Major Research Project

The Relationship Between Different Types of Curiosity and Mental Health Indicators

By Alisa Nikolaevna Priemysheva

19004443

Supervised by:

Dr S. Akhtar

University of Hertfordshire

&

Dr M. Gruber

Cardiff University

Submitted to the University of Hertfordshire as partial fulfilment of the requirement of the degree of Doctorate in Clinical Psychology

June 2024

Word Count (26887)

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Acknowledgements

First of all, I would like to express my gratitude to my supervisory team for their continuous support throughout every stage of this project. I want to thank Shazia Akhtar for making the research of this size possible and for helping me navigate the myriad of considerations and regulations surrounding this work. I also want to extend my heartfelt thanks to Matthias Gruber for your support and enthusiasm for the project and my work was a constant source of motivation. The guidance, encouragement, and insights that I received have been invaluable in shaping this research.

I would like to extend my gratitude to all the participants who generously devoted the time and effort to take part in both the pilot and research study for this project. I would also like to thank Mable Nakubulwa for the initial discussions about the project idea and for your support along the way. I would like to express my gratitude to the entire research team for their timely guidance through this process. I am especially grateful to Lizette Nolte for being there for me in the most difficult moment and providing much-needed support at that crucial time.

Thank you Irina Priemysheva, Anna Bokova, and Sasha Terekhova for your patience during my disappearance into the world of writing, and for always having a joke to share and a kind word. Finally, I want to thank Andrew White for simply everything else. Your encouragement to keep going and reminders to take it easy were perfectly timed and invaluable. Thank you for keeping me grounded and focused, you made this journey much more manageable.

Glossary of Terminology

Affective States – emotional conditions that accompany certain experiences or stimuli, such as interest, excitement, frustration or boredom. Affective states can be evaluated as positive or negative based on the individuals' experiences during those states.

Anxiety – a mental health condition characterised by feelings of worry, restlessness, or fear that are strong enough to interfere with daily life. As an umbrella term that has multiple definitions, it is best understood within the specific context and can manifest as a mental health disorder, a state of the person, or an individual tendency to certain feelings and behaviours.

Coping Efficacy – the belief in the ability to effectively manage stressors and adapt to challenging situations.

Curiosity – a complex phenomenon encompassing cognitive, affective, and behavioural processes that drive exploration, it is broadly defined as an intrinsic motivation for seeking novelty and challenging interaction with the world.

Curiosity as a Feeling of Deprivation – a curiosity facet that can be associated with discomfort of insufficient information. It can be enhanced when some information is available, creating a need to know more to reduce cognitive tension.

Curiosity as a Feeling of Interest – a curiosity facet that can motivate individuals to seek new information driven by the interest and need to explore.

Deprivation Sensitivity – an aspect of curiosity characterised by an aversive feeling in the presence of an information gap. It is strongly correlated with epistemic curiosity and is associated with an intense need to close the information gap and resolve uncertainty.

Depression – a mental health condition characterised by persistent feelings of sadness, loss of interest in activities, and a decrease in daily functioning. As an umbrella term that has multiple definitions, it is best understood within the specific context and can manifest as a

mental health disorder, a state of the person, or an individual tendency to certain feelings and behaviours.

Diversive Curiosity – curiosity facet that is connected to motivation for exploratory behaviour driven by boredom in the absence of novel stimuli.

Embracing Curiosity – the facet of curiosity that is associated with self-regulation and the ability to be open to novelty and new information.

Epistemic Curiosity – the type of curiosity that can be conceptualised as the drive to learn new ideas and know more information, associated with a uniquely human drive to generate new knowledge.

Negative Affect – a frequent experience of aversive mood states, such as anger, contempt, disgust, guilt, fear, and nervousness.

Perceived Stress – the subjective experience of how stressful a person perceives their situation to be. It can reflect feeling overwhelmed and unable to cope with challenges. Perceived stress can indicate how often a person experiences stress, which is a psychophysiological response to factors that demand adaptation and exceeding resources.

Perceptual Curiosity – the type of curiosity that is associated with a motivation to seek new sensory experiences such as visual, smell, and touch.

Positive Affect – a frequent experience of emotions such as joy, contentment, and love, significantly contributing to the sense of wellbeing.

Positive Wellbeing – aspects of human functioning that indicate resilient, functioning, and flourishing quality of life, often measured by life satisfaction and positive affect.

Satisfaction with Life – a fundamental indicator of positive wellbeing, reflecting how people evaluate their lives against a perceived subjective ideal.

Social Curiosity – the facet of curiosity that is associated with the desire to acquire social knowledge about other people's thinking, behaviour and cognitive processing.

Specific Curiosity – curiosity facet that is associated with exploration that occurs when detailed information about novel stimuli is required.

State Curiosity – a situation-specific state triggered by novel, complex, or ambiguous stimuli.

Stretching Curiosity – the facet of curiosity that involves the drive to seek out new information and experiences that expand one's knowledge and understanding, closely associated with personal growth and development.

Stress Tolerance – the facet of curiosity that is associated with the perceived capacity to manage the anxiety that comes with encountering the unfamiliar and uncertain.

Thrill-seeking – a facet of curiosity that is connected to an adventurous tendency to seek new experiences, while embracing the risk that can be enhanced with it.

Trait Curiosity – a personal characteristic, reflecting how frequently one engages with novel experiences. It is conceptualised by various models that describe individual tendencies towards certain behaviours and experiences.

Wellbeing – a state encompassing various dimensions of mental health, including emotional, psychological, and social aspects of human life.

Abstract

Background: Differences in curiosity are outlined by its influence on our behaviour, the type of information being sought, and motivation processes. Different facets of curiosity contribute to mental health indicators like depression, anxiety, and stress uniquely. These mental health indicators were found to have a significant impact on the quality of life and wellbeing. Exploring these complex relationships is essential for understanding how varying types of curiosity influence mental health outcomes.

Methods: This cross-sectional study involved 160 participants who were recruited from the general population. The online survey measured four different types of curiosity (joyous exploration, deprivation sensitivity, stretching and embracing curiosity) along with mental health indicators (depression, stress, and anxiety). Additionally, participants completed an anagram task to evaluate performance under stress. Multiple regression was employed to identify relationships between these mental health indicators, while mediation analysis elucidated the connections and their impact on stress tolerance and coping efficacy.

Results: Correlational analysis indicated significant positive correlations between all types of curiosity and mental health indicators, except for deprivation sensitivity. Multiple regression analysis revealed that joyous exploration and stretching curiosity are inversely associated with depression scores, while deprivation sensitivity is positively associated with depression, stress, and anxiety scores. Additionally, mediation analysis showed that coping efficacy fully mediated the relationship between stretching curiosity and depression scores and between joyous exploration and depression scores, while stress tolerance partially mediated these relationships.

Conclusions: This thesis explores the multidimensional nature of curiosity and its nuanced relationship with mental health, particularly depression. It highlights the importance of consistent measurement, underscores curiosity's potential to enhance mental health, and

emphasises cautious integration in clinical practice. The findings contribute theoretical and practical insights, informing future research and applications in psychology and healthcare.

CHAPTER 1: Introduction

This chapter provides an introduction to the research that explores the interplay between various types of *curiosity* and *wellbeing*. It begins by exploring curiosity as a multidimensional form of intrinsic motivation essential for learning and personal growth. The concept of wellbeing is subsequently defined by exploring different types of *wellbeing* including the context of mental health. It describes the existing research that associates *curiosity* and *wellbeing*. The introduction highlights the potential clinical benefits of fostering *curiosity* in therapeutic and health settings, suggesting it can enhance treatment outcomes and promote healthier lifestyles. Finally, it provides the rationale for the systematic literature review.

1.1 Understanding curiosity

Curiosity is a complex phenomenon that encompasses a spectrum of cognitive, affective, and behavioural processes that drive exploration in its unique way. It can be broadly defined as intrinsic motivation for seeking novelty and challenging interaction with the world (Berlyne, 1966; Gruber & Ranganath, 2019; Kashdan et al., 2011; Silvia, 2017). However, it is explored in the literature from multiple perspectives. *Curiosity* influences behaviour in multiple ways supporting learning, exploration and information seeking. It differs in the type of experience being sought and the affective states it is accompanied by. *Curiosity* is also connected to the different motivation mechanisms and types of stimuli. Therefore curiosity can be better understood through its conceptualisation in different types and constructs.

1.1.1 State and Trait Curiosity

To delve into the understanding of *curiosity*, it is essential to address whether the intrinsic motivation driving *curiosity* is a stable individual characteristic or a situational response influenced by experiences. *State curiosity* refers to a situation-specific state triggered by novel, complex, or ambiguous stimuli in the environment (F. D. Naylor, 1981). In the

experimental research, *curiosity state* can be evoked by the trivia questions, riddles or incomplete visual stimuli (Jepma et al., 2012; Wang & Huang, 2018; Fandakova & Gruber, 2021; Keller et al., 2024). State curiosity can be temporally enhanced and its influence on choices, cognition and behaviour can be examined. Therefore state curiosity is often researched in cognitive studies to measure behavioural and cognitive outcomes. Thus driven by curiosity, people were ready to spend limited resources to learn the answers to the questions that increased this feeling (Kang et al., 2009). The role of curiosity in information-seeking behaviour is confirmed by neuroimaging research (Eschmann et al., 2023), enhancing memory for new information and activating the reward system (Fandakova & Gruber, 2021; Gruber & Ranganath, 2019; Kang et al., 2009). The level of curiosity evoked by the experiment is often measured by self-reported measures. While state curiosity is once enhanced and can influence decisions after a time delay (Wang & Huang, 2018), it is unknown how long the curiosity state influences people. In contrast, trait curiosity is considered a more stable characteristic of an individual and according to the state-trait model illustrates how frequently one can be engaged with the novel experience (F. D. Naylor, 1981). While evoked curiosity can motivate people to seek new information and learn better it is unclear how much of this effect is associated with trait curiosity. Curiosity trait conceptualised by multiple models that described individual characteristics in their lenience towards certain facets and subtypes. For example, it can differ according to the type of motivation that stands behind exploratory behaviour.

1.1.2 Diversive and Specific Curiosity

The primary role of *curiosity* is associated with its motivation for exploratory behaviour. According to early theories, exploratory behaviour can be defined as specific and diversive (Berlyne, 1960, 1966). Specific exploration occurs when detailed information about novel stimuli is required. Authors suggest that this targeted exploration can be particularly

useful in situations where individuals encounter multiple new stimuli, aiding in the effective navigation and understanding of these unfamiliar environments. On the other hand, diversive exploration is believed to be motivated by boredom in the absence of various novel stimuli. This type of exploration aims for any novel interesting and stimulating experience and information. *Specific* and *diversive* subconstructs of curiosity are reflected in the later development of the questionnaires for *epistemic* and *perceptual* curiosity (Collins et al., 2004; J. A. Litman & Spielberger, 2003).

1.1.3 Epistemic and Perceptual Curiosity

One way to understand curiosity is from the perspective of the experience being sought when a person feels curious. This viewpoint divides curiosity into two types *epistemic* and *perceptual*. *Perceptual curiosity* motivates people to seek new sensory experiences like visual, smell, and touch (Collins et al., 2004). The mechanism of *perceptual curiosity* was conceptualised in the early literature as internal motivation that arose as a response to novel stimuli (Berlyne, 1950). According to this theory, also known as curiosity-drive theory, new information creates a state of uncertainty that curiosity helps to resolve. While a state of uncertainty is less pleasurable the resolution of it with new information is associated with the reward system. Later this theory found support in the neuroimaging studies of perceptual curiosity (Jepma et al., 2012). In this study, participants were presented with blurry images while their brain activity was scanned using functional magnetic resonance imaging. Thus, when presented with a blurry image the response was associated with the areas of the brain connected to arousal and conflict, while upon the resolution of the *curiosity* with a detailed image reward system was found to be connected to the process. However, according to the optimal arousal theory, not only its satisfaction but *curiosity* itself can be rewarding and associated with pleasurable experiences (Hebb, 1955; Silvia, 2017). According to this theory, both over and under-stimulated states are aversive for animals and humans. This suggests that

induction of *curiosity* can be rewarding as it assists organisations in resolving under-stimulation (e.g. boredom). Therefore it suggests that curiosity can evoke positive feelings of interest to stimulate exploration.

Although *epistemic curiosity* has also been connected to drive theory and optimal arousal theory, unlike *perceptual curiosity* it is associated with a uniquely human drive to learn new ideas and know more information (Berlyne, 1962; Litman et al., 2005; Litman, 2008). It is closely connected to the exploration that aims to learn and generate new knowledge. However, it has been identified that existing knowledge about something with an identified knowledge gap can stimulate more *curiosity* and exploration compared to the absence of knowledge on the subject (Litman et al., 2005). It appears that as individuals acquire more knowledge, their curiosity tends to increase. However, participants in this research exhibited the least curiosity when they perceived themselves as having complete knowledge of the issue. *Epistemic curiosity* has been widely researched and conceptualised from multiple perspectives. Novel studies developed ideas of drive and optimal arousal theories and developed a new conceptualisation of curiosity capturing its complex nature (Kashdan et al., 2018; Litman & Jimerson, 2004; Loewenstein, 1994).

1.1.4 Deprivation Sensitivity

The *deprivation* aspect of curiosity is described in at least two models. The first divided curiosity into aspects of *feeling interest* and *deprivation* (Litman & Jimerson, 2004). According to this conceptualisation *curiosity as a feeling of interest* influenced by optimal-level theory, suggests that organisms perceive both underaroused and overaroused states as negative. *Curiosity as a feeling of interest* in this context can play the role of a mechanism that motivates one to seek new information in moments of boredom to maintain an optimal level of arousal. In contrast, *curiosity as a feeling of deprivation*, was associated with experiencing discomfort, which is typical for other motivational systems. In line with

information gap theory *curiosity as a feeling of deprivation* can be enhanced when some information is available, this initial portion then increases the need to know more. This theory posits that curiosity arises when individuals perceive a gap between what they know and what they want to know, creating a state of cognitive tension that motivates them to acquire the missing information (Loewenstein, 1994). This model highlights the importance of curiosity in driving knowledge acquisition and reducing uncertainty. It also inspired a definition of *deprivation sensitivity* as a facet of curiosity alongside *joyous exploration*, *stress tolerance*, *thrill-seeking*, and *social curiosity* (Kashdan et al., 2018). In this study, the authors developed a measure of curiosity that encompasses rich diversity in its conceptualisation. In this approach, *curiosity* is considered a five-dimensional concept that measures individual trait differences. In this conceptualisation deprivation sensitivity refers to an aversive feeling that people can experience in the presence of an information gap. *Deprivation sensitivity* had the strongest correlation to epistemic curiosity and was associated with the intense need to close the information gap and resolve uncertainty (Kashdan et al., 2018; Kashdan, Disabato, et al., 2020a). In this research, participants who were high on *deprivation sensitivity* scores were less associated their understanding of the "good life" with pleasurable experiences and were more invested in the value of knowing. In contrast, *joyous exploration* embodies the classic definition of *curiosity*, emphasising a pleasurable exploration over security and certainty (Beiser, 1984; Kashdan et al., 2004; Silvia, 2017). Together with the *stress tolerance* subscale, *joyous exploration* indicated the strongest potential for a positive influence on wellbeing. While *joyous exploration* suggests a positive experience of exploration, *stress tolerance* is defined as a positive uncertainty. The *stress tolerance* subscale represents the perceived capacity to manage the anxiety that comes with encountering the unfamiliar. The *thrill-seeking* subscale was in contrast the least associated with knowledge and connected to an adventurous tendency in sensation-seeking. In turn, *social curiosity* was defined in the

model as a gap between the desired level of social knowledge and possessed. This type of *curiosity* connected to interpersonal relationships and was associated with the tendency to gossip. Further differences in the individual differences in these facets of curiosity were explored in the revision of this scale (Kashdan, Disabato, et al., 2020a). While maintaining its construct validity for five major domains, subconstructs for social curiosity were developed. For instance, high scores in *joyous exploration*, *stress tolerance*, and overt social curiosity predicted feelings of autonomy, competence, and belonging among participants. Meanwhile scoring high on *deprivation sensitivity* was only linked to satisfying the need for competence. The development of such a measure not only enhances the precision of curiosity-related research but also offers practical applications in educational and clinical settings where fostering *curiosity* can lead to significant improvements in learning and wellbeing. This approach allows for a more nuanced understanding of how curiosity operates across different contexts and individual differences, thus providing a comprehensive tool for assessing curiosity's role in cognitive, emotional, and social processes. The predecessor of this model encompassed two facets *embracing* and *stretching curiosity* that is widely employed in wellbeing research. Notably, *joyous exploration* and *stretching curiosity* were identified as having the strongest correlation, while *thrill-seeking* was associated with *embracing curiosity* in a similar manner.

1.1.5 Stretching and Embracing Curiosity

Epistemic curiosity can be further divided into its stretching and embracing subconstructs (Kashdan et al., 2004). *Stretching curiosity* involves the drive to seek out new information and experiences that expand one's knowledge and understanding. It is therefore closely associated with personal growth and development. In turn, embracing curiosity is associated with self-regulation and the ability to be open to novelty. Both *stretching* and *embracing curiosity* conceptually help people to be open to new experiences and explore

(Kashdan et al., 2009). While both *curiosity* types identified a correlation with personality traits like openness to new experiences and extroversion, they possess unique connections to human functioning. For example, *embracing curiosity* is found to help people absorb information even if it can differ from one's worldview. Among two types of *curiosity*, it was uniquely associated with mindfulness. In turn, *stretching curiosity* is perceived as a more proactive motivational mechanism and has a unique association with conscientiousness. A combined measure of those facets was associated positively associated with creativity, positive relationship building and personal growth (Karwowski, 2012; Kashdan et al., 2004, 2013). This *curiosity* perspective is widely explored in the field of wellbeing and mental health.

1.2 Exploring Wellbeing

Similarly to curiosity *wellbeing* is recognised as a complex multidimensional construct. It encompasses psychological, physical, financial and social aspects of human life. The World Health Organisation (WHO) describes *wellbeing* as a subjective evaluation by the people of their quality of life (Stein & Sadana, 2015). The organisation recognises that multiple objective factors like climate change can influence the wellbeing of the people, but they cannot recognise the influence of these factors. Therefore for the development of their *wellbeing* screening tool, they employed a measure of subjective *wellbeing* (Topp et al., 2015). Notably, the original 28-item tool employed questions from mental health screening tools and considered indicators of *depression*, *anxiety* and *distress*. Mental health is influential to *wellbeing* as it is directly connected to the emotional condition of the person and able to influence motivation, quality of life and physical health. However, it was found equally important to consider *wellbeing* above mental health difficulties and recognise its positive attributes (Knifton & Quinn, 2013; Michaelson et al., 2009). Therefore, the later version (WHO-5) consists of self-reported items that relate to positive statements. Indicators of

positive wellbeing are thus delineated independently from mental health metrics, despite acknowledging the evident influence of the latter. These associations are of particular relevance in clinical psychology, informing potential areas for clinical practice development and enhancing patients' quality of life. Consequently, for this research, *wellbeing* is conceptualised as encompassing both positive *wellbeing* and mental health indicators of *wellbeing*.

1.2.1 Positive Wellbeing

In the literature, *positive wellbeing* is associated with the aspects of human functioning that indicate resilience, functioning and even flourishing quality of life evaluation. It is defined from multiple perspectives and its evaluation depends on the settings and the questions of the research. *Satisfaction with life*, a fundamental indicator of *positive wellbeing* across research, defines how people evaluate their lives against the perceived subjective ideal (Diener et al., 1985; Kaczmarek et al., 2013; Lopes & Nihei, 2021; Pavot & Diener, 1993). This conceptualisation presents several challenges in interpreting results obtained using this measure. For example, people with a tendency to have more critique can evaluate their life as less satisfactory. In particular, it does not evaluate what people perceive as their ideal way to live. Furthermore, the authors of the *satisfaction with life* scale acknowledge its limitations as it evaluates subjective *wellbeing* from the cognitive perspective, leaving the emotional component behind (Pavot & Diener, 1993).

In contrast measurement of *positive affect*, the frequent experience of emotions such as joy, contentment, and love, significantly contributes to the sense of *wellbeing* (Dockray & Steptoe, 2010; Greenglass & Fiksenbaum, 2009; Nath & Pradhan, 2012). The assumption that positive emotions influence human functioning is connected to the broaden-and-build theory (Fredrickson, 2001b). This theory supports an understanding that experiencing positive affect

can broaden the ability to think and act in a more resourceful way. In turn, this ability supports resilience, which also attributes to positive wellbeing.

Resilience is attributed to the ability to cope effectively with difficulties to maintain their *wellbeing* even under challenging circumstances (Fava & Tomba, 2009; Joseph & McGregor, 2020; Liu et al., 2019; McCrea et al., 2014). This ability to be stoic in the face of rapidly changing life does not have linear relationships and rather influences *wellbeing* for future benefits (McCrea et al., 2014). Thus, people can experience a higher level of resilience and lower levels of *wellbeing* when facing challenging circumstances in their lives (Mguni et al., 2012). Among contributors to this inverse relationship research mentioned: not having children, low levels of education, being unemployed, having English as your first language, and being single or separated from the significant other. In the same research, participants were more likely to indicate a high level of resilience and a high level of *wellbeing* if they were employed and had their own family. Interestingly a similar picture was observed for the group with low resilience and high wellbeing scores, identifying that meaningful relationships and purpose have a strong identification with *wellbeing*. This social perspective has support from psychological studies indicating the value of the relationships and purpose of life as crucial parts of *wellbeing*. For example, a sense of connection to others as a motive in multiple life settings was found to have the highest correlation to *wellbeing* indicated as *satisfaction with life* and perceived functioning (Joshanloo, 2023). This research indicated that our perceived evaluation of our lives is often associated with our connection to people. Quality relationships and robust social support are essential, as they contribute to better health and provide emotional support during stressful times (Cohen & Wills, 1985).

Another crucial construct for understanding *wellbeing* is associated with having meaning and purpose in life (Ryff & Keyes, 1995). The belief that your life is purposeful was offered as a part of the multidimensional model over twenty years ago and is being considered

by modern research. It includes the ability to set goals and fulfilment in work and other daily activities. It also proposed to create a system that supports *wellbeing* influencing *life satisfaction*, health and motivation (McKnight & Kashdan, 2009).

In many ways, the question about the definition stays open. One can suggest that one definition of *wellbeing* is impossible to apply to the diversity of cultures and individual differences. For some people, it will be defined by the social connection, to others by experienced pleasures or purpose of life. It is also possible that different combinations of these factors constitute unique forms of *wellbeing*. Therefore, when searching for protective factors for wellbeing researchers and clinicians need to have this comprehensive perspective. Similarly, factors that can threaten people's ability to experience pleasure, build relationships and have meaningful lives can be considered important targets for clinical work.

1.2.2 Mental Health Indicators in the concept of wellbeing

Wellbeing can be defined in many ways, and poor mental health is inversely associated with many facets of this construct. The most common indicators used for screening for the signs of poor mental health are *depression*, *anxiety* and *stress* (Asif et al., 2020; Crawford & Henry, 2003; Hosseinzadeh-Shanjani et al., 2020; Mirzaei et al., 2019; Rawson et al., 1994; Salari et al., 2020; Turna et al., 2021). These screening measures are used worldwide among academical students, health workers and the general public. Screening tools are developed using symptomology profiles of *depression*, *anxiety* and *stress* disorders, although does not provide a diagnosis (Harris et al., 2023; Julian, 2011; Kroenke et al., 2001; Ng et al., 2007). The screening aims to identify people who have signs of these symptoms and may need further diagnostics and support.

Each of these scores is inversely related to *wellbeing* and daily functioning (Kinderman et al., 2015; Lopes & Nihei, 2021; Rahimnia et al., 2013). *Depression* and *anxiety* which are largely associated with *negative affect*, were found to have a negative

association with *life satisfaction* (Malone & Wachholtz, 2018). Negative feelings typical for *anxiety* and *depression* are associated with cognitive structures like negative thinking, rumination and self-deprecation (Krieger et al., 2013; Nolen-Hoeksema et al., 2008). Under the influence of negative thinking, people can experience difficulties in motivation and aim-setting. *Depression* is characterised by a decrease in the feeling of purpose and satisfaction in daily activities. In turn, *anxiety* is associated with avoidance and strategies of maladaptive coping (Arnaudova et al., 2017; Cox et al., 1990; Jacobson & Newman, 2014). Thus, avoidance was associated with substance abuse, and in less extreme manifestations can still prevent people from desired activities and searching for help. Also, *anxiety* and *depression* are negatively associated with self-esteem, that helpful in human functioning in multiple ways (Bajaj et al., 2016; Doron et al., 2013; Wallis, 2002). Higher self-esteem is linked to greater *wellbeing*, with individuals possessing positive self-perceptions exhibiting increased resilience (Taylor & Stanton, 2007). Thus, important components of *wellbeing* are affected among people suffering from symptoms of *anxiety* and *depression*. However, some research suggests that *wellbeing* and indicators of *anxiety* and *depression* can be influenced by the different pathways (Kinderman et al., 2015). This research indicated that *anxiety* and *depression* symptoms were predicted by the negative events that happened to people if people engaged the rumination. Low *wellbeing* was better predicted by the social isolation that was mediated by lacking of problem-solving and emotional regulation coping strategies. While negative events can influence *anxiety* and *depression*, the latter can also inhibit the ability to cope with *stress* creating a vicious circle (Wheatley, 1997).

Stress is a psychophysiological reaction to factors influence of which force excessive adaptational needs (Biggs et al., 2017; Lazarus & Folkman, 1984, 1986). In other words induced *stress* forces people to seek coping strategies to maintain *wellbeing* (Folkman, 2011). Some events can cause the need for adaptation among the majority of the people, for example,

financial difficulties, loss, and separation. Irrelevant from the coping strategies *stress* will be increased. However, the reaction of the individuals to negative events associated with daily life demands can be mitigated by effective coping. For example coping strategies like searching for social support, problem-solving, and positive reinterpretation help to address daily stress (Carver et al., 1989; M.-S. Kim & Duda, 2003; Stephenson & DeLongis, 2020). Maladaptive coping strategies like self-blaming and harmful types of avoidant behaviours were found to be predictors of *depression*, *anxiety* and increased *stress* (Lopes & Nihei, 2021). Chronic *stress* can undermine wellbeing by affecting physical health, reducing life satisfaction, and impairing cognitive function (Gouin, 2011; Schetter & Dolbier, 2011). Effective coping assumes the ability to utilise various coping strategies and evaluate what actions are essential for maintaining *positive wellbeing* (Lazarus, 1993). *Coping efficacy* is conceptualised as one's belief in one's ability to cope with factors inducing stress (Chesney et al., 2006). *Coping efficacy* is considered an important component in treatment outcomes and quality of life among people fighting enduring physical conditions (Chirico et al., 2017; Ferreira-Valente et al., 2009). *Coping efficacy* is also recognised as a protective factor against distress and the influence of trauma during the COVID-19 pandemic (Shahrour & Dardas, 2020; Vagni et al., 2020). In psychological studies, higher *coping efficacy* is associated with the implementation of different emotion-regulation strategies that result in more efficient coping with stress (Rosenbaum et al., 2022).

The capacity to manage and respond to stressful events is effectively connected to emotional and cognitive regulation ability. For example, personality traits openness to new experiences and extraversion can help people evaluate stressors through positive effects and deal with challenges more effectively (Schneider et al., 2012). Mindfulness also indicated inverse relationships with low mood and *stress* levels (Bajaj et al., 2016; Ramasubramanian,

2017). While all three constructs positively connected to curiosity, the latter suggested have positive association with *wellbeing* and possible protective power for mental health.

1.3 Curiosity in Connection to Wellbeing and Mental Health

1.3.1 Association with Wellbeing

The theoretical perspective largely connects *curiosity* to motivation in seeking new information and experience, as was evident from the previous sections. The need for novelty was suggested to the one of the crucial components of optimal functioning (González-Cutre et al., 2016). Along with the other three fundamental needs of self-determination theory, the authors suggest that novelty satisfaction can be an important component of motivation and *wellbeing*. Particularly in this study, satisfaction of the need for novelty was associated with *life satisfaction* and intrinsic motivation in education. Other studies also identify the positive association between *curiosity, life satisfaction* and *positive affect* (Joshanloo, 2023).

Curiosity was found to have a connection to other components of the wellbeing mentioned above. In particular, *stretching* and *embracing* facets of curiosity were found to be connected to meaning in life, referred to in this article as an experience of the purpose and sense of significance of one's life (Tan et al., 2023). A multicultural study suggested that *curiosity* in particular its *stress tolerance* facet and openness to people's opinions was positively associated with numerous *wellbeing* factors at the workplace (Kashdan, Goodman, et al., 2020). From the perspective of the social component of *wellbeing* curiosity is inversely connected to loneliness during social isolation (Losecaat Vermeer et al., 2022) and found to have the ability to protect people from interpersonal aggression (Kashdan et al., 2013). From the perspective of coping *curiosity* is found to be associated with active coping like positive re-evaluation and problem-solving among people suffering from enduring physical conditions (Wlodarczyk, 2017). In essence, curiosity emerges as a multifaceted trait that enriches

individual experiences, fosters resilience, assists in social life, and promotes *positive wellbeing*.

