical regression analysis for variable predicting emotion related eating

Variables	Coeff.	SE	*t*	*p*
1. PDSG	.02	.02	.73	.47
LOT-R	- .05	.02	- 2.30	.02
PDSG x LOT-R	- .04	.03	- 1.47	.14
Constant	2.98	.02	164.92	.00
2. WECP	- .02	.03	- .88	.38
LOT-R	- .06	.02	- 2.73	.01
WECP x LOT-R	.01	.03	.25	.80
Constant	2.98	.02	163.04	.00
Model Summary	R	ΔR^2	F	*p*
1.	.14	.02	3.02	.03
2.	.13	.02	2.49	.06

Note. WECP, Worries Emerging from the COVID-19 Pandemic Scale; PDSG, Perceived Distress related to Stressor Groups.

Figure 4

Relationship between Perceived Distress Related to Stressor Groups and emotion related eating scores at different levels of optimism

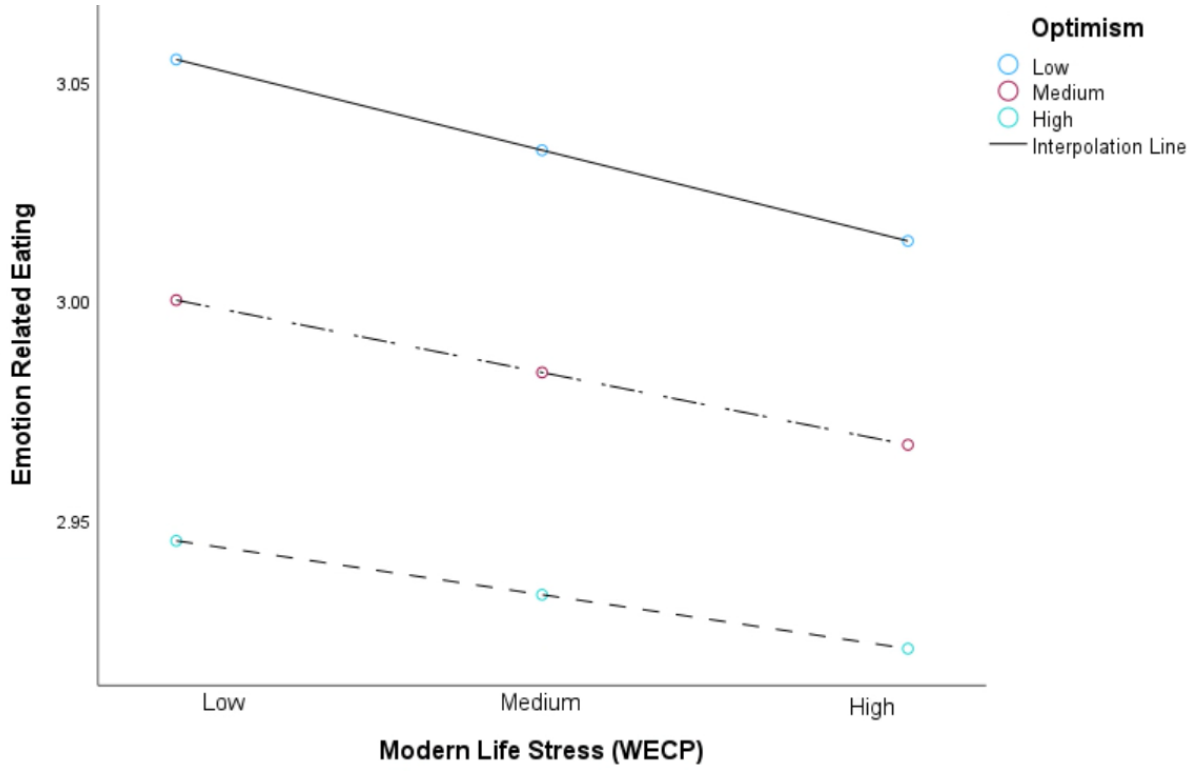


The full regression model 2 included analysis of modern life stress (WECP), optimism (LOT-R) and the interaction term (WECP x LOT-R) as predictors of emotion related eating, these were conducted via PROCESS (Model 1) computational macro (Hayes, 2012). These variables accounted 13% of the variance in stress related eating, $F(465) = 2.49$, $p < .06$ see Table 8. The model was not statistically significant. To determine the form of the interactions, regression lines were plotted to illustrate the regression of optimism on emotion related eating as a function of modern life stress. The effect of optimism on eating behaviour appears to be dependent on the level of modern life stress, see Figure 5. At low levels of

modern life stress, individuals with low dispositional optimism have higher emotion related eating scores, and those with greater optimism have lower emotion related eating scores. As modern life stress scores increase, scores for stress related eating decrease for low, moderate, and high levels of dispositional optimism, suggesting that optimism did not mitigate the effect of modern life stress has on peoples eating behaviour.

Figure 5

Relationship between Worries Emerging from the COVID-19 Pandemic Scale and emotion related eating scores at different levels of optimism



Assessing the Moderating Effects of Signature Strengths

To approach whether signature strengths moderated the relationship between modern life stress and stress related eating, a hierarchical linear regression analysis was conducted to evaluate the relative contributions of optimism and modern life stress in predicting stress related eating. To understand modern life stress using both measures, we conducted separate analysis to include both the Worries Emerging from the COVID-19 Pandemic Scale (WECP) and Perceived Distress related to Stressor Groups (PDSG) scales, for the different analysis PDSG has been labelled 1, and WECP has been labelled 2. The full regression model 1 included analysis of modern life stress (PDSG), signature strengths (SS) and the interaction term (PDSG x SS) as predictors of stress related eating, these were conducted via PROCESS (Model 1) computational macro (Hayes, 2012). These variables accounted for 9% of the variance in stress related eating, $F(465) = 1.34$, $p < .26$ see Table 9. The model was not statistically significant. To determine the form of the interactions, regression lines were plotted to illustrate the regression of signature strengths on stress related eating as a function of modern life stress. The effect of signature strengths on eating behaviour appears to be dependent on the level of modern life stress, see Figure 6. At low levels of modern life stress, individuals had low stress related eating scores for all three levels of signature strengths. As the level of modern life stress increased, so did the scores for stress related eating, for low, medium, and high signature strengths. However, the gradient that they increased varied, with low identification of signature strengths being the steepest/highest gradient, followed by medium identification of signature strengths and finally higher identification of signature strengths. The resulting scores for stress related eating were not as high. This may suggest that signature strengths do buffer the relationship between modern life stress and stress related eating as the scores increased at a lower rate with higher identification of signature strengths.