1.3.2 Association with Mental Health Indicators

In an attempt to understand the human ability for resilience and flourishing mental health, researchers have been inspired by *curiosity* in recent years. These abilities are suggested to facilitate strength in withholding distress (Folkman, 1984; Spielberger & Reheiser, 2009), partially by allowing one to remain open to new knowledge and psychological awareness (Lau et al., 2006). One of the most consistent negative associations in mental health research was found between *curiosity* and *depression* (Kaczmarek et al., 2013; Kashdan, 2004; Kawamoto et al., 2017). Decreased motivation for exploration and engagement is considered to be one of the signs of *depression* and suggests its ability to lower *curiosity* (Rodrigue et al., 1987). However, recent studies evaluating the therapy outcome for people with *depression* and suicidal ideation suggest that *trait curiosity* might act as a protective factor for these conditions (Denneson et al., 2017; Kachadourian et al., 2019). Furthermore, this research identifies that curiosity predicts elevation in *coping efficacy* during the treatment. Another study suggested that variability in daily *curiosity* can be more influential to the level of *depression* in the subjects compared to *trait curiosity* (Lydon-Staley et al., 2020). However, some findings do not support disassociation while finding no connection between indicators of *depression* and *curiosity* (Jovanović & Gavrilov-Jerković, 2014b).

While there are still some discrepancies in the field, *wellbeing* was suggested to mediate relationships between *curiosity* and *depression* and account for inconsistency in results (Theuns et al., 2014). Even more discrepancies can be observed in the less researched domains of *stress* and *anxiety*. The majority of research that identified a negative correlation between *curiosity* and *anxiety* measured trait anxiety instead of screening tools (Litman &

Jimerson, 2004; Litman & Spielberger, 2003). *Curiosity* research that measures *anxiety* as a sign of distress is limited and mostly inconclusive in the nature of these relationships (Denneson et al., 2017; Losecaat Vermeer et al., 2022). A similar situation can be observed in the studies of *stress*, where the effect of *trait curiosity* was found to have a statistically significant effect among participants who scored higher on the stress measures compared to those who scored lower (Denneson et al., 2017). However, increased *curiosity* on the day of the influence of the stressor indicated some protective power (Drake et al., 2022). An additional challenge in evaluating this research is a lack of consistency in the measures used for *depression*, *stress* and *anxiety*.

Although curiosity is shown in the above examples as a positive asset to health and *wellbeing* its conceptualisation varies (Yow et al., 2022). Thus, the majority of the *wellbeing* research expands on its connection to *embracing* and *stretching curiosity*. Research of daily curiosity utilises the same definitions and measuring tools as used for *embracing* and *stretching* (Drake et al., 2022; Kashdan & Steger, 2007; Sheldon et al., 2015). Significantly less *wellbeing* research measures curiosity as a *feeling of deprivation* and *interest-based curiosity* (Litman & Jimerson, 2004). However, late research highlights that interest-based exploration has a positive association with *wellbeing*, while the aversive *feeling of deprivation* can have an opposite connection (Lam, 2022; Li et al., 2023). Additional potential negative influences on health and wellbeing include the finding that *curiosity* is one of the major risk factors for substance use among bachelor-level students (Basnet et al., 2021).

A large variety in definitions creates additional complications in understanding in what way *curiosity* improves coping and supports mental health. Hence, to understand mechanisms of *curiosity*, research can explore its connection to other factors contributing to *wellbeing*. The diversity in the conceptualisation of *curiosity* presents a challenge that was

described by multiple authors who try to address different aspects of this phenomenon. Nevertheless, curiosity is considered as a potential asset to therapeutical interventions.

1.3.3 Curiosity in The Context of Therapy and Health

Evidence-based practice declares the need for strong theoretical and empirical evidence (Mellor et al., 2021). Although the status of *curiosity* as a protective factor of wellbeing is yet to be defined there are some examples of how curiosity enters the healthcare domain. One of the most natural benefits of curiosity is information seeking even if the nature of information is unpleasant to the person. Thus *curiosity* prompts have shown can help people look for aversive information about health risks (Horn et al., 2024). Addressing the avoidance of health information and helping patients to receive helpful material promptly can be one of the implications of *curiosity* in healthcare. Another example of the benefits of *curiosity* research is its association with mindfulness. *Curiosity* along with decentring constructs one of the conceptualisations of mindfulness in The Toronto Mindfulness Scale (Lau et al., 2006; Navarrete et al., 2023). *Curiosity* about one's feelings, thoughts, and reactions are considered to be an essential component of the ability to develop mindfulness. However, other studies indicate the absence of a connection between *curiosity* and mindfulness, using the Mindful Awareness and Attention Scale (Tan et al., 2023). While theoretical and empirical development demands more research and conceptualisation some clinicians describe using *curiosity* in their therapy. For instance, a psychologist describes examples of reframing cognitive processes using knowledge of curiosity (Waehler, 2013). Instead of typical to therapy processes, positive or rational reframing, clients were offered to get curious about their negative or disturbing thoughts.

Exploring curiosity in the context of its potential clinical benefits, it can be beneficial to examine widely accepted models of curiosity that were described in the previous sections. Various types of curiosity traits, like joyous exploration, deprivation sensitivity, stretching

and embracing curiosity, can affect individuals' mood, motivation and behaviour differently. Understanding these mechanisms can potentially inform future therapy approaches in multiple ways. Specifically, designing interventions and prevention methods that are centred around specific curiosity types and mental health indicators (e.g. depression, anxiety and stress). The development in this area can potentially provide clinicians with guidelines on the enhancement of state curiosity can with time elevate curiosity as a trait and whether this increase could serve as a protective factor against mental health difficulties. Furthermore, curiosity can be a valuable target for clinical research as it is not a stigmatised phenomenon, making it easier to incorporate into clinical practice. Therefore, *curiosity* shows a potential for clinical work and healthcare development.

1.4 Clinical Implication and Rational for Systematic Literature Review

From the early stages of the development of practical psychology, *curiosity* is considered a part of the motivation among specialists and it can take on different forms (Bordin, 1966). It suggested inspiring clinicians to search for new learning opportunities, meet new people and consider everyday responsibilities as an interesting challenge (Schattner, 2015). The ability to address patients with *curiosity* was understood as an asset for psychological interventions.

A growing body of research suggests *curiosity* can be an asset for mental health and *wellbeing*. Curiosity was been found to have a robust positive connection to *wellbeing* across multicultural studies (Gallagher & Lopez, 2007; Jovanović & Gavrilov-Jerković, 2014b; Kashdan & Steger, 2007a). *Wellbeing* is defined in these studies as life satisfaction, positivism, and social and psychological *wellbeing*. These concepts are often attributed to positive mental health, while relationships between *curiosity* and signs of mental health challenges are poorly understood.

In conclusion, the multifaceted nature of *curiosity*, encompassing various types such as *epistemic, perceptual,* and interpersonal curiosity, alongside diverse theoretical frameworks like drive theory, and interest-deprivation theory, underscores the need for a comprehensive examination of this construct. Similarly, *wellbeing* manifests in multiple dimensions, including psychological, subjective, and social *wellbeing*. Additionally, critical mental health indicators such as *depression, anxiety*, and *stress* play pivotal roles in maintaining a high quality of life. Given the intricate interplay between these two complex constructs, a systematic literature review can be aimed to meticulously explore and synthesise existing research on the potential connections between different types of *curiosity* and various facets of *wellbeing*. Therefore, the review described in the next chapter aims to unravel how different types of *curiosity* may influence mental health outcomes and *positive wellbeing*.

Chapter 2: Systematic Literature Review

2.1 Overview

This chapter presents a systematic review of the literature (SLR) focusing on the intersection of curiosity and well-being. It outlines the rationale behind the review and provides details of the methods employed for selecting studies and synthesizing information. Selected articles are synthesised and a detailed description of the results is provided. The concluding sections delve into the implications of the results, identify gaps and discussion of the rationale for conducting this research.

2.2 Introduction

This SLR aimed to compile a body of research addressing the role of *curiosity* in well-being and mental health. By identifying gaps in the literature and addressing inconsistencies regarding the relationship between *curiosity* and well-being, this review provides a comprehensive literature search and analysis (Grant & Booth, 2009). Additionally, it seeks to elucidate the mechanisms underlying the interplay between *curiosity* and wellbeing, investigating how individual differences and contextual factors may moderate this relationship. The review also outlined different types of *curiosity* and wellbeing to accommodate the diversity in terminology. Through this thorough analysis, the review offers insights that contribute to a deeper understanding of the complex dynamics between *curiosity* and wellbeing, thereby informing future research directions in this field.

2.3 Rational for Systematic Literature Review

Curiosity is a multifaceted construct intricately linked to functioning and daily experiences. Understanding its role and impact is crucial for advancing our knowledge in various fields. In particular, *curiosity* plays a significant role in wellbeing and mental health, influencing how individuals cope with challenges, engage with their environment, and pursue personal growth. However, the nature of their association remains poorly understood. Thus, *curiosity* can have a direct protective power on mental health mitigating the influence of daily

stressors and potentially increasing coping efficacy (Denneson et al., 2017; Drake et al., 2022). In other research, the relationships between *depression* and *curiosity* are mediated by wellbeing (Theuns et al., 2014). Furthermore, *curiosity* can be associated with the induction of both positive and negative feelings (Kashdan, Disabato, et al., 2020a). From the behavioural perspective, *curiosity* is linked to enhancing *wellbeing* strategies such as positive re-evaluation and problem-solving (Wlodarczyk, 2017). On the other hand, it is associated with risky behaviour and substance use (Basnet et al., 2021; Jovanović & Gavrilov-Jerković, 2014b). Therefore *curiosity*, with its multidimensional nature and various associations with *wellbeing*, presents a challenge for clinical practice implementation without substantial empirical evidence to guide it. A systematic literature review can summarise existing evidence and synthesise measures and definitions used for conceptualising *curiosity* and *wellbeing*. During the development stages of this thesis, no comprehensive review on this topic was available. Furthermore, a systematic examination of the existing literature would allow to address several unresolved queries within this domain and outline research gaps to inform the following empirical study.

Questions addressed by this SLR read as follows:

What types of *curiosity* are connected to *wellbeing*?

What are the different types of *wellbeing* measures used in the literature on *curiosity*?

What is the nature of the relationship between *wellbeing* and *curiosity*?

What are the mediating and moderating factors in the relationship between *curiosity* and *wellbeing* measures?

Is mental health considered part of wellbeing in *curiosity* research?

Can *curiosity* be a protective factor for mental health?

2.4 Methods

2.4.1 Review Protocol

The protocol for this systematic literature review was developed in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Page et al., 2021). The systematic review protocol was completed and registered on the PROSPERO database prior to data extraction (ID: CRD42024453663; see Appendix A for full Prospero Protocol; www.crd.york.ac.uk/prospero/display_record.php?RecordID=453663).

2.4.2 Search Strategy

A search strategy was developed to identify relevant studies in alignment with the review question (Aromataris & Riitano, 2014; Siddaway et al., 2019). The following electronic databases were selected to perform a literature search: PubMed, Scopus, and APA PsycNet. All three databases have extensive coverage of peer-reviewed literature across psychological and healthcare disciplines. They provide robust advanced search settings to ensure a comprehensive search and utilise a developed search strategy. The search strategy was designed to capture all relevant literature, employing a combination of keywords related to the topic of *curiosity* and *wellbeing*. Recognising the diverse conceptualisation of *wellbeing*, this review encompassed terminology related to mental health and its primary concerns. Given that one of the aims of this review is to assess in what way *curiosity* can contribute to *wellbeing*, terms related to coping were also included. A large number of studies on *curiosity* research explores the phenomena in the context of education, hence related terms were included in the exclusion criteria. Similarly, terms related to enduring mental and physical health conditions were utilised as exclusion indicators. A preliminary search revealed a coding issue with the Scopus database in which

filtering by human studies resulted in missing key papers from the research. Consequently, the terms related to animal studies were added to the exclusion criteria, instead of utilising human studies filters. Search terms were tailored for each database to maximise sensitivity while maintaining specificity. The search was conducted on the third of October 2023. The search was limited to English-language articles to ensure relevance and manageability. Boolean operators (AND, OR, NOT) were utilised in the advanced search preferences along with narrowing the search to Title/Abstract for Scopus and PubMed databases, and Abstract for APA PsycNet (see Table 1). The latter was used due to the settings options available on the advanced search algorithm on this database.

Table1

Search Terms for The Systematic Literature Review

Terms relating to participants	**AND**	**Terms relating to context**	**AND**	**Terms relating to outcome**	**NOT**	**Terms relating to exclusion criteria**
Filter by human studies		Curiosity		well-being OR wellbeing OR stress OR coping OR mental health OR psychological health OR anxiety OR depression OR depressive OR coping efficacy OR effective coping		psychiatric OR cancer education OR animal OR mice OR mouse OR rat OR rats OR smoking OR cigarettes OR infant

2.4.3 Eligibility Criteria

For this review, studies of populations without enduring physical or mental health conditions were included. Therefore, studies depicting enduring physical ailments (e.g. cancer, stroke) or psychopathologies (e.g. schizophrenia, recurrent depressive disorder, etc.) were excluded. The rationale behind this exclusion stemmed from a large number of health-related

studies investigating *curiosity* in the context of health information seeking, whereas this review aims to explore the association between *curiosity* and *wellbeing* (Grasso & Bell, 2015; Horn et al., 2024). Furthermore, enduring health concerns have a specific influence on people's lives which could not be discussed in detail within the scope of this study. One aim of this review was to inform an empirical study of *curiosity* within the correlation between *curiosity* traits and mental health measures, therefore only quantitative research papers were used for the review. A full list of the inclusion and exclusion criteria is described in Table 2.

Table 2

Inclusion and Exclusion Criteria for The Study Selection

Inclusion criteria	Exclusion criteria
• Randomized controlled trials (RCTs) • Non-randomized studies: non-randomized controlled trials, interrupted time series, controlled before-and-after studies, and cohort studies are eligible for inclusion. • All languages as long as articles were translated into English • Unpublished studies (e.g., conference abstracts, trial protocols)	• Animal studies • Studies of curiosity in the context of enduring physical and mental health conditions • Studies of curiosity in the context of education

2.4.4 Search Process

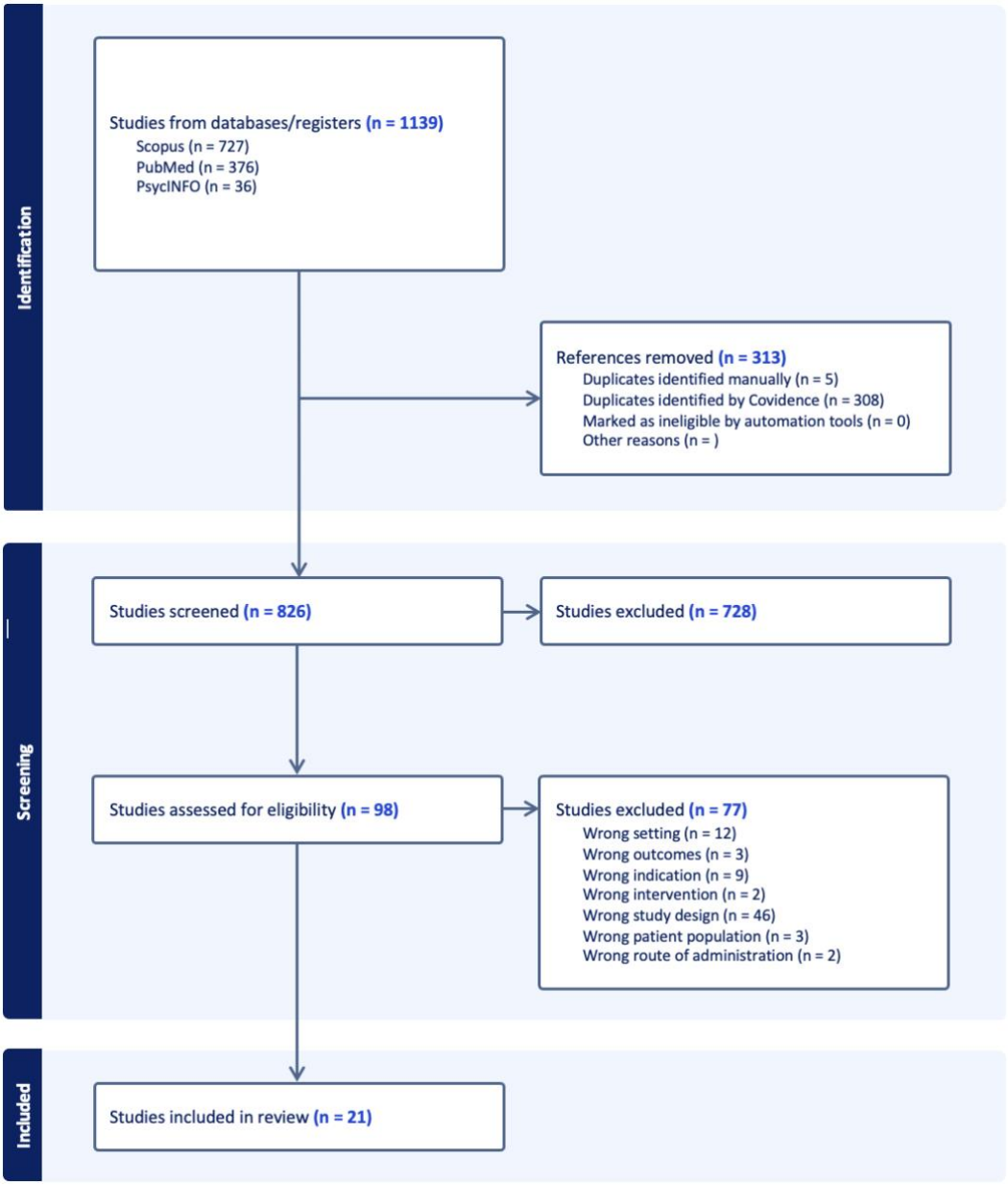
The search process included the identification of the related literature and screening. After applying the search strategy described in the above sections, selected articles were uploaded to the Confidence systematic review management program (*Covidence Systematic Review Software*, Veritas Health Innovation). The total number of selected studies was 1139, with the Scopus database being the largest source (see Figure 1). The exclusion of duplicates was performed automatically by the system. Only five additional duplicates were identified manually in the following stages and excluded. After automatically excluding the duplicates, the remaining 826 studies were subjected to screening, which comprised two stages: title/abstract screening followed by eligibility assessment through the full-text review.

Screening criteria were predetermined based on the research question and inclusion/exclusion criteria of the search. The PRISMA flow diagram presented below depicts the flow of studies throughout the review process, from initial identification to the extraction stage. The diagram included the number of studies identified, screened, assessed for eligibility, included in the review, and reasons for exclusion at each stage recorded by the Covidence software. Two independent reviewers conducted each stage of the screening and selected 21 studies for the data extraction process. The majority of conflicts were resolved by the author of this thesis, while some required consultation with project supervisors.

Thus, the initial review was finalised with thirty articles to be included in the synthesis, however after thorough evaluation eight of them were removed from the final stage. This particular exclusion criterion was not identified until after the screening stage concluded. These studies addressed *curiosity* within broader phenomena such as mindfulness and character strengths. In these studies, *curiosity* was measured using tools that were designed to investigate these broader concepts. In particular, *curiosity* was defined as a part of a bigger structure outside of the main research body describing it as a complex cognitive construct. Therefore, the scope of this review and the subsequent study did not permit the inclusion of less rigorously studied concepts associated with *curiosity*.

Figure 1

PRISMA Flow Diagram Illustrating Study Selection Process



2.4.5 Data Extraction

All 21 studies included in the review were subjected to the data extraction process, which was performed by the author of this thesis and depicted in Table 3. An Excel spreadsheet was used to capture essential information from all 21 studies included in the review in the form of the extraction of the data. For each of the studies included in the review following data was extracted and documented in the table: title of the article, names of the

authors, year of publication, sample size, demographics (age, gender, ethnicity), study design, types of curiosity evaluated in the study, types of *wellbeing* and measures of mental health indicators, measurement tools, analysis method, results (key findings, effect size, p-value), strengths and limitations.

Table 3

Extraction Data from 21 Articles Included in The Review

Title of article	Study design	Type of curiosity	test curiosity	Type of wellbeing (outcome)	Test wellbeing	Sample size	Demographics (age, gender, ethnicity)	Analysis methods	Results (key findings, effect size, p-value)	strengths	limitations	Year of publication	Authors
ANGER, CURIOSITY, AND OPTIMISM	Cross-sectional survey	State and trait	The State-Trait Personality Inventory (STPI) (Spielberger)	1) Anxiety 2)Anger 3)Positive and negative affect	1) Personality Inventory (Spielberger) 2) The State-Trait Anger Expression Inventory (Spielberger) 3) Life Orientation Test	500	Age: 19-27 Gender (male-50%, female - 50%) Ethnicity - Italian	Correlation analysis	Scores on state and trait curiosity were not significantly related to scores on anger expression subscales	1) large sample size 2) use of validated measures	1) biases inherent in self-reported data 2) cross-sectional design, which limits causal inference 3) potential confounding variables	1994	Comunian AL.
Induced Mood and Curiosity	Randomised experimental design	State and trait	Melbourne Curiosity Inventory (MCI) / the Experiment Descriptions Inventory (EDI)	Depression	Depression Adjective Checklist	60	Age: undergraduate Gender: male-21, female - 39 Ethnicity - N/A	MANOVA Correlation analysis	1) post conditioning comparison indicate difference in curiosity score (depression and elation)(ES and P-value are not provided) 2) significant negative relationships between depression and state curiosity (r = -.43, p < .001) correlation between depression and total desire for additional knowledge (r = -.50, p < .001)	1) The use of the experimental induction procedure 2)Experimental study design	1) The relative ineffectiveness of the elation induction procedure ted the results 2) study only involved undergraduates, so the findings may not generalize to other populations	1987	James R. Rodrigue, 2 Kenneth R. OIson, 3 and Robert P. Markley

The neglected relationship between social interaction anxiety and hedonic deficits: differentiation from depressive symptoms	Cross-sectional study design	State and trait curiosity / exploration and absorption	STCI/CEI	1) Anxiety 2)DEPRESSION 3)Positive and negative affect 4) Life satisfaction	1) AND 2) 90-item Mood and Anxiety Symptom Questionnaire (MASQ) 3) 7-item Subjective Vitality Scale 4) 5-item Satisfaction with Life Scale (SWLS)	100	Age: mean 24.28 years old, Gender: female - 73, male-25, not reported - 2, Ethnicity: 74 European-Americans, 6 Asian-Americans, 6 African-Americans, and 4 Hispanic-Americans, 10 - not specified	Hierarchical regression	1)social interaction anxiety was the only predictor of the curiosity (F (1.88) = 7.06, Pr = -.27, P < .01) 2) social anxiety had negative correlation with exploration subscale of curiosity (r= -.42, P < .001) and did not have a connection to absorption	1) use of the factor analysis to explore specificity of curiosity questionnaires 2) replication of the previous study on social anxiety	1) small sample size 2) only self-reported measures were used in the study 3) cross-sectional study design 4)	2004	Todd B. Kashdan

Curiosity and wellbeing	Cross-sectional study design	Curiosity aspects of exploration and absorption	CEI	1) Psychological wellbeing 2) Social wellbeing 3) Emotional wellbeing (Positive and negative affect)	1) 42-item version of Ryff's scale 2) Keyes' five components of social well-being 3) Positive and Negative Affect Schedule (PANAS)	293	Age: 18 -26 years old, Gender: female - 158, male - 135 Ethnicity: Caucasian (91.5%), Asian (3.1%), Hispanic (1.7%), African American (0.7%), other (3.0%)	Independent Samples t-tests Confirmatory Factor Analysis Correlation Analysis Hierarchical Multiple Regression ANOVA	1) males reported higher CEI scores (t(291) 1⁄4 2.55, p < 0.05) and absorption subscale (t(291) 1⁄4 2.39, p < 0.05) 2) Confirmatory Factor Analysis (CFA) supported the hypothesized two-factor structure of curiosity 3) Exploration subscale had positive moderate correlation to all indicators of wellbeing (pr = from .35 to .55; p = .001), and negative with negative affect (pr = -.14; p = .05) when controlled for absorption subscale 4) Exploration subscale has accounted for the effect of every wellbeing measure (f(2) ranging from 0.14 to 0.47) illustrating its predictive power 5) Participants classified as flourishing reported higher levels of curiosity (t(291) = 3.78, p < 0.001, d = 0.57) and higher levels of the exploration subscale (t(291) = 5.07, p < 0.001, d = 0.80)	Comprehensive assessment and analysis of multiple facets of well-being and curiosity	1) homogeneous sample limits generalizability 2) Cross-sectional design prevents establishing causality	2007	Gallagher, M.W.; Lopez, S.J.

The good, the bad (and the ugly): The role of curiosity in subjective well-being and risky behaviours among adolescents	Longitudinal design	Stretching and embracing trait curiosity	CEI-II	1) Risky behaviour engagement 2) Positive and negative affect 3) Life satisfaction	1) Risky Behaviour Questionnaire for Adolescents 2) PANAS 3) Single question	371	Age: 14-17 years old, Gender: female - 207, male - 164 Ethnicity: Serbian	Hierarchical regression analyses	1) positive affect associated stronger with the stretching subscale at both times T1 (z = 2.09, p < 0.05); T2 (z = 2.18, p < 0.05) 2) stretching and embracing did not significantly differ in their relations with life satisfaction 3) risky behaviour engagement had low correlations with the embracing subscale both times T1 (r=0.22, p<0.01), T2 (r=0.27, p<0.01), no significant correlations were found with stretching subscale 4) embracing curiosity found to be a predictor of risky behaviour (b = 0.11, p < 0.01)	Longitudinal design allowed for examining changes over time	Five month can be not long enough time to set assumption wellbeing.	2014	Jovanović V; Gavrilov-Jerković V
Exploring the association between curiosity and subjective well-being: the mediating role of self-efficacy beliefs in Hindi-speaking youth	Cross-sectional study design	Stretching and embracing trait curiosity	CEI-II	1) positive and negative experience 2) Satisfaction with life 3) General self-efficacy	1) Scale for positive and negative experience 2) SWLS 3) General self-efficacy scale	1149	Age: 15-24 years old, Gender: female - 561, male - 588 Ethnicity: Indian	Correlation analysis Factor analysis	1) stretching subscale significantly correlated with life satisfaction (r=0.13, p<0.01), positive experience (r=0.36, p<0.01) and negative experience (r= - 0.12, p<0.01), embracing subscale correlated with positive experience (r=0.26, p<0.01) 2) both subscales correlated to self-efficacy embracing (r=0.22, p<0.01)and stretching (r=0.34, p<0.01) 3) self-efficacy has full mediation effect on both subscales to life satisfaction, negative experience, and positive experience	1) large sample size 2) use of validated measures	1) cross-sectional design that prevents causality of the relationships identification	2022	Mishra, K.K.

Curious people are less affected by social rejection	Cross-sectional survey	Stretching and embracing trait curiosity	J-CEI	1) Depression 2) Life Satisfaction 3) Rejection sensitivity	1) 10 items of the Todai Health and Personality Inventory 2) SWLS 3) 9-situation Adult Rejection Sensitivity Questionnaire	500	Age: 20-39 years old, Gender: female - 250, male - 250 Ethnicity: N/A	Mediation analysis Hierarchical regression	1) Curiosity was negatively correlated with rejection sensitivity and depression (r = -.27, p < 0.05; r = -.22, p < 0.05, respectively) 2) Curiosity was positively correlated with life satisfaction (r = 0.30, p < 0.05), social inclusion experiences (r = .40, p < 0.05), and social rejection experiences (r = .26, p < 0.05) 3) Partial mediation effect of rejection sensitivity was found for connection between curiosity and life satisfaction (indirect effect = 0.12, 95% confident interval from 0.07 to 0.18) and depression (indirect effect = −0.77, 95% confident interval from −1.28 to −0.53) 4)Negative effect of social rejection on life satisfaction was weak for people who scored higher on curiosity (b = −0.026, p = 0.006), compared to lower scored (b = −0.072, p b 0.001) 5) Positive association between social rejection experiences and depression was weaker for people who scored higher on curiosity(b = 0.27, p b 0.001) than lower scored (b = 0.42, p b 0.001)	1) Utilises comprehensive analysis 2) Large sample size	1) self-report measures, which may be subject to biases and inaccuracies. 2) The cross-sectional design limits the ability to establish causality between variables.	2017	Kawamoto, T.; Ura, M.; Hirakawa, K.

Who self-initiates gratitude interventions in daily life? An examination of intentions, curiosity, depressive symptoms, and life satisfaction	Experimental study design	Stretching and embracing trait curiosity	CEI-II	1) Depression 2) Life Satisfaction	1) The 20-item Centre for Epidemiologic Studies Depression Scale 2) SWLS	226	Age: 18-29 years old, Gender: female - 71.2%, male - 28.8% Ethnicity: N/A(study took place in Poland)	Path analysis Logistic regression	1)Intentions to start the gratitude intervention were positively correlated with curiosity (r = .33, p < 0.01) 2)Significant indirect effect of curiosity on intervention initiation through intentions was detected (b = 0.24, 99% CI [0.077, 0.542], OR = 1.29) 3)Marginal indirect effect of depressive symptoms on intervention initiation through intention (b = - .119, 90% CI [-.309, -.010])	1) experimental design 2) Utilises comprehensive analysis	1) utilized an undergraduate convenience sample, limiting generalizability to other populations 2)measurement of general intention to start a well-being intervention online may not fully capture individual differences and demographic factors influencing intervention initiation	2013	Kaczmarek, L.D.; Kashdan, T.B.; Kleiman, E.M.; Baczkowski, B.; Enko, J.; Siebers, A.; Szäefer, A.; Król, M.; Baran, B.