Table 9

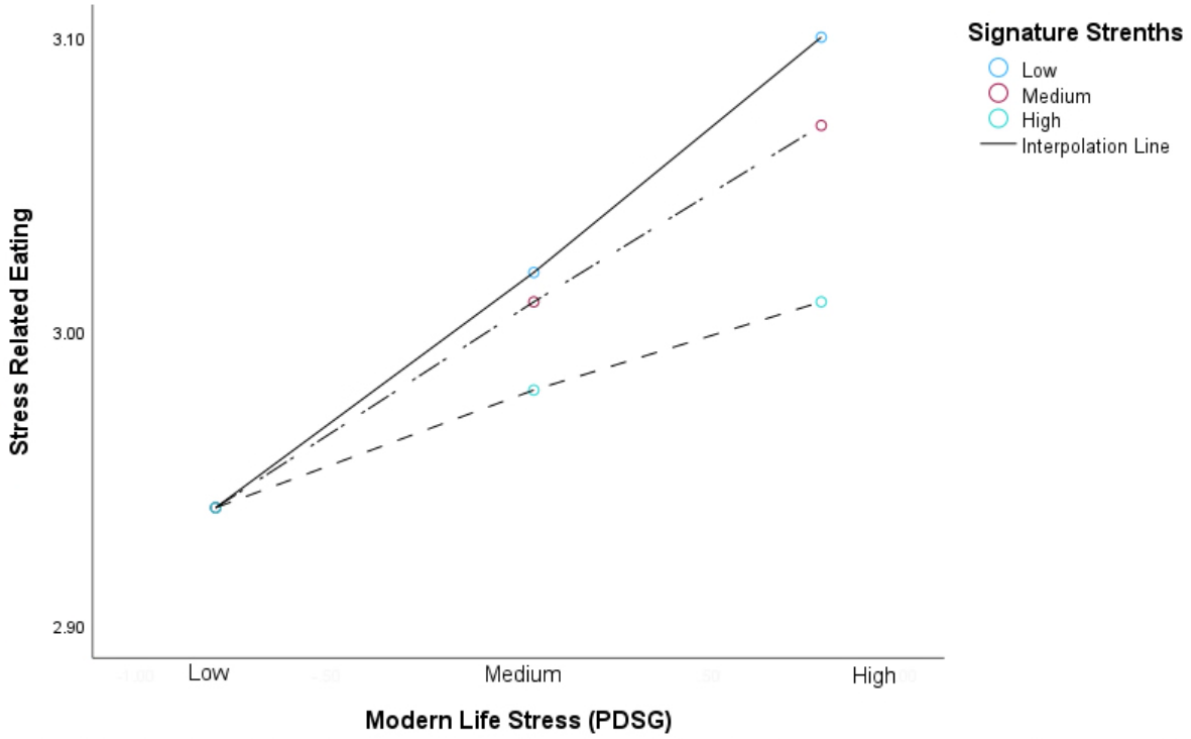
Summary of hierarchical regression analysis for variables predicting stress related eating

Variables	Coeff.	SE	*t*	*p*
1. PDSG	.07	.05	1.51	.13
SSS	- .01	.01	- .96	.34
PDSG x SS	- .02	.02	- 1.16	.25
Constant	3.00	.04	84.33	.00
2. WECP	.05	.05	1.00	.32
SSS	- .01	.01	- .88	.33
WECP x SS	- .03	.02	- 1.49	.14
Constant	2.99	.04	84.11	.00
Model Summary	R	ΔR^2	F	*p*
1.	.09	.01	1.34	.26
2.	.10	.01	1.44	.23

Note. SS, Signature Strengths; PDSG, Perceived Distress related to Stressor Groups; WECP, Worries Emerging from the COVID-19 Pandemic Scale.

Figure 6

Relationship between Perceived Distress Related to Stressor Groups and stress related eating scores at different levels of signature strengths