Subjective well-being as a mediator for curiosity and depression	Cross-sectional study design	Stretching and embracing trait curiosity	CEI-II	1) Depression 2) Happiness index	1) 9-items Centre for Epidemiologic Studies Depression Scale 2) Steen Happiness Index	257	Age: 18-64 years old, Gender: female - 73.4%, male - 26.6% Ethnicity: N/A (study took place in Poland)	Mediation analysis Regression analysis	1)Well-being indicated as a complete mediator of the relationship between curiosity and depression (indirect effect, β = -.34, SE = 0.05, z = -7.21, p < .001, 95%CI [-.44, -.25]) 2)Depression scores had partial mediation effect on the connection between curiosity and wellbeing (indirect effect β = .15, SE = 0.03, z = -3.96, p < .001, 95%CI = [.07; .24])	The study employed path analysis to test complex mediation models	1) Using of web-based surveys can restrict the practical implications of the findings. 2) The study relied on self-report measures, which may introduce biases.	2014	Kaczmarek, L.D.; Baczkowski, B.; Enko, J.; Baran, B.; Theuns, P.
Did curiosity kill the cat? Evidence from subjective well-being in adolescents	Cross-sectional study design	Stretching and embracing trait curiosity	CEI-II	1) Depression 2) Anxiety 3)Stress 4)Positive and negative affect 5) Life satisfaction 6) Loneliness	1,2 and 3)Depression Anxiety and Stress Scale (DASS-21) 4) PANAS 5) Multidimensional Students' Life Satisfaction Scale (MSLSS) 6) the De Jong Gierveld Loneliness Scale	408	Age: 15-19 years old, Gender: female - 250, male - 158 Ethnicity: N/A (study took place in Serbia)	Correlation analysis	1)Curiosity was significantly positively correlated with all of the indicators of positive mental health: positive affect (r = 0.51; p < .01), hope (r = 0.46; p < .01), purpose in life (r = 0.27; p < .01) and global life satisfaction (r = 0.19; p < .01). 2)Low negative correlations were observed between curiosity and two negative emotional states: negative affect (r = - .15; p < .01) and loneliness (r = - .11; p < .05). 3)Low negative correlations were observed between embracing subscale and loneliness (r = - 0.15, p < 0.01) and stretching subscale and depression (r = - 0.11, p < 0.05) 4)Total curiosity CEI-II score did not connected to depression, anxiety, stress	1) large sample size 2) use of validated measures	1) cross-sectional design that prevents causality of the relationships identification 2)self-reported tools	2012	Jovanovic, V.; Brdaric, D.

Curiosity for information predicts wellbeing mediated by loneliness during COVID-19 pandemic	Mixed-method longitudinal observational study	Stretching and embracing trait curiosity	CEI-II	1) Mental Wellbeing 2) Trait Anxiety 3) Depression 4) Stress	1) Warwick Edinburgh Mental Wellbeing Scale (WEMWBS) 2) State-Trait Anxiety Inventory 3) Beck's Depression Inventory 4) Perceived Stress Questionnaires	183	Age: mean = 28.51, Gender: female - 73.4%, male - 26.6% Ethnicity: N/A (study took place in Austria and Germany)	Correlation Linear regressions Post-hoc estimated marginal means Mediation analyses	1)Trait curiosity positively correlated to wellbeing measures (r = .55; p < .01), and daily excitement (r = .21; p = .021) 2)Negative correlation between anxiety and curiosity was not significant (r = - .12; p = .124) 3)The association between curiosity and wellbeing was partially mediated by loneliness (indirect effect (a*b) B = 1.92, SE = 0.44, Z = 4.35, p < 0.001, R2 = 0.53). 4)Loneliness fully mediated the effect of information-seeking on wellbeing(indirect effect (a*b) B = 0.08, SE = 0.02, Z = 2.60, p = 0.009) 5)Trait curiosity negatively predicted tyrosine-rich food intake (β = − 0.003, p = 0.017) 6)Sugar intake positively predicted anxiety (β = 0.25, p = 0.008), trait curiosity influenced this connection (interaction: β = − 0.08, p = 0.005). Stronger association for people with lower curiosity	1) Utilises comprehensive analysis 2) longitudinal study in the unique environmental conditions	correlational design that prevents causality of the relationships identification	2022	Losecaat Vermeer AB; Muth A; Terenzi D; Park SQ

Curiosity improves coping efficacy and reduces suicidal ideation severity among military veterans at risk for suicide	Randomised controlled trial	Stretching and embracing trait curiosity	CEI-II	1) Anxiety 2) Depression 3) Suicidal Ideation 4)Stress 5)Coping Self-Efficacy	1) Generalized Anxiety Disorder-7 (GAD-7) 2)The Patient Health Questionnaire (PHQ-9) 3) Beck Scale for Suicidal Ideation (BSS) 4)Cohen Perceived Stress Scale (PSS4) 5)Chesney's Coping Self-Efficacy	117	Age: 20-77 (mean = 47,6), Gender: female - 31%, male - 69% Ethnicity: white non-Hispanic (73%)	Correlation analysis Regression Explanatory factor analysis Growth curve models	1)Higher curiosity scores were associated with lower suicide ideation severity at baseline only for participants with higher distress scores (b=−0.39; 95% CI=−0.76, −0.02; p=0.04) 2)Curiosity shown small negative correlation with depression (r = - .18; p<.05), suicidal negation severity (r = - .19; p<.05), and perceived stress (r = - .19; p<.05) in the descriptive statistics, regression analysis illustrated only association of curiosity with suicidal ideation severity where association was approaching significance (b=−0.35; 95% CI =−0.73, 0.04) 3)Curiosity had positive association in correlational and regression analysis with coping efficacy, stop negative thoughts (r = .36; p<.05)/(b=2.07; 95% CI =0.89, 3.24) and coping efficacy, enlist friends and family (r = .32; p<.05)/(b=1.83; 95% CI=0.58, 3.08) 4)For participants with low distress scores at the baseline, higher curiosity was associated with smaller increase in coping efficacy, and among people with higher distress, higher curiosity was connected to larger increase	1) longitudinal study 2) use of validated tools for mental health screening	1) study presents a secondary analysis of a larger study 2) all participant were recruited in the mental health organisation, suggesting they were seeking to get better	2017	Denneson LM; Smolenski DJ; Bush NE; Dobscha SK

								in coping efficacy (b=0.44; 95% CI=0.06, 0.83; p=0.03), this effect was indicated only for efficacy to stop negative thoughts.				
Personality, effective goal-striving, and enhanced well-being: comparing 10 candidate personality strengths.	Longitudinal design	State and trait	CEI-II	1) Tendencies to try to amplify positive experiences 2) Life satisfaction 3) Meaning in Life	1)Ways of savoring Scale 2) SWLS 3) Meaning in Life Questionnaire	755	Age: 15-81 (mean = 39), Gender: female - 623, male - 122 Ethnicity: large majority White/Caucasian (online participation from 40 counties)	Regression analyses	1)Curiosity showed a significant interaction with goal attainment (β = .073, p <.01), suggesting a stronger relationship between goal attainment and SWB for individuals high in curiosity. 2)Interaction between goal attainment and curiosity found to be the most consistent predictor of the wellbeing in a comparison with other ten predictors. The interaction was between curiosity at the baseline and goal attainment in the 3 months mark (β = .068, p < .01), and between curiosity measured at the 3 months mark and goal attainment at the 6 months mark (β = .052, p < .05). 3)Only curiosity was identified as a moderator for enhancing goal attainment to increase wellbeing over 6 months and three check points (β = .111, p <.05)	1) large sample size 2) longitudinal study 3) use of validated measures	1) challenge to replicate study with ten different personality traits 2) predominantly female participants 3) small ethnical diversity	2015	Sheldon, K. M., Jose, P. E., Kashdan, T. B., & Jarden, A

Daily Stressor-Related Negative Mood and its Associations with Flourishing and Daily Curiosity	Longitudinal design	Daily curiosity	2-items from the CEI-II	1) Trait Flourishing 2) Daily Negative Mood 3) Daily Stressors	1) Trait Flourishing Scale 2) Profile of Mood States 3) Daily Inventory of Stressful Events (Adapted)	167	Age: 18-65, Gender: female - 136, male - 29, other - 2 Ethnicity: white (49.10%), African American/Black (8.38%), Asian (23.35%), Hispanic/Latino (4.79%), multiracial (6.59%), other (5.39%)	Multilevel model Moderation analysis	On the days where curiosity was rated higher than usual it had an attenuating effect on the effect of today's stressor on negative mood ($\gamma 51 = -0.10$, $p<0.001$).	1) longitudinal study 2) use of validated tools	1) secondary analysis 2) short duration of the experiment 3) shortened version of CEI-II	2022	Drake, A.; Doré, B.P.; Falk, E.B.; Zurn, P.; Bassett, D.S.; Lydon-Staley, D.M.

Curiosity and pathways to well-being and meaning in life: Traits, states, and everyday behaviors	Longitudinal design	Daily curiosity / Trait curiosity	4-items from the CEI /CEI	1) Positive and Negative Affect Schedule 2) Satisfaction with life	1) PANAS 2) SWLS	97	Age: 20-77 (mean = 47,6), Gender: female - 64, male -33 Ethnicity: Caucasian (76%) or Asian-American (14.5%), with a small percentage of African-American (4.2%), Hispanic-Ameri- can (2.1%), and Native-American (2.1%)	Correlation analysis Hierarchical Structure Multilevel Modelling	1)For participants with larger trait curiosity, on days when they felt more curious they would also indicated more frequent growth-oriented behaviours (B(γ11) = .001, SE = .000, t(90) = 2.36, p = .02), greater meaning in life (B(γ11) = .003, SE = .002, t(90) = 1.96, p = .05), and greater life satisfaction, (B(γ11) =.003, SE = .001, t(90) = 2.36, p = .02). 2)For participants with low trait curiosity highly frequent hedonistic behaviours was present only on the days they felt more pleasure (B(γ11) = -.01, SE = .003, t(90) = - 3.23, p = .002). 3)Daily pleasure predicted greater daily presence of meaning (B = .18, SE = .04, t(90) = 4.48, p < .001) and life satisfaction (B = .09, SE = .02, t(90) = 4.68, p < .001.) 4)Larger scores in daily curiosity predicted greater presence of meaning (B = .02, SE = .01, t(95) = 2.33, p = .02) and life satisfaction (B(γ01) = .05, SE = .02, t(95) = 2.29, p = .02) the next day. 5)Daily pleasure did not predict day-to-day changes in the presence of meaning or life	1) longitudinal study 2) use of validated tools	1) short duration of the experiment in 21 days 2) shortened version of CEI utilised for research 3) Correlational study limits the opportunity for causality investigation	2007	Kashdan, T.B.; Steger, M.F.

									satisfaction. 6)Greater daily pleasure led to less search for meaning (B = -.07, SE = .03, t(95) = - 2.15, p = .03)						
Within-person variability in curiosity during daily life and associations with well-being	Longitudinal design	Daily curiosity / Trait curiosity	2-iteam from CEI-II / CEI-II	1) Trait Flourishing 2) Daily Negative Mood 3) Depression 4) Life satisfaction	1) Trait Flourishing Scale 2) Profile of Mood States 3) the Centre for Epidemiological Studies Depression Scale 4) SWLS	167	Age: 18-65, Gender: female - 136, male - 29, other - 2 Ethnicity: white (49.10%), African American/Black (8.38%), Asian (23.35%), Hispanic/Latino (4.79%), multiracial (6.59%), other (5.39%)	Correlation analysis Multiple regression Explanatory factor analysis	Curiosity trait was negatively correlated with a degree of fluctuation in daily curiosity (curiosity lability) ($r(165) = -.28$, $p < .001$), indicating tendency for people who score high on curiosity have more study daily curiosity. Curiosity lability was positively associated with depression ($B = 0.16$, $p = .04$) and negatively with life satisfaction ($B = -0.71$, $p = .002$)	1) longitudinal study 2) use of validated tools for mental health screening	1) secondary analysis 2) short duration of the experiment 3) shortened version of CEI-II	2019	Lydon-Staley DM; Zurn P; Bassett DS		

The measurement of curiosity as a feeling of deprivation	Cross-sectional study design	CFD = curiosity as a feeling of deprivation; CFI = curiosity as a feeling of interest	T–Cur scale, PC scale, EC scale, 27 items designed to assess individual differences in CFD	1) Trait Anxiety 2) Trait Anger 3) Trait Depression	STPI - trait measures	321	Age: 18-40, Gender: female - 248, male - 73, Ethnicity: N/A	Factor analysis Correlation analysis	1)Intolerance component of curiosity as a feeling of deprivation indicated significant correlation with traits anxiety (r = .11, p < .05), depression (r = .11, p < .05), and anger (r = .32, p < .01) 2)Problem solving component of curiosity as a feeling of deprivation indicated significant correlation with traits depression (r = .11, p < .05), and anger (r = .17, p < .05) 3)Competence component of curiosity as a feeling of deprivation indicated significant correlation with traits anxiety (r = - .12, p < .05) and depression (r = - .12, p < .05)	1)comprehensive analysis 2) use of validated measuring tools	1) biases inherent in self-reported data 2) predominantly female participants	2004	Litman JA; Jimerson TL

Killing the cats or satisfying the human? The role of epistemic curiosity in adolescents' multidimensional well-being	Cross-sectional study design	epistemic curiosity (deprivation/interest)	5 dimensional curiosity scale (5DCR)	School Day Well-being	School Day Well-being Model	315	Age: adolescents, Gender: female - 146 , male - 168, no information - 1 Ethnicity: N/A (study took place in China)	The Structural Equation Model	1)Both fastest of curiosity, were positively correlated with five categories of well-being, while effects of joyous exploration were larger (r(313)=0.49–0.75, p<0.001) and deprivation sensitivity (r(313)=0.32–0.52, p<0.001) 2)Both facets combined (epistemic curiosity) was positively associated with physical (β = 0.55, p < 0.001), dietary (β = 0.45, p < 0.001), emotional (β = 0.44, p < 0.001), psychological (β=0.59, p<0.001), and academic wellbeing (β= 0.70, p<0.001). 3)Joyous exploration had stronger association with wellbeing (β = 0.45–0.70, p < 0.001), while no significant association was detected between deprivation sensitivity and five types wellbeing in Structural Equation Model analysis. 4)Age and gender had no moderation effect on the connection between epistemic curiosity and all five types of wellbeing	1) Addressing differences in connection between curiosity and wellbeing between male and female 2) identification weaker role of the deprivation in supporting wellbeing	1) cross-sectional design that prevents causality of the relationships identification	2023	Li, T.; Huang, H.; Liu, J.; Tang, X.

A Study of the Impact of Spirituality and Curiosity on Life Satisfaction in Chinese Christian Teachers	Cross-sectional study design	joyous exploration and deprivation sensitivity	The five-dimensional curiosity measure (The 5-DC Scale)	1) The Satisfaction with Life Scale 2) The Daily Spiritual Experiences	1) SWLS 2) The Daily Spiritual Experiences Scale	108	Age: mean - 43.9, Gender: female - 69 , male - 39, other - 2 Ethnicity: Chinese	Correlation analysis Mediation analysis Multiple regression	1)Spirituality significantly correlated with three types of curiosity: joyous exploration (r = .53, p < .001), deprivation sensitivity (r = .21, p < .05), and tolerance of stress (r = .30, p < .001) 2)Satisfaction with life was positively associated with two facets of curiosity: joyous exploration (r = .16, p < .05) and tolerance of stress (r = .25, p < .001) 3)Curiosity as feeling of deprivation was negatively connected to life satisfaction (r = - .23, p < .001) 4)Among three facets of curiosity only deprivation sensitivity had significant mediation effect on of the relationships between spirituality and life satisfaction (b = - .43, 95% CI [-1.08, -0.02]) 5)Curiosity as feeling of deprivation was associated with life satisfaction while controlling for daily spirituality (B = - 0.88, b = - .23, p = .04).	1)comprehensive analysis 2) use of validated measuring tools	1) cross-sectional design that prevents causality of the relationships identification 2)considering only one measure of wellbeing	2022	Lam, C.-Y.

The measurement of perceptual curiosity	Cross-sectional survey	Perceptual curiosity (PC) (diversive and specific)	experimental perceptual curiosity questionnaire (EPCQ), Sensation Seeking Scale (SSS), The Novelty Experiencing Scale (NES)	1) Anxiety 2) Depression 3) Anger	STPI - trait measures	320	Age: undergraduate students Gender: male-118, female - 202 Ethnicity - N/A	Factor analysis Pearson Correlation	1) Divergent validity was supported as correlations of the PC with the measures of trait anxiety, anger, and depression were not statistically significant (mdn r=0.06) 2) For the males significant correlations were found for males between the PC and trait anger (r= .21; p=0.05), anger expressed towards something or someone (r= .28; p=0.01). PC (specific) had positive correlation to suppressed anger (r= .26; p=0.01) 3) For the females, correlations were found between the PC and how often they try to control anger (r=.15; p=0.05), and negative correlation of the PC(specific) and trait anxiety (r= -.15; p=0.05)	1) factor analysis utilisation 2) validity testing 3) large sample size	1) self-reported measures 2) limited information about predictive validity 3) limited generalisability	2004	Robert P. Collins, Jordan A. Litmana, Charles D. Spielberger
Measuring Epistemic Curiosity and Its Diversive and Specific Components	Cross-sectional survey	Epistemic curiosity (EC) / Trait and Stait	STPI/ Collins curiosity questionnaire	1) Anxiety 2) Depression 3) Anger	STPI - trait measures	739	Age: Gender: male-193, female - 546 Ethnicity - N/A	Factor analysis Pearson Correlation	1) validation of the diversive and specific subscales of the epistemic curiosity 2) small negative correlation between epistemic curiosity and trait anxiety (r = -.17; p = .001)	1) factor analysis utilisation 2) validity testing 3) large sample size	1) self-reported measures 2) limited information about predictive validity	2003	Litman JA; Spielberger CD

2.4.6 Quality Assessment

The quality assessment of the included papers was conducted by the modified Effective Public Health Practice Project (EPHPP) quality assessment tool (Armijo-Olivo et al., 2012). This tool was developed to evaluate quantitative studies for systematic reviews and has been used for public health studies (Ho et al., 2024; Mistry et al., 2021). EPHPP allows comprise global rating of the selected domains, categorising them as weak (1 point), moderate (2 points), or strong (3 points). Five domains were included in this evaluation: Selection bias, study design, confounders, blinding, data collection methods, and analysis.

2.4.7 Synthesis

A descriptive approach was used for synthesis in this review. The main themes outlined ensure a full exploration of shared and inconsistent findings across the various research papers focusing on different types of curiosity. The discrepancy in the data and measurement tools used in the obtained set of studies prevented implementing a meta-analysis for this review. Instead, a synthesis without meta-analysis (SWiM) protocol was utilised for the synthesis of the data (Campbell et al., 2020). As predicted, several conceptualisations of curiosity and its facets were employed for synthesis. Hence, for the first stage of the synthesis, data were grouped according to a type of curiosity measure evaluated in a particular study. As search terms for this review included a wide variety of wellbeing and mental health indicators, the next stage identified the presence of the particular indicators in each curiosity-type group. The publications were dated between 1987 and 2023, which was also acknowledged in the synthesis process. Thus, earlier studies that were not extensively replicated formed a separate section in the description of the results. The analysis methodology and measurement tool of curiosity are reported for the most replicated conceptualisation of curiosity. Due to a large number of studies being included in the review, experimental and longitudinal studies were subjected to a detailed description. Correlational

studies with evidence for replication were described in less detail and grouped where possible.

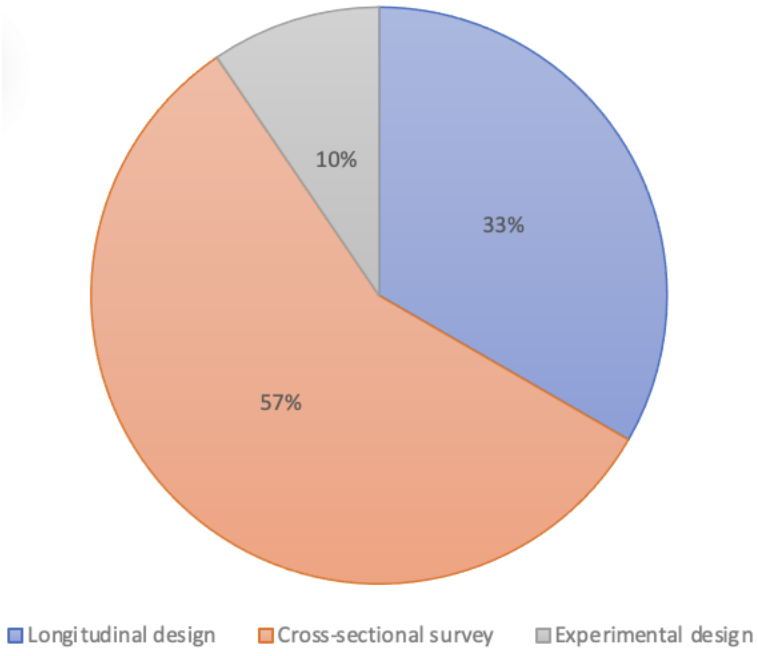
2.5 Results

2.5.1 Overview of The Results

This section aims to address the questions outlined earlier for the SLR. It provides a summary of the primary characteristics of the data, encompassing the types of curiosity and wellbeing identified. Additionally, it will offer an overview of the quality assessment, types of study and analysis design that was present in the reviewed literature. All 21 studies employed quantitative research methods. The assessment of the studies' quality was conducted using the EPHPP tool, which indicated fourteen papers to be strong, four were moderate, and two were weak (see Appendix B for the quality assessment). Among those studies, twelve had cross-sectional, seven longitudinal and two experimental study designs (see Figure 2).

Figure 2

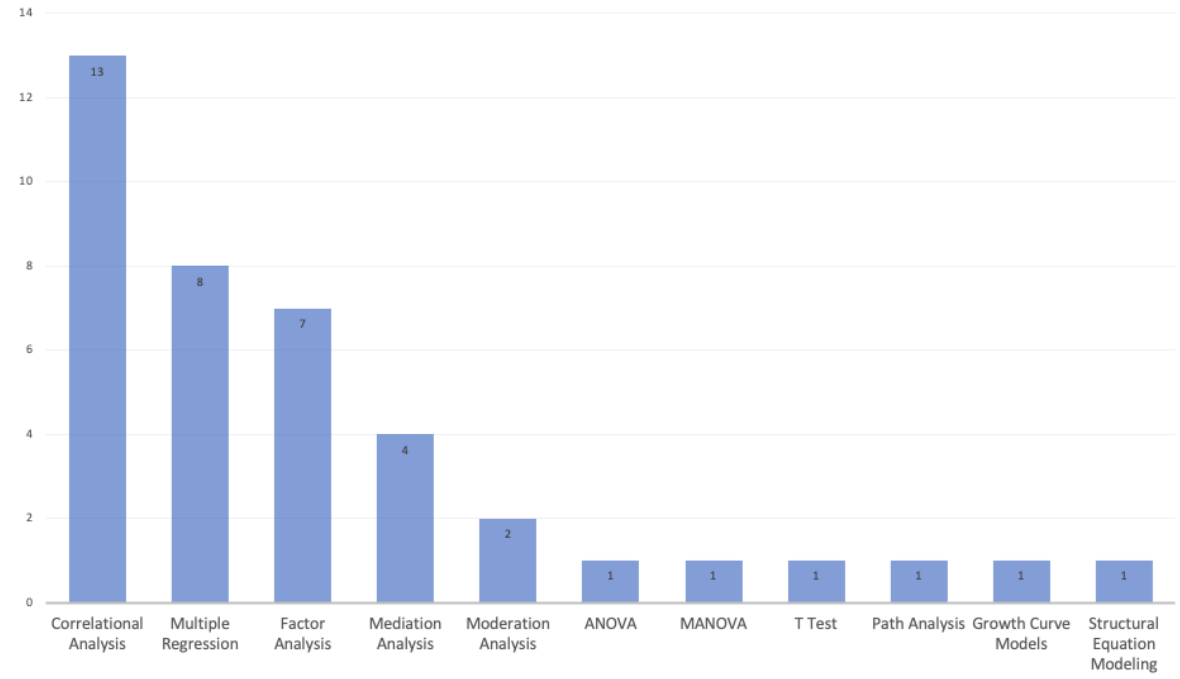
Study Design Summary



The majority of studies in a total number of 13 utilised various types of correlational analysis (see Figure 3). The prevalence of cross-sectional and correlational analyses posed challenges in establishing causal relationships between curiosity and wellbeing. However, mediation and moderation analysis were presented in four and two studies, respectively, providing a more nuanced understanding of the relationship between curiosity and wellbeing. Factor analysis was employed by seven studies, particularly to explore the specificity of various curiosity questionnaires. The remaining examples of analysis were presented individually in the review (see Figure 3). Overall, the data reflects that curiosity is a multifaceted construct, with ongoing efforts to better define and measure it, as well as to understand its implications for wellbeing.

Figure 3

Analysis Methods Distribution



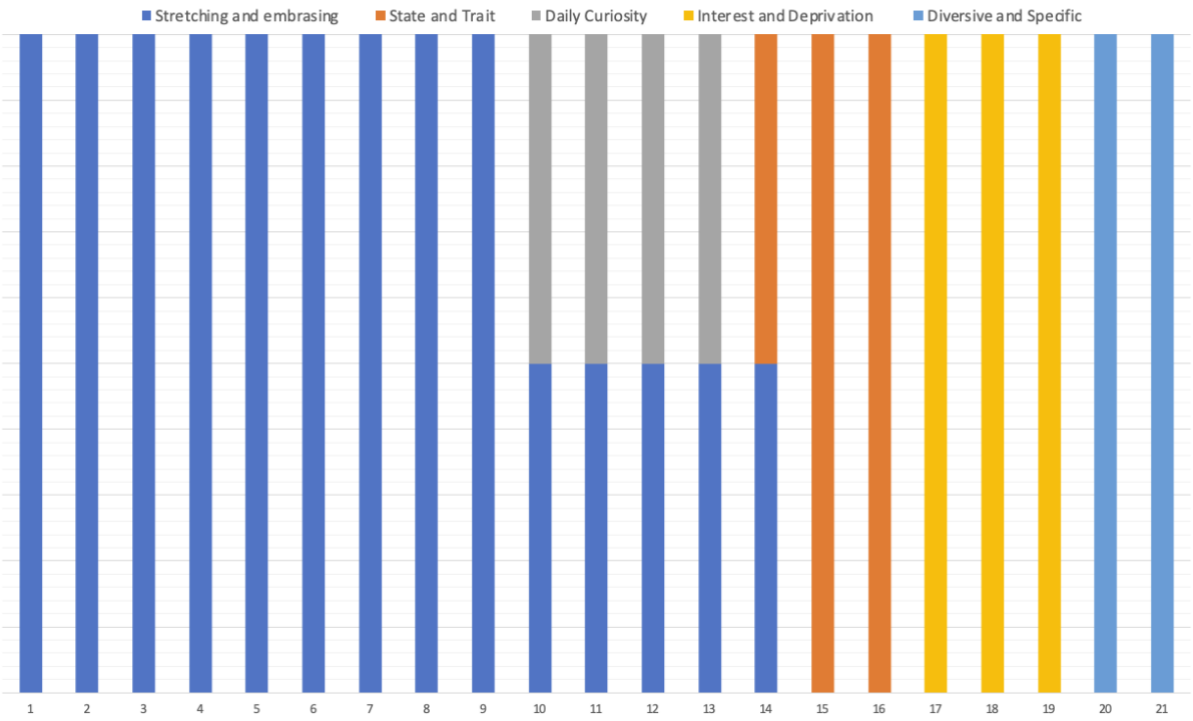
Three earlier studies focused on *state* and *trait* curiosity utilising different measurement tools and exploring indicators of positive wellbeing as well as mental health (Comunian, 1994; Kashdan, 2004; Rodrigue et al., 1987). One of them also introduced

stretching and *embracing* curiosity along with state and trait providing a comparison of their specificity (Kashdan, 2004). Another two correlational studies describe *perceptual* (Collins et al., 2004) and *epistemic* (J. A. Litman & Spielberger, 2003) curiosity in relation to traits of *anxiety*, *depression*, and *anger*. These last two studies were grouped as they focused on the *diversive* and *specific* facets of *curiosity*. However, the findings did not reveal strong relationships with *wellbeing* indicators, and subsequent research was not indicated.

An overwhelming number of 14 studies explored *stretching* and *embracing* facets of *curiosity* (see Table 3 for references; Figure 4), and among those four was exploring *daily curiosity* (Drake et al., 2022; Kashdan & Steger, 2007a; Lydon-Staley et al., 2020; Sheldon et al., 2015). All 14 studies utilise different versions of Curiosity and Exploration Inventory (CEI) making it the most consistent measure in this review (Kashdan et al., 2004, 2009). Another three studies focus on the aspects of *curiosity* described as *deprivation sensitivity* and *joyous exploration* (Lam, 2022; Li et al., 2023; J. A. Litman & Jimerson, 2004). The earlier study focuses on the factor analysis and measurement of the specific components of deprivation *curiosity* and its relationships to trait *anxiety, anger* and *depression* (J. A. Litman & Jimerson, 2004). Later studies utilised the Five-Dimensional Curiosity Scale-Revised (5DCR) and its predecessor (Lam, 2022; Li et al., 2023). However, they used different methods of analysis (correlation and the Structural Equation Model (SEM)) and different indicators of *wellbeing*. Combined these data illustrate different types of *curiosity* that were researched in the context of wellbeing, identifying *stretching* and *embracing curiosity* as the most widely researched.