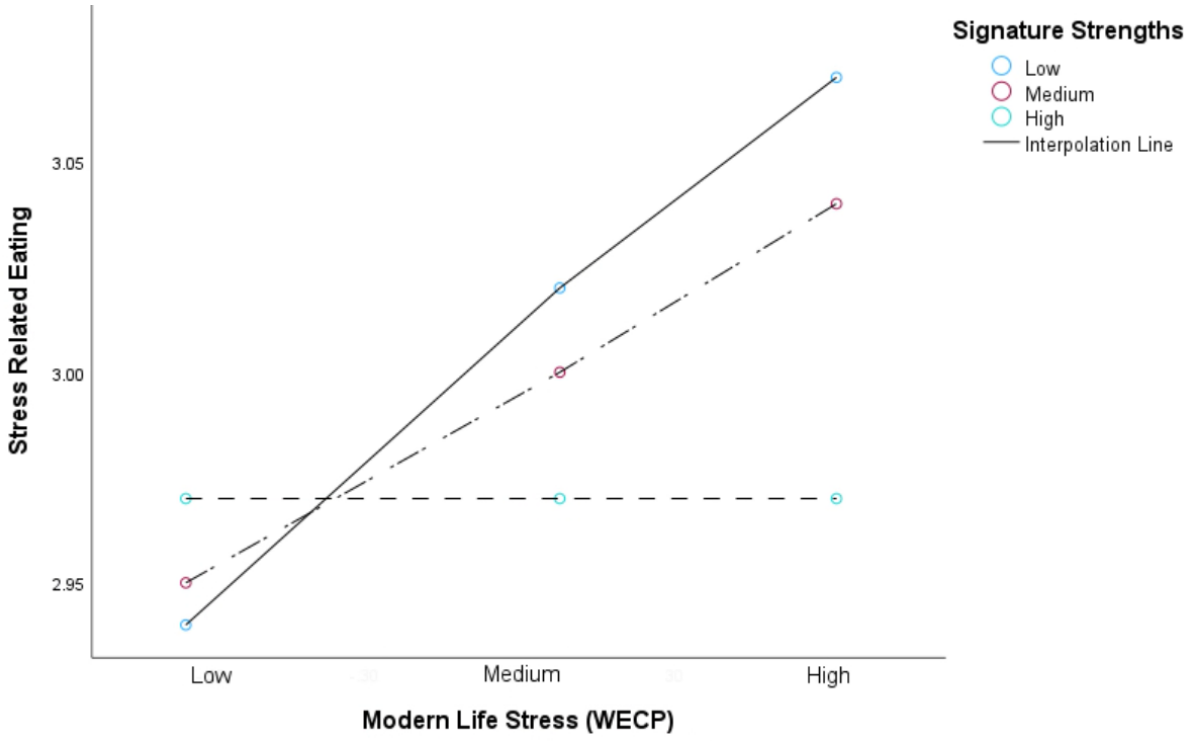


The full regression model 2 included analysis of modern life stress (WECP), signature strengths (SS) and the interaction term (WECP x SS) as predictors of stress related eating, these were conducted via PROCESS (Model 1) computational macro (Hayes, 2012). These variables accounted for 10% of the variance in stress related eating, $F(465) = 1.44$, $p < .23$ see Table 9. The model was not statistically significant. To determine the form of the interactions, regression lines were plotted to illustrate the regression of signature strengths on stress related eating as a function of modern life stress. The effect of signature strengths on eating behaviour appears to be dependent on the level of modern life stress, see Figure 7. At

low levels of modern life stress, individuals who identified a lower number of signature strengths had the lowest stress related eating scores, however as modern life stress increased, the eating scores also increased at a greater gradient than other levels of signature strengths. At medium levels of signature strengths identified, the stress related eating scores for low modern life stress were also low and were slightly higher than those for low signature strength identification. The stress related eating scores also increased, as modern life stress increased but at a slower rate and lower gradient than for low signature strength identification. For high signature strengths identification, the stress related eating scores remained the same for all levels of modern life stress, suggesting that signature strength identification could influence the relationship between stress related eating and modern life stress measured as the WECP scale.

Figure 7

Relationship between Worries Emerging from the COVID-19 Pandemic Scale and stress related eating scores at different levels of signature strengths



To approach whether signature strengths moderated the relationship between modern life stress and emotion related eating, a hierarchical linear regression analysis was conducted to evaluate the relative contributions of optimism and modern life stress in predicting emotion related eating. To understand modern life stress using both measures, we conducted separate analysis to include both the Worries Emerging from the COVID-19 Pandemic Scale (WECP) and Perceived Distress related to Stressor Groups (PDSG) scales, for the different analysis PDSG has been labelled 1, and WECP has been labelled 2. The full regression model 1 included analysis of modern life stress (PDSG), signature strengths (SS) and the interaction

term (PDSG x SS) as predictors of emotion related eating, these were conducted via PROCESS (Model 1) computational macro (Hayes, 2012). These variables accounted 9% of the variance in stress related eating, $F(465) = .14$, $p < .28$ see Table 10. The model was not statistically significant. To determine the form of the interactions, regression lines were plotted to illustrate the regression of signature strengths on emotion related eating as a function of modern life stress. The effect of signature strengths on eating behaviour appears to be dependent on the level of modern life stress, see Figure 8. The relationships do not appear to be linear which can be seen at medium and high levels of identified signature strengths. As modern life stress increased, the gradient/rate of increased emotion related eating varies between the different levels of identified signature strengths. With the smallest increase being for those who identified a higher number of signature strengths, suggesting that the level of signature strengths does influence the relationship between modern life stress as PDSG and emotion related eating.

Table 10

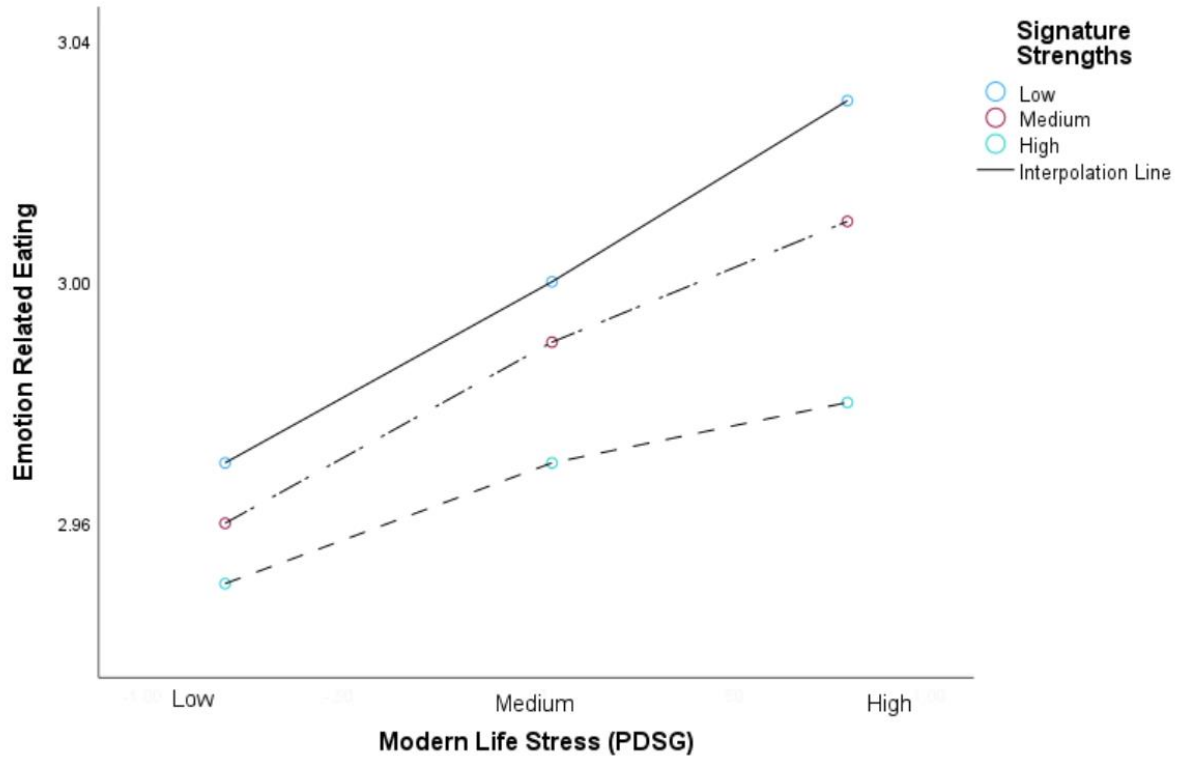
Summary of hierarchical regression analysis for variable predicting emotion related eating

Variables	Coeff.	SE	*t*	*p*
1. PDSG	.03	.02	1.26	.21
SSS	- .01	.01	- 1.37	.17
PDSG x SS	- .01	.01	- .93	.35
Constant	2.98	.02	169.47	.00
2. WECP	.00	.03	- .13	.90
SSS	- .01	.01	- 1.31	.19
WECP x SS	- .01	.01	- .51	.61
Constant	2.98	.02	168.83	.00
Model Summary	R	ΔR^2	F	*p*
1.	.09	.01	.14	.28
2.	.06	.00	.64	.59

Note. SS, Signature Strengths; PDSG, Perceived Distress related to Stressor Groups; WECP, Worries Emerging from the COVID-19 Pandemic Scale.