Figure 4

The Measures of Curiosity in Each Article



Note: this figure illustrates curiosity measures in each study selected for the review

Significantly less consistency was observed across the assessed mental health and wellbeing indicators (Figure 5). Among indicators of positive *wellbeing, satisfaction with life* emerged as the most frequently measured, with ten articles addressing it (see Table 3 for references). *Positivism* followed as the second most common measure, described in eight studies. Another three studies introduced different types of *wellbeing*, including psychological, mental, and school *wellbeing*. The least frequently measured indicators were the *happiness index* and profile of the mood states, each mentioned only once. This suggests that the data indicate two primary areas of focus within the studies reviewed: Approximately half of the studies explored indicators of positive *wellbeing*, while the other half of the studies addressed mental health indicators.

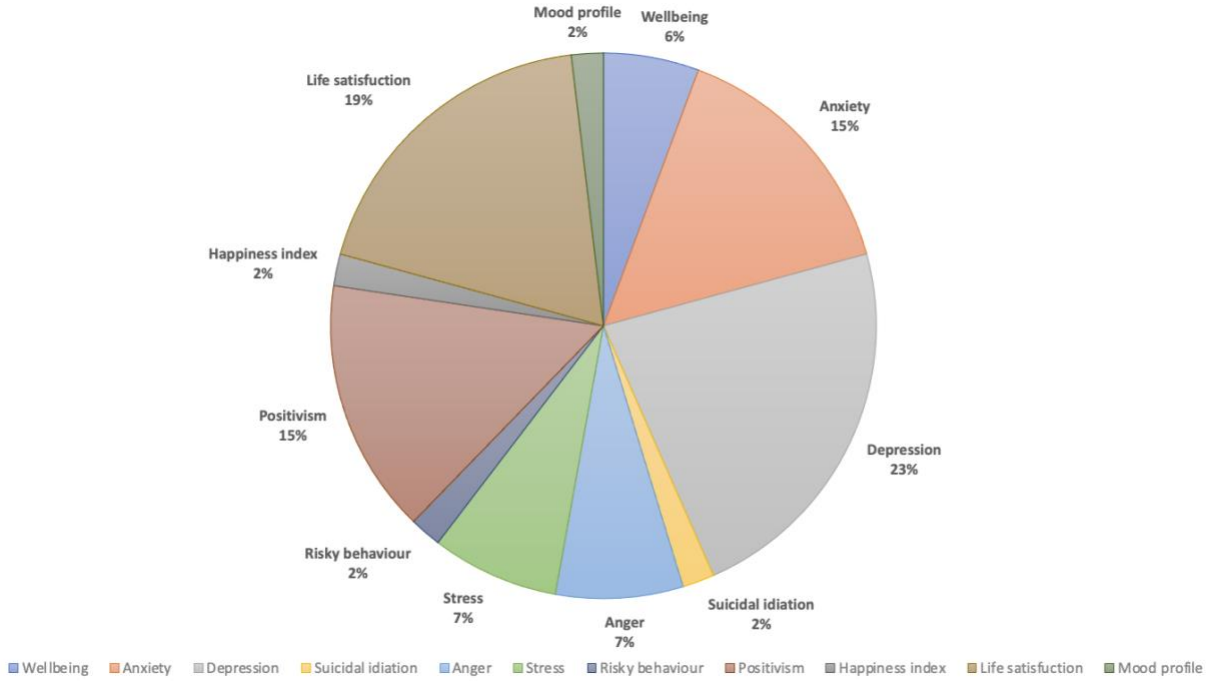
Among mental health indicators, *depression* was the most frequently reported, with twelve studies examining it (Figure 5). The second most frequently described indicator of

mental health was *anxiety*. While eight studies refer to it, only three studies measure it in the context of state *anxiety*. The other five studies measure *anxiety* as a personality trait measure, which is considered to be a less time-sensitive measure. In contrast, *depression* was predominately measured as a state in eight out of twelve studies, typically within a maximum timeframe of two weeks. Among the three major mental health indicators, stress had the least representation, with only four articles mentioning it. The same number of studies measured anger, primarily in the context of trait characteristics. Suicidal ideations and risky behaviour were each addressed once, typically considered alongside other mental health indicators. Thus, suicidal ideation was evaluated along with distress and coping efficacy measures, while risky behaviour was assessed in conjunction with positivism and *life satisfaction*.

While the diversity of the *wellbeing* measures enriched the understanding of the role of *curiosity* within this context, it hindered the replication of the results and identification of connections. This was especially challenging for the synthesis of mental health indicators as the majority of the studies utilised different assessment tools. The synthesis of the results described below provides a detailed description of conceptualisation and measures used to identify the relationships between *curiosity* and *wellbeing* observed in the previous literature.

Figure 5

Wellbeing and Mental Health Indicators Identified in The Selected Articles



The subsequent sections delve into the nature of the relationship between various types of wellbeing and *curiosity* in greater detail. Additionally, mediation and moderation connections will be examined, along with curiosity's potential role as a protective factor for mental health and wellbeing.

2.5.2 State and Trait Curiosity and Personality

Five articles discussed in this section have explored research on *curiosity* and wellbeing. However, these studies were presented with limited evidence of replication and showed little integration with more recent developments in the literature. *State and trait curiosity* and state and trait personality measures were discussed.

2.5.2.1 Earliest Evidence of The Review

One of the earlier research highlighted a connection between *depression* and *curiosity* in order to demonstrate how the state of *depression* can influence our ability to seek new information (Rodrigue et al., 1987). In this study, three groups of participants were exposed

to depressive, enhanced and neutral mood alteration exercises utilising The Velten Mood Induction Procedure. Examples of depressed conditioning were "I feel worn out, my health might not be as good as it's supposed to be."; neutral - "Utah is the Beehive State."; enhancing - "If your attitude is good, then things are good, and my attitude is good". The results indicated a negative effect on *state curiosity* in the depressed group, while trait *curiosity* remained unchanged during the experiment. These results indicated that exposure to self-deprecating statements can potentially lower one's mood, *curiosity* and the will to explore new information. Despite previous criticisms in the literature regarding its inconsistent results (Kenealy, 1986) the current research design attempts to correct it by assessing *curiosity* and *depression* both before and after the mood induction procedure. This study stands out as the only one that uses the Melbourne Curiosity Inventory. Despite its validation, this instrument remains of little use within the discourse on *curiosity* and wellbeing (F. Naylor, 2011). This article refrains from assumptions regarding protective factors associated with *trait curiosity* or the potential effects of prolonged exposure to the statements inducing a depressive state. However, it distinguishes between state and *trait curiosity*, noting that *state curiosity* is subject to more rapid fluctuations compared to trait.

Curiosity is not the only psychological phenomenon examined through the framework of state and trait formulation. Therefore, the work of C. Spielberger focuses on distinguishing between state and trait across various phenomena in The State-Trait Personality Inventory (STPI), which assesses *anxiety*, *depression*, *anger*, and *curiosity* (Spielberger, 1979). Four studies presented in the current review utilised this questionnaire for their research design.

The first one is an earlier suggestion of an indirect connection between *curiosity* and *wellbeing* (Comunian, 1994). This research, which predominately focuses on *anger* makes speculative suggestions that the absence of a correlation between *curiosity* and anger can suggest that *curiosity* might be connected to *wellbeing*. The results and background were

presented with restricted details. Although there is a suggestion of the connection between *curiosity* and optimism in the study's rationale and discussion, there are no explicit results of this investigation presented.

2.5.2.2 Specific and Diversive Curiosity

The following two studies also provide limited insight into the connection between *curiosity* and *wellbeing*, as their primary focus is on using the STPI to establish divergent validity of the questionnaires for both *perceptual* and *epistemic curiosity* (Collins et al., 2004; J. A. Litman & Spielberger, 2003). Both articles describe a robust study design and successfully establish divergent validity for both types of *curiosity* and their subscales *diversive* and *specific*. As defined in the studies, both facets of *curiosity* focus on obtaining novel information, although differ in the type of information being sought. While *diversive curiosity* is connected to the exploration of the environment, *specific curiosity* relates to a detailed search for particular information.

The results of the first study indicated a lack of correlation between epistemic and perceptual *curiosity* and scores of trait *anger, depression*, and *anxiety* for all participants combined. However, differentiation between male and female participants portrayed different profiles of the correlations. Thus for male participants *perceptual curiosity* was found to be correlated to trait *anger* (r = .21; p = 0.05), and *anger* expressed towards something or someone (r = .28; p = 0.01), PC (specific) had a positive correlation to suppressed *anger* (r = .26; p = 0.01) (Collins et al., 2004). While in the same study for the females, correlations were found between *perceptual curiosity* and how often participants try to control *anger* (r = .15; p = 0.05), and a negative correlation of *perceptual curiosity* (specific) and trait *anxiety* (r = - .15; p = 0.05). These findings were not supported by the hypothesis of the study and were revealed as a part of the measure development. Furthermore, differences in the expression and occurrence of *anger* and *anxiety* between men and women are often associated with the

cultural context (Fischer & Evers, 2010; McLean & Anderson, 2009). In the context of these review's questions, these findings can enhance our understanding of the relationship between *curiosity* and *wellbeing* particularly regarding potential gender differences.

In support of this suggestion, a small negative correlation was also replicated between *epistemic curiosity* and trait *anxiety* ($r = -.17$; $p = .001$) (J. A. Litman & Spielberger, 2003). Although results were not gender-specific, female participants outnumbered males almost threefold ($N = 739$, male = 193, female = 546). Although the exploration of the connection between *curiosity* and *wellbeing* was not a central focus of these studies, these findings indicate how different types of *curiosity* can be connected to *anger* and *anxiety*, while also providing insights into gender participation in these relationships. Furthermore, studies report on strong positive correlation between different types of *curiosity*. Thus, *perceptual curiosity* correlates with *trait curiosity* (STPI) (*mdn* $r = .545$; $p = .001$) (Collins et al., 2004). In turn, *epistemic curiosity* measured by Collins *curiosity* questionnaire correlates to *trait curiosity* (STPI) ($r = 0.61$; $p = .001$) and perceptual *curiosity* ($r = .57$; $p = .001$) (J. A. Litman & Spielberger, 2003).

2.5.2.3 Introduction of the Exploration and Absorption Curiosity

The final research in this section also explores two *curiosity* questionnaires measuring trait *curiosity* with STPI and exploration and absorption subscales (*stretching* and *embracing* in later research, respectively) of *curiosity* with the Curiosity and Exploration Inventory (CEI) (Kashdan, 2004). This correlation study describes the relationship between *curiosity* and *social anxiety*. Although the focus of the study is *social anxiety* as a negative predictor of *wellbeing*, this study illustrates how complex mechanisms of *curiosity* can be differently connected to *wellbeing*. Thus, a moderate negative correlation was identified for *trait curiosity* (STPI) and social interaction *anxiety* ($r = -.32$, $p < .001$). However, this result was only replicated for the exploration subscale of CEI ($r = -.42$, $p < .001$) and there were no

relationships indicated with the absorption subscale ($p > .85$). The exploration subscale relates to the tendency to actively explore and embrace novelty and challenge, while absorption is considered to represent the ability to "fully dive into" a topic, and embrace new things but not actively looking for new information. Furthermore, *trait curiosity* (STPI) failed to discriminate between factors related to *curiosity* and positive affect, while CEI subscales demonstrated greater specificity by capturing components of *curiosity*. Other mental health indicators measured by the 90-item Mood and Anxiety Symptom Questionnaire failed to reach statistical significance. For our review, it is the first example of the discrepancy in the data among mental health indicators while almost every study utilises different assessment tools. This article sets an example of the investigation outside personality formulation and suggests *embracing curiosity* to have a potential association with *wellbeing*. Although this article utilises the 5-item Satisfaction with Life Scale (SWLS) and no insight regarding its association with *curiosity* was provided, later studies indicate a robust correlation with *curiosity*.

2.5.3 Stretching and Embracing Curiosity and Wellbeing

All studies included in this section utilise various forms of the CEI tool and describe *stretching* and *embracing* facets of *curiosity*. Three studies employed an earlier version of CEI, while the majority of ten used CEI-II, and four utilised a shortened version tailored to the aims of their research. Although most studies employed different tools to measure mental health indicators, there has been some consistency across studies in utilising questionnaires for *life satisfaction* and *positivity*. Specifically, eight studies used SWLS to measure *life satisfaction*, and four used the Positive and Negative Affect Schedule (PANAS). This section further consolidated findings related to the markers of positive wellbeing and different mental health indicators.

2.5.3.1 Positive Wellbeing Perspective

The question of what constitutes wellbeing remains incompletely answered in the literature, with some perspectives suggesting that the mere absence of mental health difficulties does not suffice to constitute wellbeing. Within the current review, three studies endeavour to explore indicators of positive wellbeing, investigating psychological, emotional, social, and behavioural dimensions of human functioning. Participants in these studies encompassed youth aged from 14 to 26, representing diverse ethnic backgrounds. The studies were conducted in the United States, Serbia, and India.

The first article supported the hypothesised two-factor structure of *curiosity* through confirmatory factor analysis and further elucidated the disparities between the exploration and absorption facets of *curiosity* (Gallagher & Lopez, 2007). In this study, the exploration subscale had a positive moderate correlation to all indicators of emotional, psychological and social wellbeing (*pr* = from .35 to .55; *p* = .001), and a negative correlation with negative affect (*pr* = - .14; *p* = .05) when controlled for absorption subscale (*pr*). The exploration subscale has also accounted for the effect of every *wellbeing* measure (*f(*2) ranging from 0.14 to 0.47) illustrating its predictive power. Participants who were categorised as having flourishing mental health (high level of *positive affect* and *life satisfaction*) reported higher levels of *curiosity* (*t*(291) = 3.78, *p* < 0.001, *d* = 0.57) and higher levels of the *exploration* subscale (*t*(291) = 5.07, *p* < 0.001, *d* = 0.80).

The subsequent two studies employ the updated version of CEI, known as CEI-II, in which exploration *curiosity* is relabelled as "*stretching*" and absorption *curiosity* as "*embracing*" (Jovanović & Gavrilov-Jerković, 2014b; Mishra, 2022a). Given that the majority of studies discussed in this section utilise the later iteration of the questionnaire, these definitions will be uniformly applied in all subsequent cases. Both studies, to some extent, replicated the dominance of the *stretching* component of *curiosity* over *embracing* in

its positive association with well-being, while also providing a unique perspective and expanding on this connection. Thus, a longitudinal study that took place among adolescents reported risky behaviour engagement had low positive correlations with the *embracing* subscale during the first assessment time ($r = .22$, $p < .01$) and after five months ($r = .27$, $p < .01$) (Jovanović & Gavrilov-Jerković, 2014b). In turn, *embracing curiosity* measured in the first assessment found to be a predictor of *risky behaviour* during the second assessment ($b = .11$, $p < .01$). However, no significant correlations were found between the *stretching* subscale and risky behaviour. Similarly, in the second study, the *stretching* subscale significantly positively correlated with *life satisfaction* ($r = .13$, $p < .01$) and *positive experience* ($r = .36$, $p < .01$) and negatively with *negative experience* ($r = -.12$, $p < .01$). Meanwhile, the *embracing* subscale correlated only with positive experience ($r = .26$, $p < .01$), indicating a specific connection of *curiosity* to wellbeing indicators. These observations highlight the importance of delineating various facets of *curiosity*, as this can provide specific insights and a more detailed understanding of how *curiosity* relates to *wellbeing*.

The final article described in this section, along with replicating previous results, introduced *self-efficacy* as a variable for this review (Mishra, 2022a). Self-efficacy can be understood as one's belief in their ability to control their feelings actions and thoughts in order to achieve goals. In this study, both subscales of *curiosity* correlated with self-efficacy, *embracing* ($r = .22$, $p < .01$) and *stretching* ($r = .34$, $p < .01$). Furthermore, *self-efficacy* exhibited a full mediation effect on both subscales' connections to *life satisfaction*, and negative and positive experiences. Note that in the majority of the literature, self-efficacy is more closely associated with beliefs, whereas here it was linked to self-control. The self-efficacy questionnaire consists of statements regarding the beliefs in one's powers as well as retrospection on the ability in the past to solve tasks, with only some statements describing the ability or belief in the ability to exert self-control. Improving the accuracy of the

definition and understanding the involvement of other components in the effects of *curiosity* on well-being can shed more light on the mechanisms underlying their connection. These studies outline that *curiosity*, especially its *stretching* facet, plays a significant role in influencing positive psychological and social outcomes among adolescents and young adults. The distinction between *stretching* and *embracing* facets of *curiosity* highlights their different impacts on wellbeing.

2.5.3.2 Introducing Depression Indicators and Mediation Analysis

The studies introduced in this section shed light on the relationship between *curiosity* and *depression*, while also considering diverse mediation effects. All three studies found that *curiosity* was inversely related to *depression*, with two of them additionally noting a positive association with *life satisfaction* (Kaczmarek et al., 2013; Kawamoto et al., 2017; Theuns et al., 2014). The first article explored the mediation effect of *wellbeing* on the association between *curiosity* and *depression* (Theuns et al., 2014). In this article, *wellbeing* was measured as a *happiness index* that according to the authors a measure that is closely related to *life satisfaction*. *Wellbeing* was indicated as a complete mediator of the relationship between *curiosity* and *depression* (indirect effect, β = -.34, SE = 0.05, z = -7.21, p < .001, 95%CI [-.44, -.25]). Interestingly, the study also found that *depression* scores had a partial mediation effect on the connection between *curiosity* and *wellbeing* (indirect effect β = .15, *SE* = 0.03, z = - 3.96, p < .001, 95%CI = [.07; .24]). Authors highlight that these findings can indicate a potential protective power of *curiosity* for mental health, as people who exhibit higher levels of *curiosity* in their daily lives can potentially be less subjected to negative thinking. A partial mediating effect of *depression* on *curiosity* to *wellbeing* can support previously indicated in this review negative effects of *depression* symptomology on *curiosity* and exploratory behaviour (Rodrigue et al., 1987).

In the second article, the authors focus on a rejection sensitivity with which *curiosity* is also found to be inversely related (r = - .27, p < .05;) (Kawamoto et al., 2017). This article offers a thorough analysis that further emphasises *curiosity* as a potential protective factor for mental health. Thus, the positive association between social rejection experiences and *depression* was weaker for people who scored higher on *curiosity* (b = .27, p < .001) compared to those, who scored lower (b = .42, p < .001). Also, the negative effect of social rejection on *life satisfaction* was weaker for people who showed higher (b = − .026, p = .006), compared to lower scores on the CEI questionnaire (b = − .072, p < .001).

The prospective significance of *curiosity* is a protective factor for mental health illustrated in the last study in this section by introducing *curiosity* in connection with gratitude intervention initiation (Kaczmarek et al., 2013). In this experimental study participants were informed about the positive effects of the gratitude intervention on mental health. They were not instructed to start intervention, however, the intention and initiation of their intervention were later measured. The result indicated a significant indirect effect of *curiosity* on intervention initiation through intentions was detected (b = 0.24, 99% *CI* [0.077, 0.542], OR = 1.29). It also revealed that intentions to start the gratitude intervention were positively correlated with *curiosity* (r = .33, p < .01). In contrast, a marginal indirect effect of depressive symptoms on intervention initiation through intention (b = - .119, 90% *CI* [- .309, -.010]). The online format of the study can present challenges in drawing conclusions from the results, however, it offers insights into the practical implications of *curiosity* to clinical practice. Additionally, the described connections lack detailed insights into the *stretching* and *embracing* subscales of *curiosity* and their role within those associations.

2.5.3.3 Measures of Stress and Anxiety and Curiosity

The following two articles introduce stress and *anxiety* indicators that together with *depression* constitute the most common mental health indicators that the general public is

usually being screened for (Jovanovic & Brdaric, 2012; Losecaat Vermeer et al., 2022). However, the reporting of the results and choice of measurement tools leave room for a critique. Thus Vermeer et al. used measures for *depression*, *anxiety*, and *stress* to assess mental health, however only the connection between *anxiety* and *curiosity* has been reported in the study and were not significant (r = - .12; p = .124). Additionally among the three measures, only *anxiety* was measured as a trait, while for the identification of *depression* and stress, the authors used mental health screening tools. The second article used Depression Anxiety and Stress Scale (DASS-21) a state measure for all three indicators (Jovanovic & Brdaric, 2012). Total *curiosity* CEI-II score did not correlate with indicators of *depression*, *anxiety*, or *stress*. However, low negative correlations were observed between *embracing* subscale and *loneliness* (r = - .15, p < .01) and *stretching* subscale and *depression* (r = - .11, p < .05). While both articles continue to replicate previous findings of a significant positive connection between *curiosity* and *positive wellbeing*, the authors concluded that *curiosity* has a stronger association with positive wellbeing compared to the mental health indicators. A similar association was presented in the previous section in which *wellbeing* was indicated as a mediator between *curiosity* and *depression* (Theuns et al., 2014). The authors indicated that DASS-21 was validated among adolescents and therefore suitable for application among high school students. However, other validation studies focused on the clinical population (Ng et al., 2007, p. 21; Ronk et al., 2013). They acknowledged the ability of this tool to break down the clinical cut-off in a more detailed approach. This may suggest that usage of this tool can be more appropriate for clinical settings rather than with the general population. This continues to highlight the inconsistency among mental health measures received in this review.

Continuing the investigation on mediation effects, this article spotlights loneliness as a partial mediator for the connection between *curiosity* and *wellbeing* ((a*b) B = 1.92, SE =

0.44, $Z = 4.35$, $p < 0.001$, $R2 = 0.53$) (Losecaat Vermeer et al., 2022). This study, which took place during the COVID-19 pandemic outbreak, has also suggested *curiosity* to be a possible "buffer" for the negative effects of sugar intake on *anxiety* levels. Sugar intake was found to positively predict *anxiety* ($\beta = 0.25$, $p = .008$), and the *trait curiosity* influenced this connection (interaction: $\beta = -0.08$, $p = .005$).

The last study in this section has also named *curiosity* as a potential protective factor for mental health investigating its connection to distress and suicidal ideation (Denneson et al., 2017). In this secondary analysis study, the data was recorded from veterans suffering from suicidal ideations and were undergoing therapy. This research offers another introduction to self-efficacy, here connected to its coping facet. *Copping efficacy* was measured in this study by two questions from the Coping Self-Efficacy scale (CSE) related to people's beliefs in their ability to cope with negative thoughts and to make friends and family help them. The results indicated that *curiosity* had a positive association with both questions asked. Correlational analysis and regression analysis revealed that *curiosity* was positively associated with coping efficacy to stop negative thoughts ($r = .36$; $p < .05$ / $b = 2.07$; 95% $CI = .89, 3.24$), and coping efficacy to enlist friends and family ($r = .32$; $p < .05$ / $b = 1.83$; 95% $CI = 0.58, 3.08$, respectively). Individual scores of *depression*, anxiety, and *stress* were incorporated into a composite distress score. Higher *curiosity* scores were associated with lower suicide ideation severity at baseline only for participants with higher *distress* scores ($b = -0.39$; 95% $CI = -.76, -.02$; $p = .04$). Descriptive statistics revealed a small negative correlation between *curiosity* with *depression* ($r = -.18$; $p < .05$), suicidal negation severity ($r = -.19$; $p < .05$), and *perceived stress* ($r = -.19$; $p < .05$). However, regression analysis demonstrated the link only between *curiosity* and the severity of suicidal ideation, although the association was only approaching significance ($b = -0.35$; 95% $CI = -0.73, 0.04$). After mental health treatment for participants with low distress scores at baseline, higher *curiosity*

was associated with a smaller increase in coping efficacy, and for participants with higher distress, higher *curiosity* was connected to a larger increase in coping efficacy (b = .44; 95% CI = .06, 0.83; p = .03), this effect was indicated only for efficacy to stop negative thoughts. Authors interpreted these results as an indication of the moderation effects of *curiosity* on longitudinal relationships between distress and *coping efficacy*.

While the two studies described above used the CEI-II, they did not investigate the nuanced difference between *stretching* and *embracing* facets of *curiosity*. Additionally, some of the studies that were described in earlier sections of this report outlined a more robust connection between *curiosity* and positive indicators of *wellbeing*, compared to mental health scores. Interestingly, the last study offers insights suggesting *curiosity* may serve as an asset in cases where participants had higher levels of distress compared to those with lower distress levels. Across various studies, *curiosity* emerges as a predictor of wellbeing, influencing individuals' behaviours and mental health. However cross-sectional studies cannot provide a nuanced understanding of the phenomena of *curiosity* over time.

2.5.3.4 Daily Curiosity

Four longitudinal studies described in this section provide a unique insight into the relationships between *curiosity* and *wellbeing* over time (Drake et al., 2022; Kashdan & Steger, 2007a; Lydon-Staley et al., 2020; Sheldon et al., 2015). Each study employed a version of the Curiosity and Exploration Inventory (CEI) to measure *curiosity*, however, they do not report on the *stretching* and *embracing* components. Additionally, they utilised various tools for positive *wellbeing* indicators and offered insights into mental health-related difficulties by identifying *depression* scores and examining the influence of stressors on *wellbeing*.

The first article describes two different paths for *wellbeing*, growth-orientated and hedonistic in the context of its connection to *curiosity* (Kashdan & Steger, 2007a). They

anticipated a larger connection between *curiosity* and growth-oriented behaviour across 21-day diary reporting. Results indicated that participants with larger trait *curiosity*, on days when they felt more curious, also experienced more frequent growth-oriented behaviours ($B(\gamma 11) = .001$, $SE = .000$, $t(90) = 2.36$, $p = .02$), greater meaning in life ($B(\gamma 11) = .003$, $SE = .002$, $t(90) = 1.96$, $p = .05$), and greater *life satisfaction*, ($B(\gamma 11) = .003$, $SE = .001$, $t(90) = 2.36$, $p = .02$). In contrast, for participants with low trait *curiosity*, highly frequent hedonistic behaviours were present only on the days they felt more pleasure ($B(\gamma 11) = -.01$, $SE = .003$, $t(90) = -3.23$, $p = .002$). To support their hypothesis further, larger scores in *daily curiosity* predicted greater *presence of meaning* ($B = .02$, $SE = .01$, $t(95) = 2.33$, $p = .02$) and *life satisfaction* ($B(\gamma 01) = .05$, $SE = .02$, $t(95) = 2.29$, $p = .02$) the next day, while daily pleasure did not predict day-to-day changes in the presence of meaning or *life satisfaction*. Contrary, greater daily pleasure led to less *search for meaning* ($B = -.07$, $SE = .03$, $t(95) = -2.15$, $p = .03$). This study demonstrates how trait *curiosity*, as a motivational mechanism, can impact feeling of meaning in life. These findings prompt speculation on whether *curiosity* can facilitate individuals in achieving more meaningful achievements with lasting effects compared to hedonistic pleasures.

Similarly, the next study focuses on goal achievement and *wellbeing* in the context of *curiosity* (Sheldon et al., 2015). Thus, *curiosity* showed a significant interaction with goal attainment ($\beta = .073$, $p < .01$), suggesting a stronger relationship between goal attainment and *wellbeing* for individuals that appeared high in *curiosity* scores. The results further support this connection against other confounds. Thus, the interaction between goal attainment and *curiosity* was found to be the most consistent predictor of *wellbeing* in comparison with the other ten predictors. The interaction between *curiosity* at baseline and goal attainment at the 3-month timepoint ($\beta = .068$, $p < .01$), and between *curiosity* measured at the 3-month timepoint and goal attainment at the 6-month timepoint ($\beta = .052$, $p < .05$) was reported.

Additionally, only *curiosity* was identified as a moderator for enhancing goal attainment to increase *wellbeing* over six months and at all three timepoints ($\beta = .111$, $p < .05$).

The last two studies utilised one dataset for secondary analysis. This data set consisted of a 21-day diary of 165 people, which measured a variety of *wellbeing* and behavioural scores (Drake et al., 2022; Lydon-Staley et al., 2020). One of them calculated *curiosity* liability, indicating the degree of fluctuation in *daily curiosity* measures (Lydon-Staley et al., 2020). Results indicated that the *curiosity* trait was negatively correlated with *curiosity* lability ($r(165) = -.28$, $p < .001$), indicating a tendency for people who score high on *curiosity* to have more stable *daily curiosity*. Furthermore, curiosity lability was positively associated with *depression* ($B = 0.16$, $p = .04$) and negatively with *life satisfaction* ($B = -0.71$, $p = .002$). Another secondary analysis of this data set demonstrated that on the days when *curiosity* was rated higher than usual, it had an attenuating effect on the effect of today's stressor on *negative mood* ($\gamma 51 = -0.10$, $p < .001$) (Drake et al., 2022).

Three out of four longitudinal studies were conducted within a 21-day period which can be considered a relatively short duration (Drake et al., 2022; Kashdan & Steger, 2007a; Lydon-Staley et al., 2020). An additional point of critique for all four studies presented in this section is that each participant sample consisted predominately of female gender. Across the review instances of the different findings for male and female participants were introduced. Additionally, several studies that showed significant associations between *curiosity* and mental health indicators consisted of a predominately female population.

2.5.4 Curiosity as Deprivation Sensitivity and Joyous Exploration

Three studies introduced *curiosity* as *deprivation sensitivity*, an aversive facet of *curiosity*. Described in the first article as *curiosity as feeling of deprivation* (CFD), it entails tension provoked by uncertainty, motivating information-seeking and problem-solving behaviours (J. A. Litman & Jimerson, 2004). While this article primarily focused on factor

analysis to identify potential components of CFD, it also provided early data on its potential connection to mental health.

The factor analysis identified three possible subscales of CFD: a necessity to perceive competence, intolerance to the feeling when information is inaccessible or inadequate, and an urgency to address problems. The latter, problem-solving component indicated a significant positive correlation with traits *depression* ($r = .11$, $p < .05$), and *anger* ($r = .17$, $p < .05$). Conversely, the competence subscale exhibited a significant negative correlation with traits *anxiety* ($r = -.12$, $p < .05$) and *depression* ($r = -.12$, $p < .05$). The intolerance component of CFD indicated a significant positive correlation with traits *anxiety* ($r = .11$, $p < .05$), *depression* ($r = .11$, $p < .05$), and anger ($r = .32$, $p < .01$). These results provide another example of how constructs of curiosity can be linked to potentially negative indicators of wellbeing. The intolerance subscale described in this article is more closely related to the essence of deprivation-type curiosity compared to other components.

The next two studies describe this similarly, employing the term “deprivation sensitivity” to denote a similar understanding of the type of *curiosity* that relates to the tension of being aware of the knowledge gap (Lam, 2022; Li et al., 2023). They also proposed to consider another *curiosity* facet named “joyous exploration”, identified as a pleasurable experience of choosing expansion and exploration over safety (Li et al., 2023). One of these studies used the 5-dimensional *curiosity* scale (5DC) (Lam, 2022), while the second utilised the 5DC-revised version (5DCR) (Li et al., 2023). However, both studies to some extent support the notion that deprivation sensitivity can have a weaker connection to wellbeing.

In the study by Li and colleagues, which examines *wellbeing* among adolescents, correlational analysis was used alongside structural equation modelling (SEM) (Li et al., 2023). Both facets of curiosity were positively correlated with five categories of *wellbeing*

presented in the study, with the effects of joyous exploration being larger ($r(313) = 0.49–0.75$, $p < .001$) than those of deprivation sensitivity ($r(313) = 0.32–0.52$, $p < .001$). When both facets were combined (*epistemic curiosity*), a positive association was found with physical ($\beta = 0.55$, $p < .001$), dietary ($\beta = 0.45$, $p < .001$), emotional ($\beta = 0.44$, $p < 0.001$), psychological ($\beta = 0.59$, $p < .001$), and academic wellbeing ($\beta = 0.70$, $p < .001$). However, SEM analysis revealed that joyous exploration had a stronger association with wellbeing ($\beta = 0.45–0.70$, $p < .001$), while no significant association was detected between deprivation sensitivity and the five types of wellbeing. Interestingly, this study indicated that age and gender had no moderating effect on the connection between *epistemic curiosity* and all five types of *wellbeing*, suggesting that gender differences in adolescence may be less prominent compared to the adult population.

The last study of this review reports on three subscales of 5DC, adding *stress tolerance* to the previously described *joyous exploration* and *deprivation sensitivity* (Lam, 2022). This study took place among Chinese Christian teachers and focused on *life satisfaction* and spirituality. The uniqueness of the sample makes the results generalisable. Spirituality significantly correlated with three types of *curiosity*: *joyous exploration* ($r = .53$, $p < .001$), *deprivation sensitivity* ($r = .21$, $p < .05$), and *tolerance to stress* ($r = .30$, $p < .001$). While controlling for daily spirituality, deprivation sensitivity was negatively associated with *life satisfaction* ($B = -.88$, $b = -.23$, $p = .04$). Furthermore, satisfaction with life was positively associated with two facets of *curiosity*: *joyous exploration* ($r = .16$, $p < .05$) and *stress tolerance* ($r = .25$, $p < .001$), and negatively to *deprivation sensitivity* ($r = -.23$, $p < .001$). Among the three facets of *curiosity*, only deprivation sensitivity had a significant negative mediation effect on the relationships between spirituality and *life satisfaction* ($b = -.43$, 95% CI [-1.08, - 0.02]). Therefore, deprivation sensitivity was found to have positive and negative associations with *wellbeing*. When compared to joyous exploration it shows

significantly less positive association with indicators of well-being. Additionally, it had an example of a negative association with *life satisfaction* and a positive connection to *anxiety* and *depression* indicators. However, those results have not been replicated until the date of the results of this review being synthesised.

2.6 Discussion

This review provided a comprehensive analysis of different types of *curiosity* and their connections to well-being and mental health indicators. This section provides a summary of findings and identifies possible research gaps. It also aims to consider its limitations and provide possible implications of these findings.

2.6.1 Curiosity, Anxiety and Depression

Studies described at the beginning of the review results presentation described several different types of *curiosity*. Among those were *state curiosity*, *epistemic* and *perceptual curiosity*, and *diversive* and *specific* components of *curiosity*. Among those measures, state curiosity demonstrates less evidence of its association with *wellbeing* indicators. These conclusions align with recent literature suggesting that state *curiosity*, often defined as occurring in isolated moments may not fully capture its impact on human functioning (Horstmeyer, 2022). By exploring various aspects of trait *curiosity* alongside other psychological traits, a more comprehensive understanding of its influence and *wellbeing* emerges.

Although the findings from these studies were poorly replicated, two points can be considered noteworthy. That is, two studies provide insights into the negative association between *epistemic* and *perceptual curiosity* with *anxiety*, predominantly among women (Collins et al., 2004; J. A. Litman & Spielberger, 2003). The results of the correlational analysis presented a challenge in the identification of the natural relationship between two correlated variables. However, while *curiosity* influences exploration, *anxiety* often relates to

avoidance behaviour (Duronto et al., 2005; Jacobson & Newman, 2014). The opposite influence of *curiosity* and avoidance inspired some research to investigate if *curiosity* can counteract avoidance, protecting people from its negative consequences, for example, refusal to research health-related information (Horn et al., 2024; Silvia, 2017). Another study offers evidence of the negative influence of negative statements about oneself on the state of *curiosity* (Rodrigue et al., 1987). The wider understanding of depressive symptomatology supports its positive association with both, self-deprecating thoughts and avoidance (Holahan et al., 2005; K. M. Kim et al., 2021; Wagener et al., 2016). Hence, this study provides one of the earliest evidence of the inverse association between *curiosity* and symptoms of *depression*. Specifically, this research demonstrates that while *state curiosity* can be influenced by negative statements, trait *curiosity* remains unchanged. Further studies have identified *trait curiosity* as a possible protective factor against the effects of negative events, prompting questions about the reciprocal relationship between *depression* and *curiosity* (Drake et al., 2022). While depressive symptoms can hinder one's ability to explore and engage in daily activities, *curiosity*, in turn, may offer protective value against some symptoms of *depression*. The presence of mediating and moderating factors may determine which of these factors affects the other. Another possible assumption is that the association between *curiosity* and depression should not only be viewed in terms of their state and trait differences, but also in terms of specific mechanisms that conceptualise *curiosity*.

2.6.2 Stretching of Embracing Curiosity

An overwhelming number of studies in this review explored *stretching* and *embracing* facets of *curiosity*, while also providing the most consistent measure of *curiosity* in the context of *wellbeing*, the Curiosity and Exploration Inventory (CEI-II). It also expands understanding of the connection between *curiosity* and *depression*, with several studies indicating the negative association between the two constructs (Denneson et al., 2017;

Kaczmarek et al., 2013; Kawamoto et al., 2017; Theuns et al., 2014). Notably, most of the correlations were found to be small, although significant. The inconsistency and a small effect size of the findings can suggest of possible presence of the mediating and moderating factors in the relationship between *curiosity* and mental health. Thus, one of the studies concluded that wellbeing has a complete mediating effect on the relationships between *curiosity* and *depression* (Theuns et al., 2014). These findings were consistent with a large number of studies suggesting a strong positive association between positive indicators of *wellbeing* and *curiosity*. These relationships were predominantly noted for *stretching* and *embracing* facets of *curiosity* and various indicators of *wellbeing*, including *life satisfaction, positive affect,* positive experience, psychological, social and emotional *wellbeing*, and negative connection to negative experiences and risky behaviours. While *stretching curiosity* has a more consistent and stronger association with positive indicators of wellbeing, *embracing* was associated with risky behaviour, that can negatively reflect wellbeing (Jovanović & Gavrilov-Jerković, 2014b). However, the differentiation between *stretching* and *embracing curiosity* is rarely presented with the most potential protective properties connected to them combined.

Thus, *curiosity* as a united score of CEI-II has been suggested to be a protective factor in several articles. Among them are negative thinking (Theuns et al., 2014), the influence of daily *stressors* (Drake et al., 2022), suicidal ideation (Denneson et al., 2017), and the negative effects of sugar intake on *anxiety* levels (Losecaat Vermeer et al., 2022). The association between *curiosity* and these aspects of mental health can suggest a potential indirect connection to less specific conditions like *depression*, stress or *anxiety*. To address specific mechanisms of *curiosity* research, several studies also describe its association with more precise aspects of positive *wellbeing*. For instance, higher-than-usual *curiosity* was found to protect from the negative influence of stressors, meaning that on the day when *curiosity* was

higher, the influence of stressful factors was decreased (Drake et al., 2022). Another example suggested that curious people tend to have a more stable level of *daily curiosity*, while large fluctuation was positively associated with *depression* and negatively with life satisfaction (Lydon-Staley et al., 2020). Conceptually, *curiosity* and its fulfilment can potentially give people a sense of connection and novelty that expands understanding and offers new ideas. Thus, *curiosity* was found to have a positive connection to meaning (Kashdan & Steger, 2007) and goal achievement (Sheldon et al., 2015). Although there are only individual examples of these connections, wider evidence in cognitive research suggests similar connections (Mohanty et al., 2015). Self-efficacy was described as having a full mediation effect on the relationships between *curiosity* and *wellbeing*, while higher levels of *curiosity* predicted a larger increase in coping self-efficacy among people with high levels of distress (Denneson et al., 2017; Mishra, 2022a).

2.6.3 Deprivation Sensitivity and Joyous Exploration

In the reviewed studies joyous exploration demonstrated a consistent positive association with *wellbeing* while deprivation sensitivity indicated some inconsistent results. *Joyous exploration* consistently indicated positive associations with various *wellbeing* indicators such as physical, and psychological well-being, and *life satisfaction* (Lam, 2022; Li et al., 2023). Moreover, unlike deprivation sensitivity, there is no evidence of negative associations with *wellbeing* indicators identified or described. Reviewed studies investigating *deprivation sensitivity* have produced conflicting results regarding its association with *wellbeing*. Some research has established a significant positive connection between *deprivation sensitivity* and positive *wellbeing* (Li et al., 2023), notably effects of *joyous exploration* were larger for all *wellbeing* indicators. However, utilising the same measures of *curiosity*, another study has reported a negative correlation between *deprivation sensitivity* and *wellbeing* (Lam, 2022) and a positive association with indicators of *depression* and

anxiety indicators (J. A. Litman & Jimerson, 2004). While only three studies explored deprivation sensitivity in this review, conflicting findings suggest a significant gap in the understanding of the connection between these facets of *curiosity* and *wellbeing*. Some evidence of this discrepancy can be seen in the wider research. For instance, against the author's expectations, *deprivation sensitivity* failed to predict goal achievement orientation (Eren, 2009), while a similar construct was found to be associated with CEI-II scores. Furthermore, *deprivation sensitivity* was shown to have fewer associations with psychosocial benefits of *wellbeing* and had a positive association with indecisiveness, defined as a drawback in this research (Whitecross & Smithson, 2023). This discrepancy highlights that not all *curiosity* facets can share similar protective properties and further research endeavours should investigate type-*specific curiosity* and its association with wellbeing. These specific associations will have the potential to inform clinical practice outlining particular strengths that are connected to *curiosity* and what type of exploration has benefits for mental health which will be discussed below.

2.6.4 Limitations in Measuring Curiosity and Wellbeing

While there is evidence from multiple studies about the relationships between *curiosity*, *wellbeing* and *depression*, there is less evidence of the relationships between *curiosity*, *stress* and *anxiety*. Although *anxiety* is the second most frequently described indicator of mental health in this report, only three studies measure *anxiety* as state. The other five studies measured *anxiety* as a personality trait, which is a less time-sensitive measure. The trait measure is often used as it was indicated to have predictive power in the development of *anxiety* symptomology (Intrieri & Newell, 2022; Schmidt et al., 2006). However, there is an additional line of criticism suggesting STAI, which is often used as an *anxiety* trait measure, has poor discriminant validity (Julian, 2011). With multiple mental health measuring tools used across research studies, replication of the result can be

challenging. One can suggest that it can be an indicator of a weaker connection, as the association between *curiosity* and positive *wellbeing* was replicated using diverse tools and measures. An additional challenge in the measures of wellbeing is in its suggested bias towards certain ways of life, that can be impacted by culture, values and personality (Bojanowska & Urbańska, 2021; Joshanloo et al., 2021). For instance, one of the articles in the review explores growth-oriented and hedonistic *wellbeing*, suggesting an association of *curiosity* with life fulfilment that differs from *life satisfaction* (Kashdan & Steger, 2007a). Another example is that the *embracing* subscale of *curiosity* which was found to have a weaker association with wellbeing, was found to be negatively associated with loneliness, while *stretching curiosity* did not show this association. One can speculate that the nature of *embracing curiosity*, diving deeper into the topic and *embracing* new information rather than seeking it, provides more acceptance of the situation that led people with higher scores in it to feel less lonely during forced isolation (Losecaat Vermeer et al., 2022). Therefore, it seems to be important not only to research different facets of *curiosity* and its mechanisms but also to understand the way *wellbeing* is measured and understood.

2.6.5 Limitations and Strengths of the SLR

This systematic literature review employs quantitative studies and is the first to offer a systematic quantitative assessment of the relationships between *curiosity* and *wellbeing*, combining *positive wellbeing* and mental health indicators within the same study. Thereby offering a comprehensive understanding of the interplay across the spectrum. However, the broad scope of the topic may have made it challenging to capture all relevant studies comprehensively. Similarly, multiple types of *curiosity* were synthesised in this review, however, two measures were excluded, potentially limiting the scope of the findings. One of them conceptualised *curiosity* within the context of mindfulness, that found to be an asset to wellbeing and mental health in wider research. Additionally, the data extractions were

conducted by a single reviewer, which although a recommendation for this project, may introduce bias.

Additionally, the diversity of the *wellbeing* measures prevented this review from employing a meta-analysis, which would provide a more detailed synthesis of the results. The meta-analysis, if performed for this systematic literature review, could provide a less fragmented interpretation of the literature. Additional limitations were associated with search terms for the articles. While they were designed to provide comprehensive data including various types of *wellbeing* and curiosity, this diversity extended the duration of the selection process. The screening process demanded a significant number of executive decisions that could be influenced by bias and were less structured. Finally, the p-value was reported across the systematic literature review as an identification of the statistical significance of the results. This can be misleading as this does not measure the size or importance of an effect. Although the results presented in this review identify the statistical significance this numeric measure does not outline the practical relevance of the findings. Moreover, p-values can be sensitive to a sample size of the study, where large samples may produce significant p-values for trivial effects, while small samples may fail to detect meaningful effects.

2.6.6 Implications of The Results

The results of this review have several clinical and research implications. The diversity of the explored types of *curiosity* provides a comprehensive analysis of the particular mechanisms that can benefit *wellbeing* and mental health. For instance, *stretching curiosity* may be particularly beneficial for improving various well-being indicators, while understanding the role of *embracing curiosity* might help mitigate risky behaviours. Recognizing the protective role of *curiosity* in mental health can aid in developing therapeutic strategies that leverage *curiosity* to buffer against stress, *depression*, and *anxiety*. Additionally, some examples of this review provide evidence of the effect of *curiosity* in

initiating interventions beneficial to mental health (Kaczmarek et al., 2013). Among recognising specific mechanisms, *daily curiosity* can be considered a promising measure for future longitudinal studies. Future research focusing on enhancing *curiosity*, particularly its *stretching* facet, can play a significant role in establishing possible interventions that can aid to therapeutic process and self-help guides. Further research is needed to develop and refine these interventions, ensuring they are effective across diverse populations and settings. Additionally, these findings highlight the need for further investigation into the specific mechanisms by which different types of *curiosity* influence well-being and mental health. Future studies should aim to clarify the roles of deprivation sensitivity and well-being, considering the conflicting results found in this review. Additionally, there is a need for more research on the mediating and moderating factors that influence the relationship between *curiosity* and mental health outcomes. Replicating the results of previous findings and employing more rigorous methodologies, such as meta-analyses, could provide deeper insights and help resolve the inconsistencies observed in the current literature. Addressing these research gaps will enhance our understanding of *curiosity's* multifaceted nature and its potential applications in promoting mental health and *wellbeing*.

Interestingly, *curiosity* appears to play a significant role at both extremes of the *wellbeing* spectrum. Participants who were rated as having flourishing *wellbeing* exhibited higher *curiosity* scores, particularly in the dimension of *stretching*, compared to those with moderate or languishing *wellbeing* (Gallagher & Lopez, 2007). Conversely, among participants undergoing therapy, elevated levels of *curiosity* were associated with substantial increases in coping efficacy and reductions in suicidal ideation, but this effect was significant only for individuals with higher distress levels (Denneson et al., 2017). These findings illustrate the nuanced role of *curiosity* in psychological *wellbeing* and therapeutic outcomes.

This suggests that curiosity may play an important role in both maintaining high levels of *wellbeing* and potentially aiding recovery during periods of significant psychological distress.

2.6.7 Conclusions

This systematic literature review provided a comprehensive analysis of different types of *curiosity* and their connections to *wellbeing* and mental health indicators. The findings highlight the complex and nuanced relationships between various facets of curiosity, such as *state curiosity, epistemic* and *perceptual* curiosity, and the *stretching* and *embracing* facets, *deprivation sensitivity* and *joyous exploration*. The review identified that while some forms of *curiosity* are associated with positive *wellbeing* and reduced symptoms of *depression* and *anxiety*, others show less consistent or even negative associations. The *stretching* facet of *curiosity* consistently showed stronger positive connections with indicators of *wellbeing*, whereas the *embracing* facet was associated with both positive *wellbeing* and risky behaviours. However, the review also revealed research gaps, particularly regarding the less studied subscales of *curiosity* like *deprivation sensitivity*, which exhibited conflicting results in its association with well-being. These findings reflect a dual nature that necessitates cautious clinical application. The findings also revealed the complexity of the relationship between *curiosity* and mental health, with small effect sizes and inconsistencies suggesting the presence of mediating and moderating factors.

The most robust connection was established between *curiosity* and *wellbeing*. While the majority of studies employed common measures of *wellbeing* such as *life satisfaction*, positive affect, and psychological well-being, there was a noticeable lack of investigation into alternative dimensions of well-being, for example, growth-oriented and spiritual wellbeing. These alternative dimensions offer valuable insights into individuals' quality of life and satisfaction beyond hedonic measures alone. Furthermore, there is a scarcity of research examining the longitudinal effects of curiosity on various dimensions of wellbeing, limiting

our understanding of how *curiosity* influences wellbeing trajectories over time. Additionally, the review underscores the need for more research to explore how *curiosity* is connected to *stress* and *anxiety* to define possible protective mechanisms that may shape these relationships. Addressing these research gaps will not only enrich our understanding of the complex interplay between *curiosity* and *wellbeing* but also inform the development of more tailored interventions to promote *wellbeing* across diverse populations.

2.6.8 Current study

Here, the current research study aimed to address some of the gaps identified by the review. A growing body of research indicates that *curiosity* can significantly contribute to mental health and *wellbeing*. As it consistently demonstrated a robust positive correlation with *wellbeing*, its connection to mental health indicators is less understood, particularly regarding its association with stress, which remains relatively under-explored. Additionally, a limited number of replications were observed across the reviewed literature. Similarly, limited examples of multiple facets of *curiosity* are combined in the same experimental study. Therefore, this project aimed to assess various types of *curiosity*, including deprivation sensitivity, joyous exploration, *stretching* and *embracing* subscales of *curiosity*. To expand on our understanding of the interplay between different types of *curiosity* and mental health, *depression*, *anxiety* and *stress* scores were obtained. These were measured by widely used screening tools also employed by one of the studies reviewed earlier (Denneson et al., 2017), and investigating this relationship in a healthy general population in the current study. To expand understanding of the most poorly researched dimensions of wellbeing in the context of *curiosity*, the experiment also aimed to evaluate participants' performance under stress. Moreover, to contextualise *curiosity* within a framework of stress coping, its connection to stress tolerance and coping efficacy was explored, employing measures used in the previous research (Denneson et al., 2017; Lam, 2022). Given that gender has been proposed as a

potential confounding variable in *curiosity* research, the present study endeavours to ensure gender parity by recruiting an equal number of male and female participants. Furthermore, this study will focus on young adults aged between 18 and 35 who were recruited from the general population. The rationale for this choice lies in the bulk of prior investigations that have centred on young cohorts, providing evidence for our hypothesis from the populations of undergraduate students and adolescents (Gallagher & Lopez, 2007; Jovanovic & Brdaric, 2012; Kaczmarek et al., 2013; Kashdan, 2004; Kawamoto et al., 2017; Li et al., 2023; Mishra, 2022a, 2022a, p. 202; Rodrigue et al., 1987). Furthermore, wider research identified changes in trait *curiosity* across time (Chu & Fung, 2021), while the scope of this research would not provide an opportunity to meaningfully explore differences in the several age groups.

Hypotheses:

1) Curiosity will show negative relationships with indicators of depression, anxiety, and stress.

2) Coping efficacy will be positively connected to curiosity.

3) Coping efficacy and stress tolerance will have mediating effects on the relationships between curiosity and indicators of mental health.

4) Curiosity will show positive relationships with task performance scores.

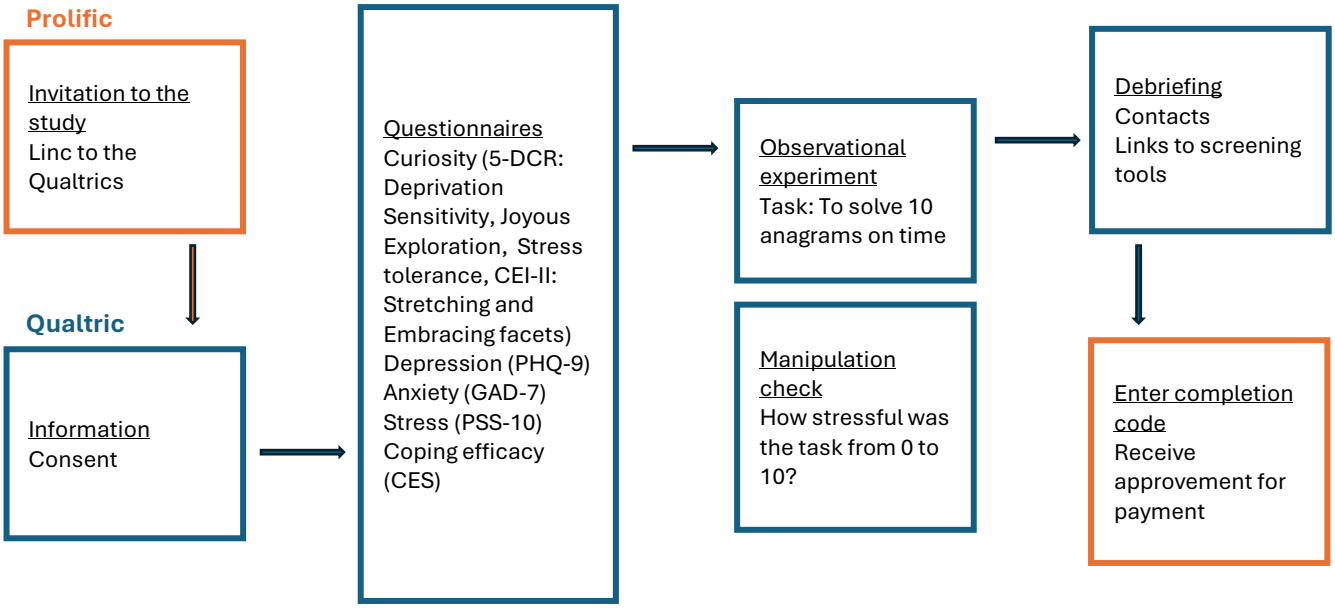
Chapter 3: Method

3.1 Design and Procedures

This cross-sectional study was set as an online observational experiment using the platform Qualtrics (https://www.qualtrics.com). All participants were recruited from the online platform Prolific (www.prolific.com) according to eligibility criteria and received the link to the study. Upon uploading the page, participants familiarised themselves with the provided online information and gave their consent for participation. Following this, they were asked to complete six questionnaires, measuring five dimensions of curiosity, three indicators of mental health and *coping efficacy* (see Figure 6 for the design overview). After completing the questionnaires participants took part in a short observational experiment aimed to measure performance under stress. For the experiment, participants were instructed about the task of solving as many anagrams as they could during the space of three minutes. This was followed by a manipulation check that measured how stressful it was to solve anagrams of time. The debriefing stage included information about research and links to NHS mental health screening tools and information. Before the debriefing stage participants were provided with the code that they were instructed to save and enter in Prolific to mark their completion. The study was preregistered in the OSF platform before data collection (see Appendix C; https://osf.io/4z2p8 for filled preregistration form).

Figure 6

Research Design Flow Chart



Note. PHQ-9- Patient Health Questionnaire, GAD-7 - Generalised Anxiety Disorder, PSS 10-Perceived Stress Scale, CEI-II – Curiosity Exploration Inventory-II, 5DCR – Five-Dimensional Curiosity Scale Revised, CES – Coping Efficacy Scale

3.2 Ethics

Ethical approval for this study was granted by the Health, Science, Engineering and Technology Ethics Committee with Delegated Authority of the University of Hertfordshire. The protocol number is LMS/PGR/UH/05602 (see Appendix D). This study did not require NHS ethics as it took place among the general population and did not require any interventions. All participants were recruited through the Prolific platform, which allows members of the general public to participate in research for financial compensation. Upon their registration to Prolific, they fill in demographic information about themselves and are notified about research only if they fit to eligibility criteria. For this study participants were informed that they could leave the study at any stage and would only be able to move to the

next screen of the study after consenting (see Appendix E for more details). In the information and consent stage, they were also provided with the contact details of the research team. The demographic information was collected to ensure transparency and inclusivity of the study (see Appendix F for more details). Participants had the option to write down their ethnicity if it was not found among the offered choices. They also had an option not to disclose their gender. As research included mental health questionnaires and a potentially stressful task on the debriefing page they were provided with links to NHS mental health screening tools and information (see Appendix G for more details). Overall participation in this study was associated with low risk. Data was obtained using the secure survey platform Qualtrics which was approved by the university's committee and then stored on the university hard drive.

3.3 Participants

3.3.1 Recruitment and Eligibility

The recruitment took place among healthy young adults age between 18 and 35 years old. Participants had to have access to a computer and the internet which allows them to participate in the online experiment. Participants must be able to fluently read and understand English. As the experiment includes a potentially stressful cognitive task, exclusion criteria for participation were having a learning disabilities diagnosis and/or inability to give informed consent. The online platform Prolific performed checks for eligibility criteria by offering participation in the study only to those participants whose profiles matched it. Additionally, settings for the study sample included equal distribution between men and women. Participation was compensated according to a 7.7 pounds hourly rate that was suggested by the platform as a "fair" rate. The estimated time to complete the questionnaire was calculated by the platform Qualtrics as 14 minutes and was compensated in the amount of 1.8 pounds sterling.

The software program G*Power was utilised to perform a power analysis. Our goal was to obtain .95 power to detect a medium effect size of .15 at the standard .05 alpha error probability. The medium effect size was chosen as curiosity and mental health indicators are complex constructs influenced by numerous factors, making it unlikely that the relationship between them would manifest as either very weak or very strong. Additionally, existing literature suggests that curiosity has a notable but not overwhelming impact on various psychological outcomes. Studies have shown that curiosity is associated with positive mental health indicators such as increased wellbeing and reduced depression measures, but these associations typically reflect moderate correlations (Kashdan & Steger, 2007a; Mishra, 2022b; Mohanty et al., 2015; Theuns et al., 2014).

Analysis was calculated with 6 total predictors and 4 tested predictors. The results of the power analysis suggested a target sample size of 129 participants. We aimed to recruit up to 160 in case of necessary exclusion of the data. A total number of 160 participants data was offered by the Prolific platform for approval and 7 datasets were marked as incomplete. The data set with the filled questionnaires was downloaded from Qualtrics and compared with the data set from the Prolific. Each data sample was approved manually if the ID number matched in both systems and participants successfully completed both attention checks. Attention checks were incorporated into two questionnaires and consisted of the suggestion to pick a certain answer for the question. Only one participant failed one of the attention checks and was excluded from the final analysis. However, another participant marked in the Prolific to have incomplete data was found in the Qualtrics data set with the completed experiment. In the Prolific database, this participant was moved to the category with the completed experiment and paid accordingly. One of the participant's IDs was found in the Qualtrics data set twice, while was logged only once in Prolific. Their first attempt was used for data analysis. Therefore, although one participant was removed from the final analysis, another

participant was added in the process of manual approval. The remaining dataset was of good quality, with all attention checks passed and sufficient time spent on the research.

3.3.2 Participants data

A total number of 160 participants was included in the study between the ages of 19 and 36 years (M = 29.3 SD = 4.4). Among those 78 identified as female, 76 as male, 4 as non-binary/third gender, and 2 preferred not to disclose their gender. The majority of participants were identified as white, totalling 131 individuals. The remaining participants were distributed among other ethnicities as follows: 14 identified as Mixed/Multiple ethnic groups, 8 as Asian/Asian British, and 7 as Black/African/Caribbean/Black British.