Figure 8

Relationship between Perceived Distress Related to Stressor Groups and emotion related eating scores at different levels of signature strengths

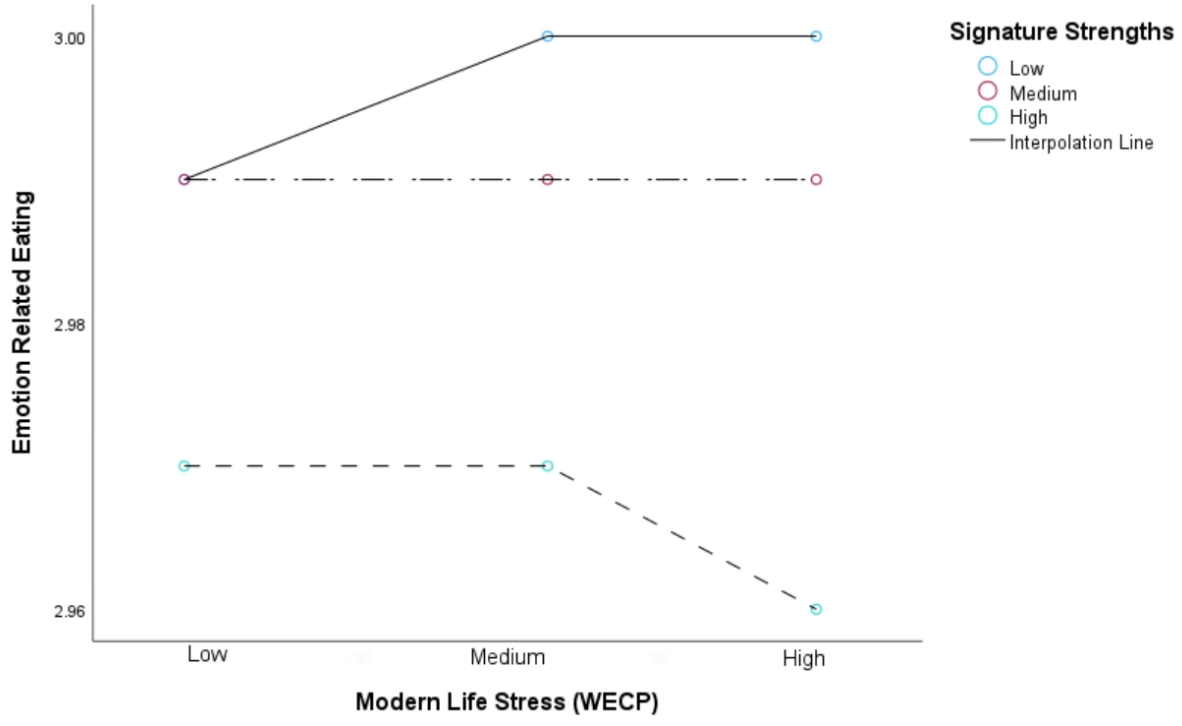


The full regression model 2 included analysis of modern life stress (WECP), signature strengths (SS) and the interaction term (WECP x SS) as predictors of emotion related eating, these were conducted via PROCESS (Model 1) computational macro (Hayes, 2012). These variables accounted for 6% of the variance in stress related eating, $F(465) = .64$, $p < .59$ see Table 10. The model was not statistically significant and does not appear to be linear. To determine the form of the interactions, regression lines were plotted to illustrate the regression of signature strengths on emotion related eating as a function of modern life stress, see Figure 7. For individuals who identified a low number of signature strengths and at low

modern life stress, the scores for emotion related eating where the same for those who identified a medium number of signature strengths. As modern life increased to medium levels, so too did stress related eating. However, it appeared to be unchanged between medium and high levels of modern life stress. For a medium number of identified signature strengths, the emotion related eating scores remained unchanged for the various levels of modern life stress. For high identification of signature strengths, the emotion related eating scores were the lowest, remained unchanged between low and medium modern life stress scores and appeared to decrease for high levels of modern life stress.

Figure 9

Relationship between Worries Emerging from the COVID-19 Pandemic Scale and emotion related eating scores at different levels of signature strengths



Discussion

Relationships between Modern Life Stress and Eating Behaviours

The primary aim of the study was to investigate the relationship between modern life stress and subsequent eating behaviours in sample of Australian and New Zealand adults. To examine this relationship, the study's first hypothesis focussed on assessing the link between modern life stress, measured by the Worries Emerging from the COVID-19 Pandemic (WECP) and Perceived Distress related to Stressor Groups (PDSG) scales, and eating behaviours, as evaluated through the Salzburg eating scales. Prior research suggested a potential link between stress and eating behaviours, thus we anticipated that as modern life stress increased, individuals would have greater stress related and emotion related eating scores. This hypothesis was based on the concept that increased levels of stress may lead to maladaptive coping mechanisms such as changes in eating behaviour and food consumption (Greeno & Wing, 1994; Hill et al., 2022; Meule et al., 2018b; Robbins & Fray, 1980; Stammers et al., 2020; Tomiyama et al., 2015). However, the findings of this study deviated from this prediction, finding that the association between modern life stress and both types of eating behaviours was not statistically significant. While initially this result was surprising, it is consistent with previous research that highlights the complexity of the stress and eating relationships, indicating individual differences in stress responses and subsequent eating behaviours (Hill et al., 2022). These results suggest that the relationship between stress and eating behaviours may be influenced by various other factors such as individual differences in their perception of stress, coping strategies and emotional regulation.