3.4 Measures

Mental health indicators, *curiosity*, and *coping efficacy* were measured using questionnaires. The set of measures was partially replicated from the previous *curiosity* and coping efficacy study described in the SLR (Denneson et al., 2017). The second measure of *coping efficacy* or performance under stress was measured by an anagram task (Endler et al., 2000).

3.4.1 Curiosity measures

Stretching and embracing curiosity: The Curiosity and Exploration Scale (CEI-II) was validated and used to evaluate stretching and embracing types of *curiosity* through its subscales (Kashdan et al., 2009). CEI-II showed an acceptable degree of internal consistency (Cronbach's α = .83), with subscales stretching (Cronbach's α = .79) and embracing (Cronbach's α = .76) showed moderate reliability. Ten statements describe a variety of personal traits and behaviours. Example of the statement for *stretching curiosity* subscale: *"I actively seek as much information as I can in new situations."*. Example of the statement for *embracing curiosity* subscale: *"I am the type of person who really enjoys the uncertainty of everyday life."* (see Appendix H for the full questionnaire). Participants rate from 1 – *"very*

slightly or not at all" to 5 – *"Extremely"* the way statements describe them. Both subscales are widely used in *wellbeing* and mental health studies as illustrated in the SLR (Kaczmarek et al., 2013; Mishra, 2022b; Theuns et al., 2014). The sum of scores was employed for the analysis.

Joyous Exploration, Deprivation Sensitivity, Stress Tolerance: Three subscales from the Five-Dimensional Curiosity Scale Revised (5DCR) were utilised to assess these facets of *curiosity* (Kashdan, Disabato, et al., 2020a). Each subscale is represented by 4 statements and combined in one questionnaire. Statements requested to be rated by participants on a seven-point scale from 1 – *"Does not describe me at all"* to 7 – *"Completely describes me".* The examples of the statement describing the *joyous exploration* subscale: *"I view challenging situations as an opportunity to grow and learn."*, the *deprivation sensitivity* subscale: *"Thinking about solutions to difficult conceptual problems can keep me awake at night."*, and the *stress* tolerance subscale: *"The smallest doubt can stop me from seeking out new experiences.".* Reversed scores were used for the analysis of the stress tolerance subscale (see Appendix I for the full questionnaire). This and the previous version of the questionnaire were validated and recently used in *wellbeing* studies (Birenbaum et al., 2019; Lam, 2022; Li et al., 2023). Convergent validity was shown through correlations with related constructs like openness to experience and intrinsic motivation, while discriminant validity is evidenced by low correlations with unrelated constructs (Kashdan, Disabato, et al., 2020a). It showed an acceptable degree of internal consistency across three subscales used in this study *joyous exploration* (Cronbach's $\alpha = .87$), *deprivation sensitivity* (Cronbach's $\alpha = .88$), *stress tolerance* (Cronbach's $\alpha = .88$). Each subscale was calculated separately, and the sum of scores for each subscale was employed for the analysis. The stress tolerance subscale was calculated with reversed scores.

3.4.2 Coping efficacy

The Coping Self-Efficacy Scale (CES) was utilised to assess self-reported coping efficacy (Chesney et al., 2006). Reduced 13-item contained statements regarding one's beliefs in their ability to utilise different types of coping in stressful situations. The reduced version was proposed by the authors of the questionnaire as included items indicated higher specificity among the original 26 statements. The questionnaire refers to three factors of coping: problem-focused (6 items), stopping unpleasant emotions and thoughts (4 items), and social support (3 items). CES showed an acceptable degree of internal consistency (Cronbach's $\alpha = .87$), with subscales get support from friends and family (Cronbach's $\alpha = .80$), to use problem-focused coping (Cronbach's $\alpha = .91$), and to stop unpleasant emotions and thoughts (Cronbach's $\alpha = .91$). Convergent validity was shown through correlations with related constructs like different types of coping and wellbeing, while discriminant validity is evidenced by negative correlations with the measures of psychological distress and maladaptive coping. A combined score of all three subscales was used for this research. The statements are rated on a ten-point scale from 0 – *"cannot do at all"* to 10 – *"certain can do".* Each item continues the statement: "When things aren't going well for you, or when you're having problems, how confident or certain are you that you can do the following:". The sum of scores was employed for the analysis (see Appendix J for the full questionnaire).

3.4.3 Mental Health Indicators

Depression: The Patient Health Questionnaire (PHQ-9) is a validated screening tool for depressive symptomology that was used to measure *depression* indicators (Kroenke et al., 2001). It has strong construct validity, correlating well with other depression measures and clinical diagnoses. It showed an acceptable degree of internal consistency (Cronbach's $\alpha = .84$). Nine statements in the questionnaire outline the main depressive symptoms and are rated in relevance to the one's condition over the last two weeks. Answers are rated from 0 –

"not at all" to 3 – *"nearly every day".* The sum of scores was employed for the analysis (see Appendix K for the full questionnaire).

Anxiety: Generalized Anxiety Disorder-7 (GAD-7) was used to assess possible indicators of *anxiety* (Swinson, 2006). It has strong construct validity, correlating well with other anxiety measures and clinical diagnoses. It showed an acceptable degree of internal consistency (Cronbach's $\alpha = .79$). The questionnaire consists of seven statements that reflect the main symptoms of Generalized Anxiety Disorder and have a similar rating structure as described above PHQ-9. The tool is a validated tool to use among the general population to screen for signs of *anxiety* (Löwe et al., 2008). The sum of scores was employed for the analysis (see Appendix L for the full questionnaire).

Preserved stress: The Perceived Stress Scale (PSS-10) was used as a validated measure to assess stress levels (Baik et al., 2019; Cohen et al., 1983; Harris et al., 2023). It showed an acceptable degree of internal consistency (Cronbach's $\alpha = .70$). Ten questions relate to one's experience of coping and stress factors in the last month. The examples of the questions "*In the last month, how often have you felt confident in your ability to handle your personal problems?"*, with a 4-point answer scale rated from 0 – *"never"* to 4 – *"very often".* The sum of scores was employed for the analysis, where items 4,5,7, and 8 were calculated as reversed scores (see Appendix M for the full questionnaire).

3.4.4 Performance under stress

The anagram task was used as a measure of performance under stress and was also offered as an empirical measure of coping efficacy (Endler et al., 2000). The task consisted of 10 anagrams with an estimated solution time between 9.7 and 55.7 seconds (Mayzner & Tresselt, 1958) (see Table 4). The task was constructed to give participants a chance for a successful solution for the anagrams while presenting with time pressure. Chosen words reflected different frequencies of occurrence per million words (from 100 to less than 1).

Anagrams were constructed using easy and more difficult letter order. According to the evidence these two parameters influence solution time (Mayzner & Tresselt, 1958). The estimated time to complete anagrams was around 5 minutes, however, to create time pressure it was decreased to 3 minutes in the experiment. All anagrams were presented to participants simultaneously with a visible countdown (see Appendix N). It was anticipated that having more diverse examples of anagrams and control in solution order would allow participants to engage with coping strategies of different natures (Aspinwall & Richter, 1999; Boyes & French, 2010; Endler et al., 2000). Each correctly solved anagram was rated as 1, missing or incorrectly solved was rated as 0 and the sum scores were employed for the analysis.

Table 4

Anagrams Selected for The Research

Correct solutions of the anagrams	**Estimated mean of time(seconds)**	**Anagram Easy order**	**Anagram Hard order**
Following words were characterised as very frequent (occurring 100 times or over per million)			
chair	9.7	IRCHA	
sugar	9.7	UGARS	
train	51.0		TIRNA
party	51.0		TAYPR
Following words were characterised as frequent (occurring at least 5O times per million)			
beach	7.3	HBEAC	
model	55.7		OLDME
Following words were characterised as infrequent (occurring at least once per million)			
patio	20.5	TIOPA	
cobra	20.5	OBRAC	
Following words were characterised as very infrequent (occurring less than once per million but more than once per four million)			
tango	46.8	GOTAN	
groin	46.8	OINGR	
	Total time: 319 (5.3 minutes)		

Note. Mayzner & Tresselt, 1958

3.4.5 Manipulation check

This check was established to ensure the task was stressful (see Appendix O). After completing the anagram task participants were asked to rate from 0 to 10 how stressful their experience was.

3.5 Pilot study

A pilot study was conducted to evaluate the integrity and functionality of the study design for the forthcoming main research. Five volunteer participants were enrolled and completed the test. The primary objectives of this pilot were to ensure the absence of errors, verify that each step of the questionnaire enforced a mandatory response, and check for any other potential issues. Additionally, the pilot aimed to assess the distribution balance among anagram tasks, ensuring that the most time-consuming solutions remain rarely solved, while none of them were omitted. The findings from the pilot indicated that there was a varied distribution of difficulty among the anagram tasks, as intended, rather than clustering around certain words. Furthermore, participants reported differing levels of stress while completing the task, with some pilot participants finding it very stressful and others less so. This variability confirmed that the study design was effective, providing confidence for proceeding with the main study.

3.6 Analysis Plan

Descriptive and statistical analysis was performed on the software JASP (JASP Team, 2020). Data preparation stages utilised Microsoft Office Excel sheets.

3.6.1 Data Cleaning

The data for this research was initially downloaded from Qualtrics, following the completion and payment approval process on Prolific. Upon downloading, the data was securely stored on an encrypted hard drive to ensure confidentiality and data integrity. The next step involved cleaning the dataset by removing all unnecessary fields that were automatically generated by Qualtrics, which were not essential to the research analysis. Subsequently, all relevant data was converted into numeric form. Finally, the sums for each variable were calculated, providing a clean and structured dataset for statistical analysis.

3.6.2 Descriptive Statistics

For each key variable in this study, mean, median, standard deviation (SD), range, skewness and kurtosis were calculated and reported in the result section. This stage of analysis aimed to describe the central tendency of each variable and the variability or dispersion of the data. These data also aimed to illustrate the span between the minimum and maximum values and the shape of the data distribution, identifying any potential asymmetry or tail heaviness. For a categorical variable, such as gender, the frequency and percentage of participants in each category were reported in the context of *curiosity* and *wellbeing* indicators to provide a detailed breakdown of the sample's composition.

A correlation matrix was reported to examine the relationships between the continuous variables in the study. Pearson correlation coefficients were calculated for each variable and presented in the results section. This stage aimed to identify potential multicollinearity issues and provide preliminary insights into the relationships among the variables before conducting the multiple regression and mediation analyses.

3.6.3 Statistical Analysis

Multiple regression analysis was performed to identify relationships between different types of *curiosity* and mental health indicators. A significant portion of our previous study described in the systematic literature review utilised multiple regression analysis as the primary modelling approach. While alternative methods, such as Structural Equation Modeling (SEM), were considered, it was essential first to establish a clear understanding of the linear relationships between different types of curiosity and various mental health indicators due to insignificant data in predicting more complex modelling. Based on the insights derived from the literature and the preliminary analyses, the multiple regression diagnostic plots and tests confirmed that the linear model had a good fit for this data set.

The first four multiple regressions aimed to identify significant predictors among four different *curiosity* facets for each mental health indicator measured in the study and the performance under stress score (see Table 5). Among these four, each multiple regression used the same independent variables. Dependant variables for these regressions were indicators of mental health (*depression* scores, *anxiety* scores, *perceived stress* scores) and task performance scores.

Table 5

List of the Multiple Regressions With Curiosity as Independent Variables

Number of multiple regression	Dependent variable	Independent variables
1	Depression Score (PHQ-9)	Deprivation sensitivity, Joyous exploration, Stretching, Embracing (four curiosity types)
2	Anxiety scores (GAD-7)	Deprivation sensitivity, Joyous exploration, Stretching, Embracing (four curiosity types)
3	Perceived stress scores (PSS-10)	Deprivation sensitivity, Joyous exploration, Stretching, Embracing (four curiosity types)
4	Task performance scores (number of solved anagrams)	Deprivation sensitivity, Joyous exploration, Stretching, Embracing (four curiosity types)

Next multiple regressions were estimated to employ *coping efficacy* measures and stress tolerance as predictors. The independent variables of the analysis were identified as significant predictors of mental health indicators and performance under stress. Therefore, three multiple regressions were performed for *stretching curiosity, joyous exploration* and *deprivation sensitivity*.

3.6.4 Exploratory Analysis

As a result of the multiple regression analysis six mediation analyses were performed to further investigate relationships between *curiosity* and mental health indicators. Stretching

curiosity and joyous exploration were identified as independent variables. Mediator variables were identified as *coping efficacy* and stress tolerance measures due to their positive predictor powers on both *curiosity* types. Dependent variables were *depression* scores (PHQ-9) scores and performance under stress. A full mediation effect was identified when the indirect effect was significant, and the direct effect was non-significant (Baron & Kenny 1986). Meaning the effect of the independent variable on the dependent was non-significant when a mediator was removed from the model. Partial mediation was defined as a significant indirect effect with a remaining significant direct effect. Meaning the effect of the independent variable on the dependent was significant when a mediator was present or removed from the model. The significance was determined at the $p < 0.05$ level.

Chapter 4: Results

4.1 Descriptive statistics

In this section, the descriptive statistics for all key variables are presented, encompassing the mean, median, standard deviation, Shapiro-Wilk test, skewness, kurtosis, minimum, and maximum values (see Table 6). The distribution plots, which illustrate distinct patterns for each measure, are provided in Appendix P. Notably, the Patient Health Questionnaire-9 (PHQ-9) and the Generalized Anxiety Disorder-7 (GAD-7) exhibited similar distribution profiles, with the majority of scores skewed towards the lower end. As these scores are used for screening in the general population, it is expected that their distribution will show a larger number of scores clustered at the lower end and fewer scores at the higher end (Kocalevent et al., 2013; Kroenke et al., 2010; Löwe et al., 2008). This skewness suggests that most participants reported lower levels of *depression* and *anxiety* symptoms. In contrast, the Perceived Stress Scale-10 (PSS-10) scores were normally distributed, which is also confirmed by the Shapiro-Wilk test. The data from the Coping Efficacy Scale (CES) was also normally distributed. Among the *curiosity* facets only the Curiosity and Exploration Inventory-II *stretching subscale* (CEI-S) and *deprivation sensitivity* subscale of the 5-Dimentional Curiosity Scale Revised (5DCR_DS) indicated normal distribution. Although some of the questionnaire data was not normally distributed, the sample size, calculated to achieve a power of .95, is large enough to provide sufficient power for performing parametric tests (Lumley et al., 2002; Norman, 2010). The descriptive statistics for gender across all key variables, with four individuals identifying as non-binary and two preferring not to disclose their gender, were calculated (see Appendix Q). However, no meaningful conclusions can be drawn from the results.

Table 6

Descriptive Statistics

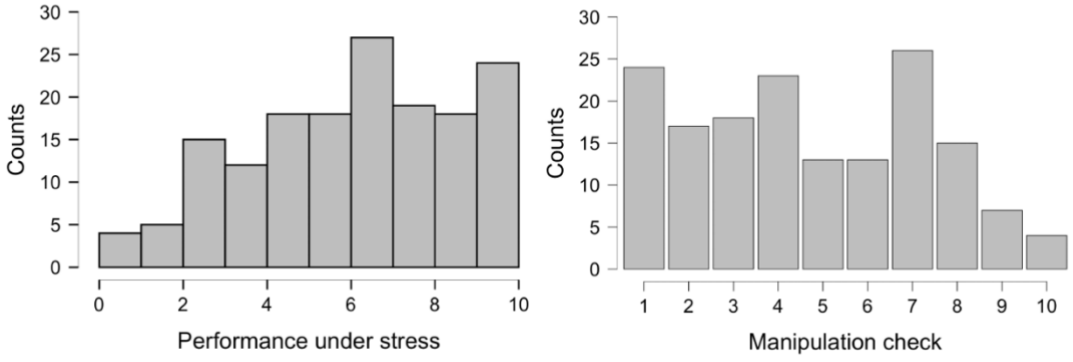
	PHQ-9	GAD-7	PSS-10	CEI-II	CEI-S	CEI-E	5DCR_JE	5DCR_DS	5DCR_ST	CES	Performance under stress	Manipulation check
Valid	160	160	160	160	160	160	160	160	160	160	160	160
Missing	0	0	0	0	0	0	0	0	0	0	0	0
Mean	7.975	7.287	18.181	28.181	15.688	12.494	18.887	16.100	15.925	70.475	6.531	4.700
Median	7.000	6.000	18.000	28.000	16.000	12.000	20.000	16.000	16.000	72.000	7.000	4.000
Std. Deviation	5.617	5.241	7.636	8.161	4.159	4.543	5.513	5.645	6.048	25.744	2.530	2.608
Variance	31.547	27.464	58.313	66.602	17.298	20.641	30.390	31.864	36.573	662.742	6.402	6.803
Skewness	0.733	0.617	0.002	0.009	-0.142	0.128	-0.734	-0.063	0.023	-0.253	-0.416	0.140
Std. Error of Skewness	0.192	0.192	0.192	0.192	0.192	0.192	0.192	0.192	0.192	0.192	0.192	0.192
Kurtosis	-0.106	-0.399	-0.294	-0.844	-0.561	-1.049	0.075	-0.623	-1.067	-0.198	-0.561	-1.131
Std. Error of Kurtosis	0.381	0.381	0.381	0.381	0.381	0.381	0.381	0.381	0.381	0.381	0.381	0.381
Shapiro-Wilk	0.937	0.943	0.990	0.981	0.982	0.958	0.952	0.983	0.967	0.990	0.945	0.936
P-value of Shapiro-Wilk	< .001	< .001	0.334	0.027	0.039	< .001	< .001	0.048	< .001	0.298	< .001	< .001
Minimum	0.000	0.000	0.000	10.000	5.000	5.000	4.000	4.000	4.000	8.000	0.000	1.000
Maximum	24.000	21.000	37.000	46.000	25.000	23.000	28.000	28.000	28.000	130.000	10.000	10.000

Note. PHQ-9- Patient Health Questionnaire, GAD-7 - Generalised Anxiety Disorder, PSS 10 - Perceived Stress Scale, CEI – Curiosity Exploration Inventory-II, CEI-S – Stretching curiosity, CEI-E – Embracing curiosity, 5DCR – Five-Dimensional Curiosity Scale Revised, 5DCR-JE – Joyous Exploration, 5DCR-DS – Deprivation Sensitivity, 5DCR-ST – Stress tolerance, CES – Coping Efficacy Scale, Performance under stress – number of correctly solved anagrams during three minutes, Manipulation check – self-evaluation of stress experienced during the anagram task.

To evaluate the efficiency of the anagram task distribution plots for performance under stress (the number of correctly solved anagrams) and manipulation check (how stressed participants felt during the task) were calculated (see Figure 7). The results indicated that most participants successfully solved the majority of the offered anagrams, despite taking two minutes less time than the average time typically required for the solution. There was a slight increase in the number of participants who solved all 10 anagrams, which could suggest that some participants either regularly engaged in this type of task or potentially accessed solutions online. The manipulation check, aimed at evaluating the stressfulness of the task, revealed a less definitive picture. Only a few participants found the task extremely stressful, while many rated it as not stressful or only moderately stressful. This suggests that the task may not have been sufficiently stressful to elicit strong stress responses among the participants.

Figure 7

Descriptive Statistics for The Observational Experiment



Among the possible covariate variables considered in the study were age and education. The correlation matrix revealed that age had no significant correlation with any of the key variables, suggesting that age did not influence the outcomes measured (see Table 7). However, education showed a significant negative correlation with depression scores (PHQ-

9) and a small but significant positive correlation with joyous exploration (r = - .204, p < .01, r = 0.164, p = .038).

All mental health indicators exhibited significant, large, positive correlations with one another. In particular, the *depression* scores (PHQ-9) with the *anxiety* scores (GAD-7) indicated high levels of comorbidity between the two indicators (r = .775, p < .001). Similarly, all five facets of *curiosity* were found to have significant correlations with one another, reflecting the interconnectedness of different dimensions of *curiosity* (r = from .262 to .832, p < .001). *Stretching curiosity* and joyous exploration scores indicated the largest positive correlation (r = . 832, p < .001).

However, the number of solved anagrams did not show any significant correlations with the key variables. As hypothesised, *curiosity* facets apart from deprivation sensitivity were negatively significantly correlated with *depression* (r = from - .172 to - .314, from p < .05 to p < .001), *stress* (r = from - .266 to - .531, p < .001) and *anxiety* scores (r = from - .192 to - .314, from p < .05 to p < .001). *Deprivation sensitivity* was found to have a positive small but significant correlation with *anxiety* (r = .180, p = .023). This facet of *curiosity* was also the only one that had no positive correlation with *coping efficacy* while the other four had small to moderate positive correlations with it. Similarly, *deprivation sensitivity* was the only facet of *curiosity* that did not indicate a significant negative correlation with *perceived stress* scores (PSS-10). These results indicated that deprivation sensitivity stands out among other *curiosity* subscales in its relationships to the mental health indicators scores.

Table 7

The Correlation Matrix for All Variables in The Research

Variable		Age	Education	PHQ-9	GAD-7	PSS-10	CEI-II	CEI-S	CEI-E	V5DCR_JE	V5DCR_DS	V5DCR_ST	CES	Performance under stress
1. Age	Pearson's r	—												
	p-value	—												
2. Education	Pearson's r	-0.092	—											
	p-value	0.248	—											
3. PHQ-9	Pearson's r	-0.013	**-0.204****	—										
	p-value	0.868	0.010	—										
4. GAD-7	Pearson's r	0.006	-0.144	**0.775*****	—									
	p-value	0.944	0.069	< .001	—									
5. PSS-10	Pearson's r	-0.082	-0.015	**0.545*****	**0.555*****	—								
	p-value	0.305	0.855	< .001	< .001	—								
6. CEI-II	Pearson's r	-0.095	0.090	**-0.232****	**-0.222****	**-0.318*****	—							
	p-value	0.231	0.259	0.003	0.005	< .001	—							
7. CEI-S	Pearson's r	-0.042	0.118	**-0.268*****	**-0.226****	**-0.334*****	**0.932*****	—						
	p-value	0.594	0.137	< .001	0.004	< .001	< .001	—						
8. CEI-E	Pearson's r	-0.132	0.053	**-0.172***	**-0.192***	**-0.266*****	**0.943*****	**0.758*****	—					
	p-value	0.096	0.504	0.030	0.015	< .001	< .001	< .001	—					
9. 5DCR_JE	Pearson's r	-0.054	**0.164***	**-0.279*****	**-0.217****	**-0.330*****	**0.773*****	**0.832*****	**0.627*****	—				
	p-value	0.494	0.038	< .001	0.006	< .001	< .001	< .001	< .001	—				
10. 5DCR_DS	Pearson's r	-0.078	0.008	0.137	**0.180***	-0.045	**0.403*****	**0.478*****	**0.286*****	**0.490*****	—			
	p-value	0.325	0.925	0.084	0.023	0.571	< .001	< .001	< .001	< .001	—			
11. 5DCR_ST	Pearson's r	-0.054	0.067	**-0.314*****	**-0.314*****	**-0.531*****	**0.303*****	**0.309*****	**0.262*****	**0.337*****	-0.007	—		
	p-value	0.494	0.399	< .001	< .001	< .001	< .001	< .001	< .001	< .001	0.926	—		
12. CES	Pearson's r	0.002	0.103	**-0.507*****	**-0.488*****	**-0.417*****	**0.526*****	**0.515*****	**0.474*****	**0.436*****	0.077	**0.227***	—	
	p-value	0.984	0.194	< .001	< .001	< .001	< .001	< .001	< .001	< .001	0.331	0.004	—	
13. Performance under stress	Pearson's r	-0.006	-0.067	0.051	0.031	0.139	-0.063	-0.023	-0.091	-0.091	-0.144	0.047	-0.052	—
	p-value	0.939	0.402	0.519	0.701	0.081	0.432	0.773	0.251	0.253	0.070	0.557	0.511	—

14. Manipulation check	Pearson's r	-0.038	-0.028	0.138	0.136	0.056	0.011	-0.028	0.045	-0.034	-0.006	0.089	-0.076	-0.125
	p-value	0.635	0.723	0.081	0.086	0.483	0.889	0.727	0.568	0.671	0.944	0.263	0.343	0.114

Note. PHQ-9- Patient Health Questionnaire, GAD-7 - Generalised Anxiety Disorder, PSS 10- Perceived Stress Scale, CEI – Curiosity Exploration Inventory-II, CEI-S – Stretching curiosity, CEI-E – Embracing curiosity, 5DCR – Five-Dimensional Curiosity Scale Revised, 5DCR-JE – Joyous Exploration, 5DCR-DS – Deprivation Sensitivity, 5DCR-ST – Stress tolerance, CES – Coping Efficacy Scale, Performance under stress – number of correctly solved anagrams during three minutes, Manipulation check – self-evaluation of stress experienced during the anagram task.

4.2 Statistical Analysis

4.2.1 Relationships Between Different Types of Curiosity and Mental Health Indicators

The nature of the connection between different types of *curiosity* and mental health indicators was shown in the result of multiple regression. The first multiple regression identified the association of the four types of *curiosity* to *depression* scores (PHQ-9 scores). The overall model for four predictors was significant (R^2 = .20, F = 9.53, p < .001). Interestingly, *stretching curiosity* and *joyous exploration* had negative association with *depression* scores, while, in contrast to the hypothesis, *deprivation sensitivity* indicated a positive relationship (see Table 8).

Table 8

Coefficients for The Depression Indicators Scores (PHQ-9)

Model		Unstandardized	Standard Error	Standardized	t	p	95% CI Lower	95% CI Upper
H_0	(Intercept)	7.975	0.444		17.960	< .001	7.098	8.852
H_1	(Intercept)	11.906	1.654		7.200	< .001	8.640	15.173
	CEI-S	-0.427	0.214	**-0.316**	-1.997	**0.048**	-0.849	-0.005
	CEI-E	0.176	0.138	0.142	1.279	0.203	-0.096	0.448
	5DCR_JE	-0.304	0.135	**-0.298**	-2.254	**0.026**	-0.570	-0.038
	5DCR_DS	0.391	0.084	**0.393**	4.671	**< .001**	0.226	0.557

Note. CEI-S – Stretching curiosity, CEI-E – Embracing curiosity, 5DCR-JE – Joyous Exploration, 5DCR-DS – Deprivation Sensitivity

Similarly, the overall model for *anxiety* indicators scores (GAD-7) for all four predictors was significant (R^2 = 0.17, F = 8.05, p < .001). However, only *deprivation sensitivity* indicated a positive association (see Table 9). Therefore, there no significant negative predictors were identified.

Table 9

Coefficients for The Anxiety Indicators Scores (GAD-7)

Model		Unstandardized	Standard Error	Standardized	t	p	95% CI Lower	95% CI Upper
H_0	(Intercept)	7.287	0.414		17.590	< .001	6.469	8.106
H_1	(Intercept)	9.880	1.567		6.305	< .001	6.785	12.976
	CEI-S	-0.321	0.202	-0.254	-1.583	0.115	-0.721	0.079
	CEI-E	0.024	0.131	0.021	0.185	0.853	-0.234	0.282
	5DCR_JE	-0.204	0.128	-0.215	-1.598	0.112	-0.456	0.048
	5DCR_DS	0.372	0.079	**0.401**	4.686	**< .001**	0.215	0.529

Note. CEI-S – Stretching curiosity, CEI-E – Embracing curiosity, 5DCR-JE – Joyous Exploration, 5DCR-DS – Deprivation Sensitivity

For the last mental health indicator suggested by the hypothesis, the perceived stress scores (PSS-10) the overall model for four *curiosity* facets as predictors was significant (R^2 = .14, F = 6.46, p < .001). Similarly to the model for *anxiety*, *deprivation sensitivity* was the only *curiosity* facet that indicated a significant unique association (see Table 10). Therefore models for *anxiety* and *perceived stress* indicated similar profiles with four *curiosity* subscales. Therefore first hypothesis about the negative relationships between *curiosity* and indicators of *depression*, *anxiety*, and *stress* was only partially proven. The analysis identified that only *stretching curiosity* and *joyous exploration* had negative association with only *depression* scores. While *deprivation sensitivity* contrary to our hypothesis has positive association with all three mental health indicators (*depression*, *stress* and *anxiety* scores).

Table 10

Coefficients for The Perceived Stress Indicators Scores (PSS-10)

Model		Unstandardized	Standard Error	Standardized	t	p	95% CI Lower	95% CI Upper
H_0	(Intercept)	18.181	0.604		30.116	< .001	16.989	19.374
H_1	(Intercept)	26.881	2.323		11.571	< .001	22.292	31.470
	CEI-S	-0.425	0.300	-0.232	-1.417	0.159	-1.018	0.168
	CEI-E	-0.003	0.194	-0.002	-0.013	0.989	-0.385	0.380
	5DCR_JE	-0.307	0.189	-0.222	-1.622	0.107	-0.681	0.067

	5DCR_DS	0.236	0.118	**0.175**	2.007	**0.046**	0.004	0.469

Note. CEI-S – Stretching curiosity, CEI-E – Embracing curiosity, 5DCR-JE – Joyous Exploration, 5DCR-DS – Deprivation Sensitivity

For the anagram task which aimed to indicate performance under stress the overall model was not significant ($R^2 = 0.05$, $F = 2.11$, $p = 0.08$). Therefore, the second hypothesis that *curiosity* has a positive relationship with task performance scores was not supported by the results.