These results are consistent with previous studies that have reported small effect sizes between stress and food consumption. These findings support the idea that only a portion of individuals, approximately 30 – 40%, tend to increase their food intake under stress while

others may decrease their food intake or exhibit no significant change (Hill et al., 2022). This observation parallels with the initial validation of the Salzburg Stress Eating Scale (SSES), where the authors found that the SSES scores were uncorrelated with perceived stress. This could suggest a dissociation between an individual's experience of stress and the translation to their eating behaviour. Notably, in this study the sample included a relatively high proportion of male participants (over 49%), which is a greater percentage of the sample than most studies investigating eating related behaviours. Previous research has indicated gender differences in eating behaviour, where the eating patterns in males tend not to be as strongly affected compared to females (Devonport et al., 2019). The current results support this as the emotion related eating scores ranged around the middle of the scale, suggesting that most of the sample reported to eat just as much as usual in response to stress and those who reported eating more than usual were balanced by those who reported eating less than usual. Similarly, emotion related eating scores were also distributed around the midpoint of the scale, indicating that most participants reported consistent eating habits in response to specific emotions, with variations balanced between those consuming more or less than usual. These results alongside the presence of a significant proportion of male participants in this study could indicate gender-based differences in eating behaviour in response to stress. This further supports the significance of individual differences, contributing to the complexity and variability of stress measures, and eating behaviours.

This study used an exploratory measure of stress, while previous studies have used measures of perceived stress that encompass general thoughts and emotions around stress. The exploratory measures limited statistical significance in this study may stem from the possibility that the stressors assessed may not be universally applicable or particularly relevant to the populations studied. For example, the COVID-19 pandemic was addressed considerably on both scales, compared to other factors such as financial security and climate

change that were only touched on briefly, could play a more substantial role in an individual's perception of their modern life stress. For both the Worries Emerging from the COVID-19 Pandemic Scale (WECP) and Perceived Distress related to Stressor Groups (PDSG) participants scored more highly on the financial subscales than the other subscales. For instance, for the WECP subscales the mean scores were highest for financial worries, followed by worries about lockdowns, long-term effects of COIVD-19 and lastly worries around vaccines. For the PDSG subscales, the mean scores were highest for financial insecurity, followed by Russia-Ukraine war, climate change and lastly COVID-19. The means ranged around the middle of the scale which could suggest that the measures included to measure modern life stress in this study may not be prevailing stressors for the sample studied. This outcome could be due to the geographic location of the study, where New Zealand and Australia's relative distance from global epicentres like Europe might lead to varying perceptions of the stressors such as the COVID-19 pandemic and Russia-Ukraine war. Previous research that investigated the relationship between modern life stress and well-being took place in European countries that are close in proximity to the Russia-Ukraine war and the effects of the COVID-19 pandemic could have been considered more catastrophic (Fel et al., 2022; Skwirczyńska et al., 2022). This could affect the relationship individuals have in how they perceive their modern life stress and whether it affects their eating behaviour. Such that, the observed relationship between modern life stress and eating behaviour could be mediated by additional factors and are not as strongly associated within New Zealand and Australian adult populations.

Stress Related Eating, Emotion Related Eating, Optimism, and Signature Strengths

The second hypothesis looked at the role of two positive psychology factors, optimism and signature strengths, and their relationship with stress related and emotion related eating behaviours. We hypothesised that these positive psychology factors would

demonstrate inverse relationships with stress related and emotion related eating behaviours. More specifically, those with higher levels of optimism and higher identifiable signature strengths were expected to demonstrate lower scores on both eating scales, indicating a potential protective effect of optimism and signature strengths on eating behaviours. Prior research indicated that greater optimism scores were related to higher life satisfaction (Hulbert & Morrison, 2006; Hyde & White, 2009; Vollmann et al., 2011). Furthermore, signature strengths may act as internal resources or coping mechanisms themselves, allowing individuals to cope more effectively with stressors. In this study there was a statistically significant inverse relationship between optimism and both stress related and emotion related eating behaviours. This finding is consistent with recent research that emphasises the protective role of optimism against maladaptive coping behaviours during times of stress. Studies have shown that individuals with higher levels of optimism tend to engage in healthier coping mechanisms and emotional regulation, which could contribute to their ability to manage modern life stress without changing their eating behaviours (Carver & Scheier, 2002; Lopez et al., 2018). Furthermore, the significant relationship between optimism and signature strengths is in line with recent research suggesting that individuals who have higher levels of optimism tend to have a greater range of positive psychological resources (Hirsch et al., 2007). Recent studies have demonstrated that these resources contribute to overall well-being and could play a role in buffering against stress related outcomes (Genç & Arslan, 2021; Gungor et al., 2021). In this context, signature strengths can be considered as tangible resources that individuals leverage to manage stressors effectively and mitigate the likelihood of stress related and emotion related eating behaviours. The results of this study showed support for this idea where an individual's identification of their own signature strengths could act both as an awareness of one's own strengths, or they could be used as coping strategies on their own, reducing the need or probability of someone turning to stress or

emotion related eating behaviours. For instance, in this study the most common identified signature strengths after the second round of identification were Judgement/Critical Thinking, Kindness and Humour. All three of these strengths could be used to manage stressful situations. Critical thinking and judgement could allow the individual to objectively evaluate a situation and actively problem solve or place a realistic level of stress to the situation. Kindness shown to oneself could support an individual to cope with anxiety around the stressor. Kindness shown to others could shift the focus from negative situations to helping others who are in greater need. Similarly, humour could bring light to situations or bring a level of positivity even in times of stress and allow either the individual or those around them to shift from the negative realms of stress. These findings could support the Macro Theory of positive functioning as individuals with greater positive affect could build on beneficial resources and skills (i.e., their signature strengths) that can be utilised when stressors occur, increasing their resilience to the stress (Stanley & Schutte, 2023). Further research in this area could look more specifically into the signature strengths that are common for various levels of modern life stress and what strategies these participants implement to cope with stressful situations.

Moderating Effects of Optimism and Signature Strengths

The third hypothesis explored the potential moderating effect of optimism and signature strengths on the relationship between modern life stress and eating behaviours. This study proposed that both optimism and signature strengths would function as buffers, weakening the association between increased levels of modern life stress and increased scores for stress related and emotion related eating. It was hypothesised that individuals characterised by moderate to high levels of optimism and those identifying with more signature strengths would demonstrate a diminished impact of modern life stress on their eating behaviours. Despite these expectations, the statistical analysis revealed that the

moderating role of optimism and signature strengths were not statistically significant in buffering the connection between stress and eating behaviours.