The results of four multiple regressions indicated that stretching *curiosity*, *deprivation sensitivity*, and *joyous exploration* had significant association with mental health indicators (see Table 11). Among those relationships, the first two aligned with the hypothesis and indicated inverse relationships between *curiosity* and *depression*. However, positive relationships between *deprivation sensitivity* and all three mental health indicators do not support the original hypothesis. Nevertheless, in the preregistration stage, every significant predictor for mental health has been planned for further analysis. Therefore, three of these *curiosity* types were subjected to further analysis to investigate their relationship with *coping efficacy* and *stress tolerance*.

Table 11

Significant Predictors Pairs for Exploratory Analysis

Direction of relationships	Curiosity type	Mental health indicator
Negative	Stretching Curiosity	Depression Scores
Negative	Joyous Exploration	Depression Scores
Positive	Deprivation Sensitivity	Depression Scores
Positive	Deprivation Sensitivity	Anxiety Scores
Positive	Deprivation Sensitivity	Perceived Stress Scores

4.2.2 Coping Efficacy, Stress Tolerance and Curiosity

The overall model where *coping efficacy* and *stress tolerance* were predictors for *stretching curiosity* was significant (R^2 = .30, F = 34.34, p < .001). In this model, both coping efficacy and *stress tolerance* indicated unique association (see Table 12).

Table 12

Coefficients for Stretching Curiosity

Model		Unstandardized	Standard Error	Standardized	t	p	95% CI Lower	95% CI Upper
H_0	(Intercept)	15.688	0.329		47.711	< .001	15.038	16.337
H_1	(Intercept)	8.116	0.991		8.189	< .001	6.159	10.074
	CES	0.076	0.011	**0.469**	6.867	**< .001**	0.054	0.098
	5DCR_ST	0.139	0.047	**0.202**	2.958	**0.004**	0.046	0.232

Note: 5DCR-ST – Stress tolerance, CES – Coping Efficacy Scale

Similar findings were identified for *joyous exploration* with the overall model was significant (R^2 = .25, F = 26.16, p < .001). Where both *coping efficacy* and *stress tolerance* indicated unique association (see Table 13).

Table 13

Coefficients for Joyous Exploration

Model		Unstandardized	Standard Error	Standardized	t	p	95% CI Lower	95% CI Upper
H_0	(Intercept)	18.887	0.436		43.338	< .001	18.027	19.748
H_1	(Intercept)	9.504	1.364		6.968	< .001	6.810	12.198
	CES	0.081	0.015	**0.379**	5.346	**< .001**	0.051	0.111
	5DCR_ST	0.229	0.065	**0.251**	3.530	**< .001**	0.101	0.357

Note. 5DCR-ST – Stress tolerance, CES – Coping Efficacy Scale

In contrast, for deprivation sensitivity similar overall model with *coping efficacy* and stress tolerance as predictors was not significant (R^2 = .007, F = .52, p = .59). Therefore, the third hypothesis that *coping efficacy* was positively connected to *curiosity* was true only for *joyous exploration* and *stretching curiosity*. While no significant connection to *coping efficacy* was identified for *deprivation sensitivity* and *embracing curiosity*. Therefore, variables for exploratory mediation analysis were selected only for *stretching curiosity* and *joyous exploration* (see Table 14). Mediation analysis was aimed to further examine the significant relationships between *curiosity* and mental health indicators by introducing *coping efficacy* and *stress tolerance* as possible mediators for this connection.

Table 14

Pathways for Mediation Analysis

Direction of the relationships between curiosity and depression	Curiosity type	Mediators	Mental health indicator
Negative	Stretching Curiosity	Coping efficacy and Stress tolerance	Depression scores
Negative	Joyous Exploration	Coping efficacy and Stress tolerance	Depression scores

4.3 Exploratory Analysis

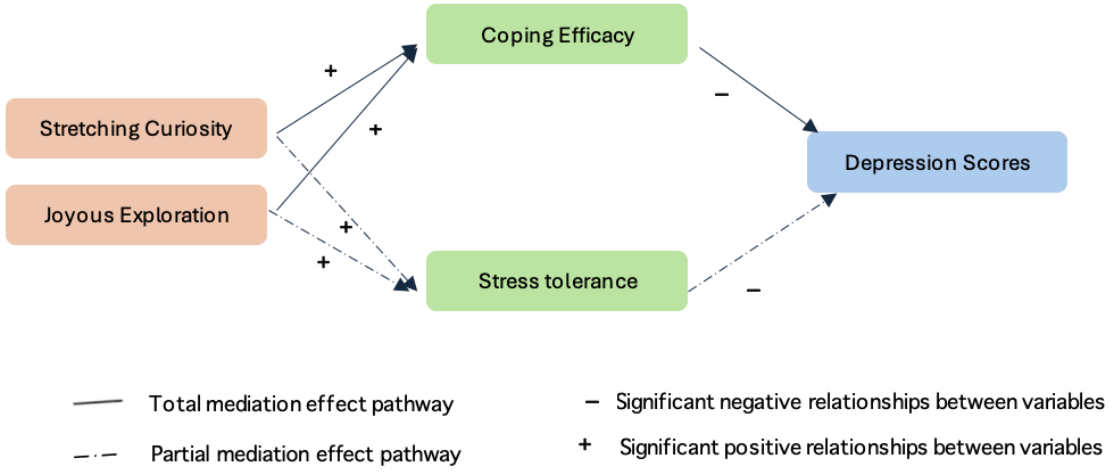
These results of the mediation analysis indicate that the relationship between *joyous exploration* and *depression* scores was fully mediated by *coping efficacy*. The direct effect of joyous exploration on *depression* scores was not statistically significant (z = - .95, p = .34). This suggests that, when coping efficacy is included in the model, *joyous exploration* does not have a significant direct impact on *depression* scores. In contrast, the indirect effect of *joyous exploration* on *depression* scores via *coping efficacy* was statistically significant (z = - 4.39, p < .001). This indicates that joyous exploration affects *depression* scores indirectly by

influencing *coping efficacy*, which in turn affects *depression* scores. These results indicate that the relationship between *joyous exploration* and *depression* scores was fully mediated by *coping efficacy*. Furthermore, stress tolerance had only a partial mediation effect on the relationships between *joyous exploration* and *depression* scores. Where both direct effect (z = - 2.50, p = .01) and indirect effect (z = - 2.60, p = .009) were statistically significant (see Appendix R for detailed tables).

Similar mediation effects were found for the relationship between *stretching curiosity* and *depression* scores (see Appendix S for detailed tables). Where *coping efficacy* indicated a total mediating power effect on the relationships between *stretching curiosity* and *depression* scores (direct effect: z = - .12, p = .90; indirect effect: z = - 4.86, p < .001), while *stress tolerance* had only partial mediation (direct effect: z = - 2.44, p = .015; indirect effect: z = - 2.57, p = .01). *Coping efficacy*, had a full mediation effect on the relationships between two types of *curiosity* and *depression* scores, while *stress tolerance* only partial effect to the same relationships (Figure 8).

Figure 8

Significant Mediations of the Exploratory Analysis



Overall, three out of four hypotheses were partially supported by the results. The strongest relationships were indicated between *stretching curiosity* and *joyous exploration*,

both of which were individually negatively associated with *depression*. Additionally, they demonstrated similar mediation profiles that included the total mediation effect of *coping efficacy* and the partial mediation effect of *stress tolerance* to the relationships between *curiosity* and *depression* indicators. These findings are discussed in more detail in the following chapter.

Chapter 5: Discussion

5.1 Overview

The current study aimed to deepen the understanding of the relationship between different types of *curiosity* and primarily mental health indicators, including *depression*, *anxiety*, and *stress*. Additionally, the study examined the potential mediation effects of *stress tolerance* and *coping efficacy* on these relationships. In this section the key results are discussed, linking them to the broader research context and systematic literature review findings. Furthermore, the clinical and theoretical implications of the findings were described along with the study's limitations and strengths.

5.2 Summary and Key Findings

The study provided several important insights into the relationships between different types of *curiosity* and mental health indicators. Specifically, the findings showed that *stretching curiosity* and *joyous exploration* were negatively associated with *depression* scores, indicating that higher levels of these *curiosity* types are linked to lower levels of *depression*. Therefore, the first hypothesis that *curiosity* will have a negative association with mental health indicators was partially confirmed.

The second hypothesis indicating a positive association between *coping efficacy* and *curiosity* was also supported by the findings of the study. The correlation analysis outlined that each type of *curiosity* apart from *deprivation sensitivity* was significantly positively associated with *coping efficacy*. Furthermore, *coping efficacy* along with *stress tolerance* was found to have association with *joyous exploration* and *stretching curiosity*.

The third hypothesis for the study predicted a possible mediation effect of *coping efficacy* and *stress tolerance* on the relationship between *curiosity* and mental health indicators. This hypothesis was fully supported by results only for *stretching curiosity* and *joyous exploration* and *depression* scores. Mediation analysis indicated that *coping efficacy*

and *stress tolerance* were significant mediators in the relationship between these types of *curiosity* and depression. Specifically, the relationship between *stretching curiosity* and *depression*, as well as between *joyous exploration* and *depression*, was fully mediated by coping efficacy. *Stress tolerance* also partially mediated these relationships, indicating it plays a role, although less pronounced, in the connection between curiosity and depression.

In contrast with the hypothesis, all four types of curiosity had no significant relationship with performance under stress, as measured by the anagram task. Therefore, the fourth hypothesis, suggesting a positive association between *curiosity* and task performance, was not supported by the results of the study. According to descriptive statistics, the experiment aimed to evaluate performance under stress was not highly effective, therefore relationships between *curiosity* and performance under *stress* cannot be described by these findings with confidence.

In contrast with the hypothesis, multiple regression analysis found no significant inverse association of curiosity to *perceived stress* (as measured by the PSS-10) or *anxiety* indicators (as measured by the GAD-7). Therefore, only correlational analysis used in descriptive statistics provided indicators of the negative associations between these mental health indicators and all curiosity facets apart from deprivation sensitivity. Multiple regression analysis continues to single out *deprivation sensitivity* as one of the *curiosity* types that has a positive association to indicators of *depression*, *anxiety* and *stress*. Therefore, although models for *anxiety* and *stress* were significant, only *deprivation sensitivity* had unique association and it was positive. These findings highlight the complex and nuanced roles that different types of curiosity play in mental health and coping mechanisms.

5.3 Key findings

5.3.1 Curiosity and Stress

Although some previous longitudinal research identified a connection and protective power of curiosity on the daily stressors (Drake et al., 2022), the findings of this research indicated only positive association. Furthermore, the majority of research outlined in the SLR did not indicate a strong connection between the two constructs. In Drake's study *stretching* and *embracing* facets of curiosity were used (Drake et al., 2022), while the current model combined four different types of *curiosity*. *Deprivation sensitivity*, *stretching* and *embracing* curiosity have different profiles and are associated with different emotional, behavioural, and motivational experiences. One can suggest that different types of curiosity can have different predictive power on stress. However, when all four types of curiosity were included in the same model in this research, only deprivation sensitivity indicated a unique association. These results suggest that different types of curiosity can have varying levels of influence on stress, highlighting the unique role of deprivation sensitivity.

Additionally, these findings suggest that perhaps a cross-sectional study design is insufficient to capture the nature of *curiosity* and *stress*. Diverse coping strategies and perceived resources may influence individuals' *perceived stress* levels uniquely, affecting measures of *stress* commonly used in cross-sectional studies (Obbarius et al., 2021). Stress-coping profiles consist of multiple strategies of adaptive and less adaptive behaviours that appear as a response to stressors. Earlier theories suggest that every coping strategy takes a part in effective coping, however, if strategies are over or underused it can transfer into additional stressors (Folkman & Lazarus, 1988). For example, avoidance can help people prevent conflicts or being exposed to negative experiences, however, when used often can prevent them from achieving goals and potential development. In its extreme form, avoidant behaviour can develop different forms of addiction (Chou et al., 2018; García-Oliva &

Piqueras, 2016; Thomas et al., 2011). Similarly, with other strategies, positive re-evaluation can help people to accept the situation, but when used too often can influence the ability to problem-solve and decrease opportunities for the person to objectively improve their life (Biggs et al., 2017). This project identified that different types of curiosity can have polarised associations with mental health indicators, such as stress. Furthermore, studies identified a positive association between curiosity and positive coping strategies (Wlodarczyk, 2017) and maladaptive strategies (Basnet et al., 2021). As assisting with coping is not a major purpose of *curiosity*, its influence can be indirectly connected to the development of coping strategies. Exploration that is triggered by curiosity can have positive consequences for coping, for example, expanding knowledge of the different ways of solving problems and understanding emotions and reactions better. However, exploration can also introduce people to risky behaviour, and maladaptive and dangerous strategies of coping. For example, some research suggests that *curiosity* improves memory irrelevant of the valence of the information (Padulo et al., 2022). In other words, while *curiosity* acts as a driver for exploration, it may require additional mechanisms to provide direction and set aims for the exploration.

5.3.2 Stretching Curiosity and Joyous Exploration

This study identified similar profiles for the relationships between *stretching curiosity* and depression scores and *joyous exploration* and depression scores. Thus similar association and the relationships with the mediators were indicated for both types of curiosity in the context of depression scores. The similarity of these profiles draws attention to the conceptual similarity between *joyous exploration* and *stretching curiosity*.

Stretching curiosity and *joyous exploration*, while distinct in their nuances, share some key similarities that may underline their roles in fostering *wellbeing*. *Stretching curiosity*, defined as the desire to seek out new knowledge and experiences, fosters cognitive and emotional growth by encouraging individuals to explore and learn (Kashdan et al., 2009;

Kashdan & Steger, 2007b). Similarly, *joyous exploration* is characterised by the pursuit of novel and enjoyable experiences (Fredrickson, 2001). Consequently, both types of curiosity involve a proactive engagement with new information and experiences. Furthermore, they both are associated with positive affect. *Stretching curiosity* and *joyous exploration* have shown a positive correlation in previous research (Kashdan et al., 2018). The correlational analysis of the current study also identified a significant positive correlation between *stretching curiosity* and *joyous exploration*. This was the strongest correlation observed between two distinct facets of curiosity.

Further similarities between *stretching curiosity* and *joyous exploration* were observed in identical profiles outlined in the mediation analysis. The study found that *coping efficacy* acted as a total mediator in the relationship between both types of *curiosity* and *depression* indicators. *Coping efficacy* is defined as the belief in one's ability to manage stressful events and its consequences (Hua & Howell, 2022; Shahrour & Dardas, 2020). It was found to have positive predictive power to distress levels while people with low *coping efficacy* experienced higher *stress* (Shahrour & Dardas, 2020). Additionally, it was found that higher *coping efficacy* had a negative association with information avoidance (Hua & Howell, 2022). Specifically, individuals with higher *coping efficacy*, or those whose *coping efficacy* was strengthened by memories of positive coping experiences, were less likely to avoid learning about health risks. In the previous chapters of this work, a similar negative association between curiosity and avoidance was made. Both *stretching curiosity* and *joyous exploration* share an association with the proactive search for new information and positive exploration. This behaviour can provide individuals with a broader range of strategies to cope with stress, thereby enhancing their *coping efficacy*. Consequently, this increased belief in their ability to cope may help protect against *depression*, as has been supported by the research on *daily curiosity* (Drake et al., 2022). This suggests that the mechanism through

which curiosity supports and safeguards against *depression* involves the reinforcement of *coping efficacy* through continual exploration and learning.

In future research, exploring the relationship between these two facets of curiosity and *depression* could involve examining how different aspects of *coping efficacy* contribute to this relationship. The Coping Efficacy Questionnaire includes subscales related to problem-focused coping, managing unpleasant emotions and thoughts, and seeking social support, which are fundamental to specific coping strategies (Chesney et al., 2006). Investigating which specific dimensions of *coping efficacy* are most closely associated with *curiosity* could offer insights into how *curiosity* influences mental health outcomes. Understanding these associations could also shed light on the mechanisms through which *curiosity* mitigates *depression*, potentially leading to more targeted interventions and support strategies for individuals at risk.

5.3.3 Negative association between Curiosity and Depression

The negative relationship between *curiosity* and *depression* that has been identified in this research can be considered one of the strongest established in the wider literature (Kaczmarek et al., 2013; Lydon-Staley et al., 2020; Theuns et al., 2014). This association was also the most consistent throughout the systematic literature review described above, in particular for *stretching curiosity*. The current research results highlight the inverse association between *depression* and *stretching* and *joyous exploration*. The relationship between *curiosity* and *depression* can be influenced by multiple factors. Both *stretching curiosity* and *joyous exploration* are associated with positive affect stemming from the exploration and embracing of novel information. The role of positive emotions was recognised to be beneficial for wellbeing and development (Fredrickson, 2001a). In turn, negative or challenging events accompanied by negative thinking are associated with the pathway for developing *depression* symptoms (Kinderman et al., 2015). Furthermore,

wellbeing was found to be a mediator for a relationship between *curiosity* and *depression* (Theuns et al., 2014). Notably, curiosity was measured as a combined score of *stretching* and *embracing* facets, while *wellbeing* was assessed as the happiness index which is the most closely associated with the *life satisfaction* measure. These findings suggest that one way that curiosity can support people against depression is to provide positive daily experiences that improve *life satisfaction*.

Building on previous discussions regarding the role of positive coping, *stress tolerance* was indicated as a potential partial mediator, and *coping efficacy* as a complete mediator in this relationship. Apart from the association with coping strategies, coping efficacy reflects one's belief in their ability to manage challenges, indicating an ability for introspection and self-confidence (Green et al., 2022). Positive self-perception and evaluation of one's ability can improve resilience and promote *wellbeing* (Taylor & Stanton, 2007). In contrast, self-deprecating and self-blaming thoughts are associated with *depressive* symptomology (Lopes & Nihei, 2021). Those people who often experience *curiosity* and engage with positive exploration can develop a better understanding of their abilities in the context of difficult situations. To understand this connection better further research is needed to explore subsets of *coping efficacy, stretching curiosity* and *joyous exploration* in daily life.

Moreover, our ability for introspection can be supported by *curiosity* to own feelings and thoughts. Within the mindfulness conceptualisation that specifies decentring and curiosity as two subscales of mindfulness measure, curiosity shows a specific association with awareness of internal states (Lau et al., 2006). Interestingly, within this conceptualisation *curiosity* was also negatively associated with *depression* but found no connection with stress in the other study (Bieling et al., 2012; Lau et al., 2006). Understanding one's feelings and thoughts provides opportunities for cognitive growth and emotional resilience and remains an important part of mental health treatment (Clark, 2020;

Longmore & Worrell, 2007). These results further support the negative association between *curiosity* and *depression*, suggesting that possibly cultivating *curiosity* about one's feelings and thoughts can act as a protective factor against *depression*. Understanding this mechanism within the context of mental health treatment could clarify how *curiosity* functions as a protective factor against *depression*, leveraging both external engagement and internal reflection. Overall, these findings suggest that fostering certain types of *curiosity*, such as *stretching curiosity* and *joyous exploration*, can be beneficial to mental health by improving coping efficacy.

Finally, *stress tolerance* defined as the ability to positively withstand all the uncertainty that arises from novel environments or information partially mediates the relationship between *curiosity* and *depression.* This study defines *stress tolerance* within the five-dimensional conceptualisations of *curiosity* (Kashdan, Disabato, et al., 2020a). The other research defines *stress tolerance* in the context of coping strategies and associates it more with resilience (Bland et al., 2012). In this study, it is associated with positive uncertainty and is a facet of curiosity. Therefore partial mediation effect can be connected with its ability to facilitate new knowledge that is a part of the motivation mechanisms behind curiosity. Further research can extend the investigation of mediating factors by broader conceptualising *stress tolerance*.

Social curiosity was not included in the systematic literature review due to its specificity and limitations of the scope of this project. Consequently, it was not indicated for the experimental research as a possible predicting factor for mental health. However, social context is an essential part of effective coping and *wellbeing* (Folkman, 2011; Folkman & Lazarus, 1988; Stein & Sadana, 2015). *Social curiosity* can be defined as an interest in other people's feelings, thoughts and observation of their behaviour (Kashdan, Disabato, et al., 2020b). It connected to the desire to understand others better and suggested having an

influence on skill development through these observations. While this type of curiosity is not conceptually linked directly to social interactions or support, future research can explore its indirect effect through mechanisms such as problem-solving and the pursuit of knowledge.

Access to emotional support and a diverse social network can act as protective factors for *depression* (Santini et al., 2015). The conceptualisation of the *coping efficacy* also suggests the importance of the social support identified in its subscale (Chesney et al., 2006). Therefore, future research can consider the investigation of the association between the social support subscale of coping efficacy and *stretching curiosity* and *joyous exploration*. Additionally, a closer investigation of *social curiosity* and its impact on mental health outcomes could provide further insights into the comprehensive role of curiosity in promoting *wellbeing*.

5.3.4 Deprivation Sensitivity and Mental Health Indicators

The results of this study indicated that deprivation sensitivity was the only type of curiosity that showed a positive relationship with depression, stress and anxiety indicators. This was not predicted by the hypothesis of the study due to inconsistency and limited studies available on the topic. However, these findings align with the existing literature mentioned in the systematic literature review of this thesis (Lam, 2022; J. A. Litman & Jimerson, 2004). In these studies deprivation sensitivity not only indicated a positive association with anxiety and depression but a negative connection to wellbeing. Furthermore, the current experimental study indicated that *deprivation sensitivity* was the only curiosity type that was not associated with *coping efficacy* in the correlation analysis.

In contrast to other curiosity and in line with information gap theory *deprivation sensitivity* is characterised by an aversive state (Litman, 2008). This suggests that some forms of exploration can be associated with tension stemming from the lack of desired knowledge. These feelings, experienced regularly can be closely associated with the negative effects of

exploration. Furthermore, *deprivation sensitivity* as a facet of *curiosity* can be driven by feelings of uncertainty and the need to fulfil it. Negative reaction to uncertainty, also known as intolerance to uncertainty is strongly associated with *depression, stress and anxiety* in both general and clinical populations (Bakioğlu et al., 2021; Carleton et al., 2012; Dar et al., 2017; Demirtas & Yildiz, 2019; Jensen et al., 2016). Research also indicated a stronger connection between intolerance to uncertainty and anxiety compared to depression. This suggests that individuals who struggle with uncertainty are more likely to experience heightened levels of *anxiety* than *depressive* symptoms. In contrast, *stretching curiosity* and *joyous exploration* that have a negative association with *depression* are described in the context of positive experiences during exploration. Additionally, correlational analysis in the current research identified that among all curiosity facets *deprivation sensitivity* did not correlate only to *stress tolerance*, also known as positive uncertainty. Furthermore, while *stress tolerance* has a unique association to stretching and embracing curiosity it failed to indicate similar relationships for *deprivation sensitivity*. Thus, further research into the interaction between *stress tolerance* and *deprivation sensitivity* can offer deeper insights into how they, or their interplay, affect mental health.

Another question concerning the nature of the motivational behaviour evoked by *deprivation sensitivity* can be considered by future research. In particular, how the aversive nature of the experience during *deprivation sensitivity* influences the frequency of appearance of the other types of curiosity. Although there is a positive correlation between majority types of curiosity the role of *deprivation sensitivity* is not clearly understood. The aversive experience of this form of curiosity can potentially lead to other phenomena associated with anxiety, stress and depression like rumination, self-doubt and worry. For example, if unresolved information can potentially be associated with self-generated thoughts or self-deprecation it in turn can influence symptoms of depression (Nolen-Hoeksema et al., 2008).

Deprivation sensitivity's association with negative affect can be explained by its focus on resolving feelings of ignorance and uncertainty, which can intensify *stress* and emotional discomfort. In contrast to other types of *curiosity*, individuals high in *deprivation sensitivity* can be more prone to experience negative emotional states as they are continuously driven by a need to resolve information gaps, which can lead to persistent feelings of inadequacy and distress.

Possible reasons for the positive association between *deprivation sensitivity* and *anxiety, stress,* and *depression* may include the maladaptive coping strategies employed by individuals high in this form of curiosity. Instead of embracing uncertainty and exploring new possibilities, these individuals might focus on the immediate resolution of discomfort, often leading to avoidance behaviours (Chou et al., 2018). Overall, these results caution that not all types of *curiosity* can be beneficial for *wellbeing*, as seen with *deprivation sensitivity's* positive association with depression, stress, and anxiety. This underscores the need for targeted approaches when leveraging curiosity for mental health interventions.

5.4 Clinical Implications

According to interest/deprivation theory, both joyous and aversive types of curiosity can be a natural part of motivational behaviour (J. Litman, 2005). Therefore understanding the interplay between curiosity and components of mental health can greatly benefit our understanding. Thus, developing clinical interventions that include curiosity can take into consideration that the need to close the gap can not only be associated with aversive feelings but also connected to other potentially harmful behaviours. For example, in a series of studies, researchers identified a connection between curiosity and indulgent choices (Wang & Huang, 2018). In this research, curiosity was evoked by creating an information gap among participants by offering to solve the riddle without giving them the answers. People whose curiosity was evoked by the task but not satisfied were more likely to have indulgent

preferences, particularly food. Also, highly curious participants indicated the reward-seeking behaviour that transferred from the riddle task to other areas. These effects of curiosity also remained after time delay and indulgent behaviour was mitigated by receiving the reward before the task. This research showcased that evoked curiosity, particularly by creating an information gap, can be connected to unwanted consequences. The connection between curiosity and risky behaviour in adolescence was described in the review and presents another example of the complex influence of curiosity on behaviour (Jovanović & Gavrilov-Jerković, 2014a). In this correlational study *embracing curiosity* was associated with young people's frequency of engaging in behaviour of alcohol use and skipping class. Although our findings did not provide evidence to associate this curiosity type with mental health indicators, this evidence shows the importance of a detailed understanding curiosity mechanism for the development of the intervention.

While the creation of an information gap can lead to unwanted consequences, other facets of *curiosity* can potentially inform clinical practice and mental health treatment positively. For instance, *stretching curiosity* and *joyous exploration* have shown a consistent negative association with *depression*. This highlights a potential application for re-evaluating situations from the perspective of curiosity. Developing interventions that incorporate these aspects of *curiosity* into clinical practice could potentially benefit individuals in addressing depressive symptoms (Waehler, 2013). Furthermore, in the context of long waiting lists, further research into specific *curiosity* mechanisms and their effects on mental health can inform the development of educational or psychoeducational programs, as well as software designed to foster *curiosity* for self-help, personal development, and related applications.

Research indicates that *curiosity* is a complex construct that is associated with multiple mechanisms. As discussed earlier in this section curiosity may be "blind" to the valence of the information it processes. In this case, current findings can inform clinical

practice through mechanisms associated with the various facets of *curiosity*. For example, positive uncertainty and exploration associated with interests and positive experiences can equally inform interventions in the context of mental health. In the context of individual therapy, it can inform the development of behavioural experiments and coping strategy development (Bennett-Levy, 2003). In the community, understanding the positive influence of exploration and novelty can inform program development aimed at the prevention of poor mental health and *wellbeing*.

This result can further inform clinical research that can aim to introduce specific mechanisms of *curiosity* in clinical practice. Other possible clinical trials can enquire about the possibility of developing specific *curiosity traits* that are found to be beneficial for mental health. However, one way to ensure evidence-based practice is a strong model and theoretical understanding of the psychological constructs.

5.5 Theoretical implications

The results of the current experimental study support the findings of the systematic literature review, addressing some of the gaps identified in the review. The systematic literature review identified *stretching curiosity* has consistent relationships with *wellbeing*, particularly with *positive wellbeing* constructs. This study's results further highlight the importance of *stretching curiosity* for the *wellbeing* process by identifying its association *depression* indicators. Additionally, the study examines a related construct, *joyous exploration*, highlighting a possible beneficial impact of exploration that is associated with positive emotions on wellbeing. A further association of these similar curiosity constructs to *wellbeing* is not in its connection to *coping efficacy*. The total mediating effect that *coping efficacy* has on relationships between these two types of *curiosity* and *depression* adds a nuanced understanding of these connections. It also adds to previous findings that found an association between *coping efficacy* and *curiosity* (Denneson et al., 2017; Mishra, 2022a). It

adds to these findings by specifying a particular facet of curiosity that is associated with *coping efficacy* and its mediating influence between *curiosity* and *depression*. Furthermore, the systematic literature review identifies the need for a better understanding of *deprivation sensitivity* in the context of *wellbeing*. This study sheds more light and provides evidence of a positive association between *deprivation sensitivity* and mental health indicators, particularly *depression* and *anxiety*. These findings underline the importance of both *curiosity* dimensions in mental health. However, these findings need to be replicated and pathways for future research can consider including the dual influence of *curiosity* on *wellbeing*

Current research supports the importance of understanding curiosity in these diverse contexts. Both systematic literature review and wider evidence suggest that curiosity is better understood within a multifaceted context (Horstmeyer, 2022; Jovanović & Gavrilov-Jerković, 2014a; Kashdan, Disabato, et al., 2020a). Three out of five subscales of the latest five-dimensional conceptualisation of curiosity were utilised in the current study (Kashdan, Disabato, et al., 2020a). Each of them, *joyous exploration, deprivation sensitivity* and *stress tolerance*, indicated a unique presentation in the context of mental health. According to the five-dimensional conceptualisation, *joyous exploration* is closely linked with pleasurable experiences and positive emotions. The broaden-and-build theory posits that positive experiences and emotions play a supportive role in mental health (Fredrickson, 2001a). Therefore, these findings tentatively support this notion by demonstrating a negative correlation between *joyous exploration* and *depression*. However, contrary to expectations, the anticipated negative associations with *stress* and *anxiety* were observed only in correlational but not in multiple regression analyses of this study. One possible explanation could be that *joyous exploration* while enhancing overall wellbeing through positive emotional experiences, may not directly mitigate *stress* and *anxiety* as hypothesised. This discrepancy suggests a nuanced relationship between *joyous exploration* and different facets

of mental health, warranting further investigation into the underlying mechanisms and contextual factors involved.