The results indicate that individuals who experiencing moderate to high levels of modern life stress as measured by the Perceived Distress Related to Stressor Groups (PDSG) and Worries Emerging from the COVID-19 pandemic scales (WECP), with moderate to high levels of optimism may receive the benefit of a buffering effect that protects against stress related eating behaviours. However, these results should be interpreted with caution as optimisms moderating effect was not statistically significant and only accounted for a small proportion of the variance in stress related eating behaviours (12% for PDSG and 11% for WECP). Furthermore, the moderating role of signature strengths on the relationship between modern life stress and stress related eating was explored. While there was indication that medium to high identification of signature strengths might influence the relationship between modern life stress and stress related eating. The results showed that modern life stress scores and stress related eating scores increased at a lower rate for medium to high identification of signature strengths compared to low identification of signature strengths. The results were not statistically significant and accounted for only a limited percentage of the variance in stress related eating behaviours (9% for PDSG and 10% for WECP).

Non-linear relationships emerged when examining the moderating role of both optimism and signature strengths on modern life stress and emotion related eating. For instance, optimism may exhibit a dose-response effect on this relationship; where individuals who experience greater levels of modern life stress, appear to receive greater benefit from optimism and have a lower stress related eating response. However, these trends were not statistically significant and accounted for a relatively small amount of variance in emotion related eating behaviours (14% for PDSG and 13% for WECP). Similarly, the moderation analysis of signature strengths on emotion related eating and modern life stress was non-

linear. For the PDSG measure of modern life stress, signature strengths appeared to affect the relationship between stress related eating and stress. As the modern life stress scores increased, the emotion related eating scores increased at a slower rate for those who identified with a greater number of signature strengths. Interestingly, for the WECP measure for modern life stress, the emotion related eating scores appeared to decrease for high levels of modern life stress and high identification of signature strengths. This could be due to individuals eating as a coping mechanism for low and medium levels of modern life stress but utilising alternative strategies that could be relevant to their signature strengths when their modern life stress is high. This could suggest that the level of signature strengths identified does play a role on the relationship between modern life stress as measured by the WECP and emotion related eating behaviour. Again, these results were not statistically significant and only accounted for a limited amount of variance in emotion related eating (9% for PDSG and 6% for WECP).

Although these results are contrary to the anticipated findings, they align with previous research suggesting that moderating effects are context specific and are influenced by factors such as the nature of the stressor, the individuals coping strategies and the timing of the assessment (Gungor et al., 2021). Although the current study did not yield statistically significant results, the results showed trends that suggest the potential for these psychological factors to influence the relationship between modern life stress and both stress related and emotion related eating behaviours. Furthermore, the results could lend support for Lazarus and Folkman's (1984) transactional theory, which suggests that modern life stress would have a transactional relationship with the individual, affecting their eating behaviour in efforts to cope with the situation or context. The relationship between modern life stress, optimism and signature strengths suggest that they could be coping resources. For instance, when an individual appraises their modern life stress, the primary appraisal would involve the

evaluation of the risks, demands, or challenges the modern life stress has on them. The secondary appraisal would involve the individual evaluating the availability of their resources (i.e., level of optimism or signature strengths) and the probability they have of influencing the stressful event. Thus, their appraisal of the modern life stress would be how they interpret the stressor, based on their own evaluation of the threat, the level of the challenge and the centrality or the significance the events have on their own health and well-being. This suggests individuals will likely interpret the modern life stress depending on these factors and their own individual differences. Therefore, the modern life stress appraisal may not be as great in Australian and New Zealand populations, compared to the same measures on populations that are directly experiencing the effects of these stressors.

Implications and Future Research

These findings have significant implications for understanding the interactions between stress, eating behaviour and both optimism and signature strengths as positive psychology factors. The absence of statistically significant results in some cases emphasises the complexity of these relationships and highlights the need for further investigation. It is plausible that the measures used for modern life stress may need to be refined more accurately to represent stressors related to Australian and New Zealand populations. Moreover, the present study's findings suggest that stress eating behaviours may not be as prevalent in the studied populations as previously anticipated or at least in male populations. This underscores the importance of considering culturally specific stressors and individual differences when examining stress and eating related behaviours. Recent research suggests that a comprehensive approach to studying stress related eating relationships should consider individual differences, such as psychological traits, personality factors and coping strategies. Thus, future research could benefit from incorporating a broader array of psychological

variables and study designs to better understand the underlying mechanisms driving stress driven eating behaviours.

In conclusion, this study contributes to the growing body of knowledge in the field by shedding light on the multifaceted nature of stress, eating behaviour and the role of positive psychology factors in this area. While the hypothesis did not uniformly align with the findings, these results provide valuable insights into the nuanced interrelationships that govern individuals' responses to stressors and the potential protective effects of optimism. Signature strengths also demonstrated potential links with eating behaviours, highlighting the role of positive psychological resources in shaping individual responses to stressors. Future research endeavours could benefit from employing a broader array of stress measures and investigating potential moderating factors beyond optimism and signature strengths to gain a more comprehensive understanding of the factors influencing stress related and emotion related eating behaviours.

Limitations

While the Prolific crowd sourcing platform has shown satisfactory data quality, there are still limitations concerning the representativeness of the samples provided. The resultant convenience sample required participants to be members of the platform, to see the notification for the survey and answered within the short time frame as the first 465 participants. This selection process may introduce overrepresentation or underrepresentation of specific groups, particularly those who are platform members have evening email access and possess the technological resources. Moreover, the absence of random sampling in participant selection calls for cautious generalisation of findings to broader adult populations in Australia and New Zealand. Another consideration is that multiple participants selected their age as 60+ in the survey, suggesting that there were numerous participants in this age

bracket, but did not have the option to select their actual age to have an improved understanding of the answers within this group. Recognising the importance of inclusivity, it is important to acknowledge the limitations in the representation of indigenous populations and ethnic minorities in both Australia and New Zealand. These groups are frequently underreported and subject to misrepresentation, which affects the generalisability of the study's findings.

Researcher Reflections

Reflecting on my experience with my master's thesis, I encountered a series of challenges, a familiar experience for many researchers. Despite these challenges, the process provided me with invaluable insights, learning and further respect for research in the field of psychology and academia. Engaging in the overall process from topic selection, data collection, analysis and writing processes has significantly contributed to my growth and perseverance both personally and professionally. Although the results of my research did not yield statistical significance for the hypothesised relationships, I appreciated the lessons learned from the experience. This prompted a shift in focus to consider the implications of non-statistically significant results within the context of the current sample. The study's exploratory lens deepened my appreciation for the research process, enhancing my skills and confidence in the research space.

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Appendices

Appendix A. Survey Questions

General Stress, Optimism, Character Strengths, Stress Eating and Emotional Eating in Adults

Participant Information Sheet

An Invitation

My name is Breanna Keenan, and I am a Masters student in Psychology at Massey University being supervised by Associate Professor Ross Flett. We would really appreciate your contribution in this important research.

What is involved?

We would like to invite you to participate in the survey that will take approximately ??? minutes to complete. Your responses will contribute to research designed to find information on general measures of stress and related eating behaviours as well as the effects of optimism and character strengths. Your contribution will help us obtain a better understanding of the influence of various stress and eating behaviours in adults across New Zealand and Australia. Clicking on the next button at the bottom of this page will take you to the survey. Thank you for taking the time to complete this survey.

Who can participate?

You need to be 16 years or older to participate. We are interested in responses from all sorts of people. If you agree to participate you will be asked to complete a short anonymous survey questionnaire. The survey is administered online, using the online survey software Qualtrics. The survey includes a few demographic questions, questions around general stress, as well as psychometric measures looking at stress, eating behaviours, optimism, and character strengths. All questions are close-ended, and you will be asked to simply click on an option that gives the best answer to a question.

Your rights as a participant:

You are under no obligation to accept this invitation. If you decide to participate, completion and submission of the questionnaire implies consent. You have the right to decline to answer any particular question. In order to protect your privacy, the survey will remain anonymous.
Data resulting from this research will be used for research purposed and will be securely stored at Massey University for 5 years, after which it will be destroyed. The information you provide will be used in my thesis and submitted for assessment, the findings may be published in scientific journals or presented at scientific conferences in New Zealand and overseas.

Contact Information

If you have any further questions, please feel free to contact the researcher or supervisor. A detailed report outlining the findings of this research study will be available to all participants, on request, in March 2023.

Researcher
Breanna Keenan
Manawatū Campus
School of Psychology
Massey University
PO Box 756
Wellington 6140
b.keenan2@icloud.com

Supervisor
Associate Professor
School of Psychology
Massey University
PO Box 756
Wellington 6140
+64 69518081
R.A.Flett@massey.ac.nz

Te Kunenga ki Pūrehuroa

Massey University School of Psychology – Te Kura Hinengaro Tangata
PO Box 756, Wellington 6140, New Zealand
T +64 4 801-5799 ext 62165 : W psychology.massey.ac.nz

This project has been evaluated by per review and judged to be low risk. Consequently, it has not been reviewed by one of the University's Human Ethics Committees. The researchers named in this document are responsible for the ethical conduct of this research.
If you have any concerns about the conduct of this research, that you want to raise with someone other than the researchers, please contact
Professor Craig Johnson, Director (Research Ethics),
email humanethics@massey.ac.nz .

Respondent Consent

I have read and understood the information sheet for this study and consent to collection of my responses and participation in the study.

○ Yes ○ No

Section 1: Demographic Information

Please respond by selecting or filling in the relevant answer.

Note this is a test of age and will go to end of survey if less than 16 years old.
What is your current age? (Multichoice – single answer only)

Less than 16, 16-19, 20-29, 20-39, 40-49, 50-59, 60 or over

What is your gender? (Multichoice – single answer only)

Male, Female, Another gender (Please Specify) _____

Which ethnic groups do you belong to/identify with? Please write all that apply to you.

(Text Entry Question)

Which country are you currently residing in? (Multichoice – single answer only)

Australia, New Zealand

Section 2: Survey

Stress Eating

(5-point Likert scale: 1 = I eat much less than usual, 2 = I eat less than usual, 3 = I eat just as much as usual, 4 = I eat more than usual, 5 = I eat much more than usual)

1. When I am overwhelmed with things I have to do, …

2. During periods of great stress, …

3. When I feel things are out of control, …

4. On days where everything seems to go wrong, …

5. While preparing for a strenuous task, …

6. When I am under pressure, …

7. When I feel nervous and stressed, …

8. When I feel that I have no influence over the important things in my life, …

9. When I feel that I am not really on top of things, …

10. When I feel difficulties have been piling up so high that I cannot overcome them, …

Emotional Eating

(5-point Likert scale: 1 = I eat much less than usual, 2 = I eat less than usual, 3 = I eat just as much as usual, 4 = I eat more than usual, 5 = I eat much more than usual)

When I feel lonely, …

When I am sad, …

When I am angry, …

When I am bored, …

When I am anxious, …

When I am frustrated, …

When I am upset, …

When I am worried, …

When I am depressed, …

When I am tense, …

When I am irritated, …

When I am furious, …

When I am jealous, …

When I feel uneasy, …

When I am cheerful, …

When I am happy, …

When I feel confident, …

When I am nervous, …

When I feel optimistic, …

When I am proud, …

General Stress

All things considered, how stressful has your life been in the past 4 weeks?

1 = “Not stressful at all” – 10 = “Extremely stressful”

WECP Scale

(5-point Likert scale strongly disagree to strongly agree)

The pandemic has caused me to feel disconnected from the world around me

Since the start of the pandemic I feel so distant from people

I am daunted at the thought of increased socialising

I am worried that the Covid-19 virus will mutate into a deadlier strain

I am worried that the Covid-19 virus will never disappear from the population

I feel financially vulnerable due to the pandemic

I feel uncertainty around my longer term financial position

Since the start of the pandemic, I worry more about the wellbeing of my friends and family

Since the start of the pandemic, I worry more about the security of my friends and family

Covid-19 vaccines are beneficial

I believe the Covid-19 vaccines’ benefits outweigh any risks

Sub-clinical stress symptoms related to stressor groups

(5-point Likert Scale: 0 = not at all; 4 = extremely)

I’m worried that the number of natural disasters in New Zealand/Australia will increase

I’m worried that future generations might suffer from the consequences of climate change

I’m worried that climate change will lead to an increase in geopolitical conflicts

Due to the Covid-19 pandemic, I’m worried about my own health

Due to the Covid-19 pandemic, I’m concerned about my own economic situation

I’m worried about social erosion in New Zealand/Australia , due to the Pandemic

I’m worried about the Ukrainian people

I’m worried about the economic consequences of the war, for example an increase in energy costs

I’m worried that the war might have an impact on geopolitical safety, for example in terms of a third world war

Financial Stress Questions

(5-point Likert Scale: 0 = not at all; 4 = extremely)

I'm worried about the cost of living in New Zealand/Australia

I'm worried about the cost of food in New Zealand/Australia

I'm worried about my own financial situation

LOT-R

(5-Point Likert Scale: 0 = strongly disagree, 1 = disagree, 2 = neutral, 3 = agree, and 4 = strongly agree)

1. In uncertain times, I usually expect the best.

2. It's easy for me to relax.

3. If something can go wrong for me, it will.

4. I'm always optimistic about my future.

5. I enjoy my friends a lot.

6. It's important for me to keep busy.

7. I hardly ever expect things to go my way.

8. I don't get upset too easily.

9. I rarely count on good things happening to me.

10. Overall, I expect more good things to happen to me than bad.

Signature Strengths

Instructions:

Read the following descriptions of 24 character strengths. Everyone uses these strengths at times. What we would like you to do is to put a check in the box next those strengths that are absolutely essential to you, that define who you are as a person, that are part of who you are. For example, someone who has devoted their life to helping others might choose Kindness as one of his essential strengths, someone who prides herself on being able to figure out other people might consider Social Intelligence key to who she is, and someone who is constantly seeking out new information might consider Love of Learning to be essential. Most people check just a few essential strengths.

There are some people who believe none of these characteristics is more essential to who they are than any of the others. If so, don't check any of the strengths. In the last row, check None of these characteristics is more essential to who I am than any of the others.

Please describe the person you are, NOT the person you wish you could be. Also, think about your life in general, not how you behaved in 1-2 situations.

Essential Strength?	Character Strengths
	1. Creativity: You are viewed as a creative person; you see, do, and/or create things that are of use; you think of unique ways to solve problems and be productive.
	2. Curiosity: You are an explorer; you seek novelty; you are interested in new activities, ideas, and people; you are open to new experiences.
	3. Judgment/Critical Thinking: You are analytical; you examine things from all sides; you do not jump to conclusions, but instead attempt to weigh all the evidence when making decisions.
	4. Love of Learning: You often find ways to deepen your knowledge and experiences; you regularly look for new opportunities to learn; you are passionate about building knowledge.
	5. Perspective/Wisdom: You take the "big picture" view of things; others turn to you for wise advice; you help others make sense of the world; you learn from your mistakes.
	6. Bravery/Courage: You face your fears and overcome challenges and adversity; you stand up for what is right; you do not shrink in the face of pain or inner tension or turmoil.
	7. Perseverance: You keep going and going when you have a goal in mind; you attempt to overcome all obstacles; you finish what you start.
	8. Honesty: You are a person of high integrity and authenticity; you tell the truth, even when it hurts; you present yourself to others in a sincere way; you take responsibility for your actions.
	9. Zest: You are enthusiastic toward life; you are highly energetic and activated; you use your energy to the fullest degree.
	10. Love: You are warm and genuine to others; you not only share but are open to receiving love from others; you value growing close and intimate with others.
	11. Kindness: You do good things for people; you help and care for others; you are generous and giving; you are compassionate.
	12. Social Intelligence: You pay close attention to social nuances and the emotions of others; you have good insight into what makes people "tick"; you seem to know what to say and do in any social situation.
	13. Teamwork: You are a collaborative and participative member on groups and teams; you are loyal to your group; you feel a strong sense of duty to your group; you always do your share.
	14. Fairness: You believe strongly in an equal and just opportunity for all; you don't let personal feelings bias your decisions about others; you treat people the way you want to be treated.
	15. Leadership: You positively influence those you lead; you prefer to lead than to follow; you are very good at organizing and taking charge for the collective benefit of the group.
	16. Forgiveness/Mercy: You readily let go of hurt after you are wronged; you give people a second chance; you are not vengeful or resentful; you accept people's shortcomings.

	17. Humility/Modesty: You let your accomplishments speak for themselves; you see your own goodness but prefer to focus the attention on others; you do not see yourself as more special than others; you admit your imperfections.
	18. Prudence: You are wisely cautious; you are planful and conscientious; you are careful to not take undue risks or do things you might later regret.
	19. Self-Regulation: You are a very disciplined person; you manage your vices and bad habits; you stay calm and cool under pressure; you manage your impulses and emotions.
	20. Appreciation of Beauty & Excellence: You notice the beauty and excellence around you; you are often awe-struck by beauty, greatness, and/or the moral goodness you witness; you are often filled with wonder.
	21. Gratitude: You regularly experience and express thankfulness; you don't take the good things that happen in your life for granted; you tend to feel blessed in many circumstances.
	22. Hope: You are optimistic, expecting the best to happen; you believe in and work toward a positive future; you can think of many pathways to reach your goals.
	23. Humour: You are playful; you love to make people smile and laugh; your sense of humour helps you connect closely to others; you brighten gloomy situations with fun and/or jokes.
	24. Spirituality/Sense of Meaning: You hold a set of beliefs, whether religious or not, about how your life is part of something bigger and more meaningful; those beliefs shape your behavior and provide a sense of comfort, understanding, and purpose.
	None of these characteristics is more essential to who I am than any of the others. Remember, you should choose this option if the strengths are all equally essential to you, NOT because you think they should be equally essential.

Final Step: Review the strengths you checked. Do any of these strengths stand out as more important to who you are than the others? If so, put a second check in the box next to those strengths.

Attention Questions

Please type in the box below, "I am paying attention". This is an attention check. (Text Entry Question)

The colour test you are about to take part in is very simple, when asked for your favourite colour, you must select Orange. This is an attention check. (Multichoice Question – Single answer only)

Based on the text you read above, what colour have you been asked to enter.

Red, Blue, Orange, Green, Yellow, Purple

THANK YOU!

Thank you for your time spent taking this survey.

Your responses have been recorded.