These conceptualisations are further supported by findings indicating that *deprivation sensitivity* connects positively with anxiety, stress and depression. Deprivation sensitivity is conceptualised as the tension and frustration arising from not having the complete information that one desires. This study aligns with this understanding, revealing a positive relationship between deprivation sensitivity and indicators of anxiety and depression. This suggests that individuals experiencing higher levels of deprivation sensitivity may be more prone to emotional distress and psychological symptoms associated with uncertainty and unmet expectations. This dual perspective—highlighting the benefits of *joyous exploration* and the challenges posed by *deprivation sensitivity*—underscores the complexity of curiosity-motivated experiences and their implications for mental health outcomes.

Deprivation sensitivity does not appear to be predicted by either coping efficacy or stress tolerance. However, *stress tolerance* was associated with *joyous exploration*. *Stress tolerance*, as a facet of curiosity, is associated with the ability of the person to withhold anxiety that comes with the novelty and unpredictability of the exploration process (Kashdan, Disabato, et al., 2020a). These findings underscore the notion that the ability to embrace and tolerate uncertainty positively can foster curiosity. Moreover, *stress tolerance* exhibits a partial mediating effect on the relationships between joyous exploration and depression scores. These support the broader understanding that intolerance to uncertainty is negatively linked to *wellbeing* (Carleton et al., 2012; Dar et al., 2017). Therefore, future research could explore *stress tolerance* in the wider context of mental health.

Interestingly, the dichotomy of curiosity can be considered from the cultural and linguistic perspectives that associated it with both benefits and downfalls for centuries. Thus, the famous disobedience in the book of Genesis was associated with curiosity, while some

name curiosity itself a sin (Brailowsky, 2016). Along with ancient Greek myths about Pandora and Psyche, curiosity in these stories led to the loss of paradise-like life and resulted in pain and punishment (Papastephanou, 2019). In children's literature curiosity is also portrayed in negative and positive lights, while most of the books picture it neutrally (Holmes & Holmes, 1991). One can argue that negative connotations were associated not with the curiosity itself, but with some "forbidden knowledge" and were elaborated as an oppression tool rather than curiosity itself. Nevertheless, from cosmology to medicine, history has a plethora of examples of how new knowledge is being punished or ridiculed by society (Papastephanou, 2019). Until now in the English-speaking world, everyone is familiar with the proverb cautioning people to keep their curiosity to themselves hinting at the poor destiny of the cat that did otherwise (Speake, 2015). Furthermore, in Russian culture curiosity is described by two different words. One that has a more negative connotation and is associated closely with *social curiosity* and perceptual exploration. Another word can be directly translated as a love for knowledge and associated direct inquiry for knowledge to create and develop. Therefore future research could also investigate the influence of culture on the development and facilitation of curiosity.

5.6 Strengths and Limitations

One of the main limitations of the study is its cross-sectional design, which precludes causal inferences. Although an observational experiment was included in the study its effectiveness was not established. The anagram task was aimed at elevating *stress* among the participants. However, almost half of the participants rated the stressfulness of the task below four on the ten-point scale. Additionally, most of the people successfully solved over half of the presented anagrams. There are several potential improvements to be made to the task. One possible difficulty with most of the anagram studies relies on the source which can be somewhat outdated (Mayzner & Tresselt, 1958). Due to the development of the language that

is used in daily life, the time to solve these anagrams for the modern generation can be different. Therefore less time for the tasks could increase the *stress* experienced by the people. Although previous studies utilised anagrams for performance under stress, an online study can provide less stress due to access to comfortable settings and anonymity. Therefore changing the content or association with the task can improve its effectiveness. Additionally, longitudinal studies successfully used everyday stress in the curiosity studies which can be considered a more reliable measure. Furthermore, findings relate to a sub-population of young adults aged between 18 and 35, that restricts generalisability to this group.

To explore relationships between different types of curiosity and mental health indicators multiple regression and mediation analysis were used. Both combined provide a robust framework offering insights into both direct and indirect effects and the association between curiosity on mental health. Multiple regression allows for the examination of the unique contributions of each type of curiosity while controlling for confounding variables, increasing the clarity of these relationships. Meanwhile, mediation analysis reveals the underlying mechanisms, such as the roles of stress tolerance and coping efficacy, thus offering a more nuanced understanding. These methods are valuable for testing and refining theoretical models and can help to develop practical implications. However, they come with limitations like sensitivity to assumptions, and potential measurement errors from self-reported data. However, the fully anonymised nature of data acquisition can enhance the reliability of the self-reported data by providing more security (Rhodes et al., 2003). The complexity of psychological constructs and the risk of overfitting can affect the generalisability of the results. To mitigate these limitations experimental and longitudinal study designs can be considered for future research.

Despite these limitations, the study has several strengths. It is one of the few studies to empirically test the mediation effects of *stress tolerance* and *coping efficacy*, providing a

more nuanced understanding of how curiosity impacts mental health. Additionally, the integration of findings from a systematic literature review strengthens the validity of the results and situates them within the broader research context. This study was one of the few to combine *deprivation sensitivity*, *joyous exploration*, *stretching* and *embracing* curiosity in the context of mental health in one research. Combining them in one model allowed us to highlight the most consistent associations between curiosity and *depression* scores among the general population. Utilising the stretching and embracing conceptualisation of curiosity in future research can be beneficial, as these facets have been more extensively studied in the context of wellbeing. However, this approach only captures two specific aspects of curiosity. On the other hand, the five-dimensional curiosity conceptualisation offers a more detailed and comprehensive approach. It also encompasses *joyous exploration*, which, by its conceptualisation and according to empirical studies, has strong associations with *stretching curiosity.* In turn, the latter indicated a more consistent positive association with *wellbeing* compared to *embracing curiosity*.

Although the study limited participants to the young adult age they were recruited from the general public. The majority of the research highlighted in the systematic literature review revealed the main participant group for undergraduate students and made the generalisation of the results less effective. Utilising screening tools for the general population can provide a more realistic picture of protective factors of *curiosity* two different types of mental health indicators. In particular, *depression* scores according to this research's main findings.

5.7 Conclusions

In this thesis, the multidimensional nature of *curiosity* has been thoroughly investigated within the context of mental health. The systematic review identified critical research gaps and advocated for more consistent measurement approaches, laying the groundwork for subsequent experimental studies. The findings from these studies provided

evidence demonstrating that different dimensions of *curiosity* are uniquely associated with mental health indicators. Specifically, the current study highlighted nuanced connections between curiosity and *depression*, offering deeper and more nuanced insights into their complex relationship. The adoption of a five-dimensional conceptualisation of curiosity emerges as a promising direction for future research, facilitating a more comprehensive understanding of its role in mental health outcomes. Overall, this work underscores the potential of *curiosity* to promote positive mental health. However, it also emphasises the need for cautious integration of *curiosity* in clinical practice, ensuring alignment with theoretical frameworks and robust empirical evidence. By advancing our understanding of curiosity's impact on mental health, this thesis contributes insights that can inform both research and practical applications in psychology and healthcare.

Tables

Table1

Search Terms for The Systematic Literature Review

Terms relating to participants	AND	Terms relating to context	AND	Terms relating to outcome	NOT	Terms relating to exclusion criteria
Filter by human studies		Curiosity		well-being OR wellbeing OR stress OR coping OR mental health OR psychological health OR anxiety OR depression OR depressive OR coping efficacy OR effective coping		psychiatric OR cancer education OR animal OR mice OR mouse OR rat OR rats OR smoking OR cigarettes OR infant

Table 2

Inclusion and Exclusion Criteria for The Study Selection

Inclusion criteria	Exclusion criteria
• Randomized controlled trials (RCTs) • Non-randomized studies: non-randomized controlled trials, interrupted time series, controlled before-and-after studies, and cohort studies are eligible for inclusion. • All languages as long as articles were translated into English • Unpublished studies (e.g., conference abstracts, trial protocols)	• Animal studies • Studies of curiosity in the context of enduring physical and mental health conditions • Studies of curiosity in the context of education

Table 3

Extraction Data from 21 Articles Included in The Review

Title of article	Study	Type of curiosity	test curiosity	Type of wellbeing (outcome)	Test wellbeing	Sample size	Demographics (age, gender, ethnicity)	Analysis methods	Results (key findings, effect size, p-value)	strengths	limitations	Year of publicatio	Authors
ANGER, CURIOSITY, AND OPTIMISM	Cross-sectional survey	State and trait	The State-Trait Personality Inventory (STPI) (Spielberger)	1) Anxiety 2)Anger 3)Positive and negative affect	1) Personality Inventory (Spielberger) 2) The State-Trait Anger Expression Inventory (Spielberger) 3) Life Orientation Test	500	Age: 19-27 Gender (male-50%, female - 50%) Ethnicity - Italian	Correlation analysis	Scores on state and trait curiosity were not significantly related to scores on anger expression subscales	1) large sample size 2) use of validated measures	1) biases inherent in self-reported data 2) cross-sectional design, which limits causal inference 3) potential confounding variables	1994	Comunian AL.
Induced Mood and Curiosity	Randomised experimental design	State and trait	Melbourne Curiosity Inventory (MCI) / the Experiment Descriptions Inventory (EDI)	Depression	Depression Adjective Checklist	60	Age: undergraduate Gender: male-21, female - 39 Ethnicity - N/A	MANOVA Correlation analysis	1) post conditioning comparison indicate difference in curiosity score (depression and elation)(ES and P-value are not provided) 2) significant negative relationships between depression and state curiosity (r = -.43, p < .001) correlation between depression and total desire for additional knowledge (r = -.50, p < .001)	1) The use of the experimental induction procedure 2)Experimental study design	1) The relative ineffectiveness of the elation induction procedure ted the results 2) study only involved undergraduates, so the findings may not generalize to other populations	1987	James R. Rodrigue, 2 Kenneth R. OIson, 3 and Robert P. Markley

The neglected relationship between social interaction anxiety and hedonic deficits: differentiation from depressive symptoms	Cross-sectional study design	State and trait curiosity / exploration and absorption	STCI/CEI	1) Anxiety 2)DEPRESSION 3)Positive and negative affect 4) Life satisfaction	1) AND 2) 90-item Mood and Anxiety Symptom Questionnaire (MASQ) 3) 7-item Subjective Vitality Scale 4) 5-item Satisfaction with Life Scale (SWLS)	100	Age: mean 24.28 years old, Gender: female - 73, male-25, not reported - 2, Ethnicity: 74 European-Americans, 6 Asian-Americans, 6 African-Americans, and 4 Hispanic-Americans, 10 - not specified	Hierarchical regression	1)social interaction anxiety was the only predictor of the curiosity (F (1.88) = 7.06, Pr = -.27, P < .01) 2) social anxiety had negative correlation with exploration subscale of curiosity (r= -.42, P < .001) and did not have a connection to absorption	1) use of the factor analysis to explore specificity of curiosity questionnaires 2) replication of the previous study on social anxiety	1) small sample size 2) only self-reported measures were used in the study 3) cross-sectional study design 4)	2004	Todd B. Kashdan

Curiosity and wellbeing	Cross-sectional study design	Curiosity aspects of exploration and absorption	CEI	1) Psychological wellbeing 2) Social wellbeing 3) Emotional wellbeing (Positive and negative affect)	1) 42-item version of Ryff's scale 2) Keyes' five components of social well-being 3) Positive and Negative Affect Schedule (PANAS)	293	Age: 18 -26 years old, Gender: female - 158, male - 135 Ethnicity: Caucasian (91.5%), Asian (3.1%), Hispanic (1.7%), African American (0.7%), other (3.0%)	Independent Samples t-tests Confirmatory Factor Analysis Correlation Analysis Hierarchical Multiple Regression ANOVA	1) males reported higher CEI scores (t(291) 1⁄4 2.55, $p < 0.05$) and absorption subscale (t(291) 1⁄4 2.39, $p < 0.05$) 2) Confirmatory Factor Analysis (CFA) supported the hypothesized two-factor structure of curiosity 3) Exploration subscale had positive moderate correlation to all indicators of wellbeing (pr = from .35 to .55; $p = .001$), and negative with negative affect (pr = -.14; $p = .05$) when controlled for absorption subscale 4) Exploration subscale has accounted for the effect of every wellbeing measure (f(2) ranging from 0.14 to 0.47) illustrating its predictive power 5) Participants classified as flourishing reported higher levels of curiosity (t(291) = 3.78, $p < 0.001$, $d = 0.57$) and higher levels of the exploration subscale (t(291) = 5.07, $p < 0.001$, $d = 0.80$)	Comprehensive assessment and analysis of multiple facets of well-being and curiosity	1) homogeneous sample limits generalizability 2) Cross-sectional design prevents establishing causality	2007	Gallagher, M.W.; Lopez, S.J.

The good, the bad (and the ugly): The role of curiosity in subjective well-being and risky behaviours among adolescents	Longitudinal design	Stretching and embracing trait curiosity	CEI-II	1) Risky behaviour engagement 2) Positive and negative affect 3) Life satisfaction	1) Risky Behaviour Questionnaire for Adolescents 2) PANAS 3) Single question	371	Age: 14-17 years old, Gender: female - 207, male - 164 Ethnicity: Serbian	Hierarchical regression analyses	1) positive affect associated stronger with the stretching subscale at both times T1 ($z = 2.09$, $p < 0.05$); T2 ($z = 2.18$, $p < 0.05$) 2) stretching and embracing did not significantly differ in their relations with life satisfaction 3) risky behaviour engagement had low correlations with the embracing subscale both times T1 ($r=0.22$, $p<0.01$), T2 ($r=0.27$, $p<0.01$), no significant correlations were found with stretching subscale 4) embracing curiosity found to be a predictor of risky behaviour ($b = 0.11$, $p < 0.01$)	Longitudinal design allowed for examining changes over time	Five month can be not long enough time to set assumption wellbeing.	2014	Jovanović V; Gavrilov-Jerković V
Exploring the association between curiosity and subjective well-being: the mediating role of self-efficacy beliefs in Hindi-speaking youth	Cross-sectional study design	Stretching and embracing trait curiosity	CEI-II	1) positive and negative experience 2) Satisfaction with life 3) General self-efficacy	1) Scale for positive and negative experience 2) SWLS 3) General self-efficacy scale	1149	Age: 15-24 years old, Gender: female - 561, male - 588 Ethnicity: Indian	Correlation analysis Factor analysis	1) stretching subscale significantly correlated with life satisfaction ($r=0.13$, $p<0.01$), positive experience ($r=0.36$, $p<0.01$) and negative experience ($r= - 0.12$, $p<0.01$), embracing subscale correlated with positive experience ($r=0.26$, $p<0.01$) 2) both subscales correlated to self-efficacy embracing ($r=0.22$, $p<0.01$)and stretching ($r=0.34$, $p<0.01$) 3) self-efficacy has full mediation effect on both subscales to life satisfaction, negative experience, and positive experience	1) large sample size 2) use of validated measures	1) cross-sectional design that prevents causality of the relationships identification	2022	Mishra, K.K.

Curious people are less affected by social rejection	Cross-sectional survey	Stretching and embracing trait curiosity	J-CEI	1) Depression 2) Life Satisfaction 3) Rejection sensitivity	1) 10 items of the Todai Health and Personality Inventory 2) SWLS 3) 9-situation Adult Rejection Sensitivity Questionnaire	500	Age: 20-39 years old, Gender: female - 250, male - 250 Ethnicity: N/A	Mediation analysis Hierarchical regression	1) Curiosity was negatively correlated with rejection sensitivity and depression ($r = -.27$, $p < 0.05$; $r = -.22$, $p < 0.05$, respectively) 2) Curiosity was positively correlated with life satisfaction ($r = 0.30$, $p < 0.05$), social inclusion experiences ($r = .40$, $p < 0.05$), and social rejection experiences ($r = .26$, $p < 0.05$) 3) Partial mediation effect of rejection sensitivity was found for connection between curiosity and life satisfaction (indirect effect = 0.12, 95% confident interval from 0.07 to 0.18) and depression (indirect effect = −0.77, 95% confident interval from −1.28 to −0.53) 4)Negative effect of social rejection on life satisfaction was weak for people who scored higher on curiosity ($b = −0.026$, $p = 0.006$), compared to lower scored (b = −0.072, p b 0.001) 5) Positive association between social rejection experiences and depression was weaker for people who scored higher on curiosity($b = 0.27$, p b 0.001) than lower scored ($b = 0.42$, p b 0.001)	1) Utilises comprehensive analysis 2) Large sample size	1) self-report measures, which may be subject to biases and inaccuracies. 2) The cross-sectional design limits the ability to establish causality between variables.	2017	Kawamoto, T.; Ura, M.; Hirakai, K.

Who self-initiates gratitude interventions in daily life? An examination of intentions, curiosity, depressive symptoms, and life satisfaction	Experimental study design	Stretching and embracing trait curiosity	CEI-II	1) Depression 2) Life Satisfaction	1) The 20-item Centre for Epidemiologic Studies Depression Scale 2) SWLS	226	Age: 18-29 years old, Gender: female - 71.2%, male - 28.8% Ethnicity: N/A(study took place in Poland)	Path analysis Logistic regression	1)Intentions to start the gratitude intervention were positively correlated with curiosity (r = .33, p < 0.01) 2)Significant indirect effect of curiosity on intervention initiation through intentions was detected (b = 0.24, 99% CI [0.077, 0.542], OR = 1.29) 3)Marginal indirect effect of depressive symptoms on intervention initiation through intention (b = - .119, 90% CI [-.309, -.010])	1) experimental design 2) Utilises comprehensive analysis	1) utilized an undergraduate convenience sample, limiting generalizability to other populations 2)measurement of general intention to start a well-being intervention online may not fully capture individual differences and demographic factors influencing intervention initiation	2013	Kaczmarek, L.D.; Kashdan, T.B.; Kleiman, E.M.; Baczkowski, B.; Enko, J.; Siebers, A.; Szäefer, A.; Król, M.; Baran, B.

Subjective well-being as a mediator for curiosity and depression	Cross-sectional study design	Stretching and embracing trait curiosity	CEI-II	1) Depression 2) Happiness index	1) 9-items Centre for Epidemiologic Studies Depression Scale 2) Steen Happiness Index	257	Age: 18-64 years old, Gender: female - 73.4%, male - 26.6% Ethnicity: N/A (study took place in Poland)	Mediation analysis Regression analysis	1)Well-being indicated as a complete mediator of the relationship between curiosity and depression (indirect effect, $\beta = -.34$, SE = 0.05, $z = -7.21$, $p < .001$, 95%CI [-.44, -.25]) 2)Depression scores had partial mediation effect on the connection between curiosity and wellbeing (indirect effect $\beta = .15$, SE = 0.03, $z = -3.96$, $p < .001$, 95%CI = [.07; .24])	The study employed path analysis to test complex mediation models	1) Using of web-based surveys can restrict the practical implications of the findings. 2) The study relied on self-report measures, which may introduce biases.	2014	Kaczmarek, L.D.; Baczkowski, B.; Enko, J.; Baran, B.; Theuns, P.
Did curiosity kill the cat? Evidence from subjective well-being in adolescents	Cross-sectional study design	Stretching and embracing trait curiosity	CEI-II	1) Depression 2) Anxiety 3)Stress 4)Positive and negative affect 5) Life satisfaction 6) Loneliness	1,2 and 3)Depression Anxiety and Stress Scale (DASS-21) 4) PANAS 5) Multidimensional Students' Life Satisfaction Scale (MSLSS) 6) the De Jong Gierveld Loneliness Scale	408	Age: 15-19 years old, Gender: female - 250, male - 158 Ethnicity: N/A (study took place in Serbia)	Correlation analysis	1)Curiosity was significantly positively correlated with all of the indicators of positive mental health: positive affect ($r = 0.51$; $p < .01$), hope ($r = 0.46$; $p < .01$), purpose in life ($r = 0.27$; $p < .01$) and global life satisfaction ($r = 0.19$; $p < .01$). 2)Low negative correlations were observed between curiosity and two negative emotional states: negative affect ($r = - .15$; $p < .01$) and loneliness ($r = - .11$; $p < .05$). 3)Low negative correlations were observed between embracing subscale and loneliness ($r = - 0.15$, $p < 0.01$) and stretching subscale and depression ($r = - 0.11$, $p < 0.05$) 4)Total curiosity CEI-II score did not connected to depression, anxiety, stress	1) large sample size 2) use of validated measures	1) cross-sectional design that prevents causality of the relationships identification 2)self-reported tools	2012	Jovanovic, V.; Brdaric, D.

Curiosity for information predicts wellbeing mediated by loneliness during COVID-19 pandemic	Mixed-method longitudinal observational study	Stretching and embracing trait curiosity	CEI-II	1) Mental Wellbeing 2) Trait Anxiety 3) Depression 4) Stress	1) Warwick Edinburgh Mental Wellbeing Scale (WEMWBS) 2) State-Trait Anxiety Inventory 3) Beck's Depression Inventory 4) Perceived Stress Questionnaires	183	Age: mean = 28.51, Gender: female - 73.4%, male - 26.6% Ethnicity: N/A (study took place in Austria and Germany)	Correlation Linear regressions Post-hoc estimated marginal means Mediation analyses	1)Trait curiosity positively correlated to wellbeing measures ($r = .55$; $p < .01$), and daily excitement ($r = .21$; $p = .021$) 2)Negative correlation between anxiety and curiosity was not significant ($r = -.12$; $p = .124$) 3)The association between curiosity and wellbeing was partially mediated by loneliness (indirect effect (a*b) $B = 1.92$, $SE = 0.44$, $Z = 4.35$, $p < 0.001$, $R2 = 0.53$). 4)Loneliness fully mediated the effect of information-seeking on wellbeing(indirect effect (a*b) $B = 0.08$, $SE = 0.02$, $Z = 2.60$, $p = 0.009$) 5)Trait curiosity negatively predicted tyrosine-rich food intake ($\beta = -0.003$, $p = 0.017$) 6)Sugar intake positively predicted anxiety ($\beta = 0.25$, $p = 0.008$), trait curiosity influenced this connection (interaction: $\beta = -0.08$, $p = 0.005$). Stronger association for people with lower curiosity	1) Utilises comprehensive analysis 2) longitudinal study in the unique environmental conditions	correlational design that prevents causality of the relationships identification	2022	Loseca at Vermeer AB; Muth A; Terenzi D; Park SQ

Curiosity improves coping efficacy and reduces suicidal ideation severity among military veterans at risk for suicide	Randomised controlled trial	Stretching and embracing trait curiosity	CEI-II	1) Anxiety 2) Depression 3) Suicidal Ideation 4)Stress 5)Coping Self-Efficacy	1) Generalized Anxiety Disorder-7 (GAD-7) 2)The Patient Health Questionnaire (PHQ-9) 3) Beck Scale for Suicidal Ideation (BSS) 4)Cohen Perceived Stress Scale (PSS4) 5)Chesney's Coping Self-Efficacy	117	Age: 20-77 (mean = 47,6), Gender: female - 31%, male - 69% Ethnicity: white non-Hispanic (73%)	Correlation analysis Regression Explanatory factor analysis Growth curve models	1)Higher curiosity scores were associated with lower suicide ideation severity at baseline only for participants with higher distress scores (b=−0.39; 95% CI=−0.76, −0.02; p=0.04) 2)Curiosity shown small negative correlation with depression (r = - .18; p<.05), suicidal negation severity (r = - .19; p<.05), and perceived stress (r = - .19; p<.05) in the descriptive statistics, regression analysis illustrated only association of curiosity with suicidal ideation severity where association was approaching significance (b=−0.35; 95% CI =−0.73, 0.04) 3)Curiosity had positive association in correlational and regression analysis with coping efficacy, stop negative thoughts (r = .36; p<.05)/(b=2.07; 95% CI =0.89, 3.24) and coping efficacy, enlist friends and family (r = .32; p<.05)/(b=1.83; 95% CI=0.58, 3.08) 4)For participants with low distress scores at the baseline, higher curiosity was associated with smaller increase in coping efficacy, and among people with higher distress, higher curiosity was connected to larger increase	1) longitudinal study 2) use of validated tools for mental health screening	1) study presents a secondary analysis of a larger study 2) all participant were recruited in the mental health organisation, suggesting they were seeking to get better	2017	Dennison LM; Smolenski DJ; Bush NE; Dobscha SK

									in coping efficacy (b=0.44; 95% CI=0.06, 0.83; p=0.03), this effect was indicated only for efficacy to stop negative thoughts.				
Personality, effective goal-striving, and enhanced well-being: comparing 10 candidate personality strengths.	Longitudinal design	State and trait	CEI-II	1) Tendencies to try to amplify positive experiences 2) Life satisfaction 3) Meaning in Life	1)Ways of savoring Scale 2) SWLS 3) Meaning in Life Questionnaire	755	Age: 15-81 (mean = 39), Gender: female - 623, male - 122 Ethnicity: large majority White/Caucasian (online participation from 40 counties)	Regression analyses	1)Curiosity showed a significant interaction with goal attainment (β = .073, p <.01), suggesting a stronger relationship between goal attainment and SWB for individuals high in curiosity. 2)Interaction between goal attainment and curiosity found to be the most consistent predictor of the wellbeing in a comparison with other ten predictors. The interaction was between curiosity at the baseline and goal attainment in the 3 months mark (β = .068, p < .01), and between curiosity measured at the 3 months mark and goal attainment at the 6 months mark (β = .052, p < .05). 3)Only curiosity was identified as a moderator for enhancing goal attainment to increase wellbeing over 6 months and three check points (β = .111, p <.05)	1) large sample size 2) longitudinal study 3) use of validated measures	1) challenge to replicate study with ten different personality traits 2) predominantly female participants 3) small ethnical diversity	2015	Sheldon, K. M., Jose, P. E., Kashdan, T. B., & Jarden, A

Daily Stressor-Related Negative Mood and its Associations with Flourishing and Daily Curiosity	Longitudinal design	Daily curiosity	2-items from the CEI-II	1) Trait Flourishing 2) Daily Negative Mood 3) Daily Stressors	1) Trait Flourishing Scale 2) Profile of Mood States 3) Daily Inventory of Stressful Events (Adapted)	167	Age: 18-65, Gender: female - 136, male - 29, other - 2 Ethnicity: white (49.10%), African American/Black (8.38%), Asian (23.35%), Hispanic/Latino (4.79%), multiracial (6.59%), other (5.39%)	Multilevel model Moderation analysis	On the days where curiosity was rated higher than usual it had an attenuating effect on the effect of today's stressor on negative mood ($\gamma 51 = -0.10$, $p<0.001$).	1) longitudinal study 2) use of validated tools	1) secondary analysis 2) short duration of the experiment 3) shortened version of CEI-II	2022	Drake, A.; Doré, B.P.; Falk, E.B.; Zurn, P.; Bassett, D.S.; Lydon-Staley, D.M.

Curiosity and pathways to well-being and meaning in life: Traits, states, and everyday behaviors	Longitudinal design	Daily curiosity / Trait curiosity	4-items from the CEI /CEI	1) Positive and Negative Affect Schedule 2) Satisfaction with life	1) PANAS 2) SWLS	97	Age: 20-77 (mean = 47,6), Gender: female - 64, male -33 Ethnicity: Caucasian (76%) or Asian-American (14.5%), with a small percentage of African-American (4.2%), Hispanic-Ameri- can (2.1%), and Native-American (2.1%)	Correlation analysis Hierarchical Structure Multilevel Modelling	1)For participants with larger trait curiosity, on days when they felt more curious they would also indicated more frequent growth-oriented behaviours (B(γ11) = .001, SE = .000, t(90) = 2.36, p = .02), greater meaning in life (B(γ11) = .003, SE = .002, t(90) = 1.96, p = .05), and greater life satisfaction, (B(γ11) =.003, SE = .001, t(90) = 2.36, p = .02). 2)For participants with low trait curiosity highly frequent hedonistic behaviours was present only on the days they felt more pleasure (B(γ11) = -.01, SE = .003, t(90) = - 3.23, p = .002). 3)Daily pleasure predicted greater daily presence of meaning (B = .18, SE = .04, t(90) = 4.48, p < .001) and life satisfaction (B = .09, SE = .02, t(90) = 4.68, p < .001.) 4)Larger scores in daily curiosity predicted greater presence of meaning (B = .02, SE = .01, t(95) = 2.33, p = .02) and life satisfaction (B(γ01) = .05, SE = .02, t(95) = 2.29, p = .02) the next day. 5)Daily pleasure did not predict day-to-day changes in the presence of meaning or life	1) longitudinal study 2) use of validated tools	1) short duration of the experiment in 21 days 2) shortened version of CEI utilised for research 3) Correlational study limits the opportunity for causality investigation	2007	Kashdan, T.B.; Steger, M.F.

									satisfaction. 6)Greater daily pleasure led to less search for meaning (B = -.07, SE = .03, t(95) = - 2.15, p = .03)				
Within-person variability in curiosity during daily life and associations with well-being	Longitudinal design	Daily curiosity / Trait curiosity	2-iteam from CEI-II / CEI-II	1) Trait Flourishing 2) Daily Negative Mood 3) Depression 4) Life satisfaction	1) Trait Flourishing Scale 2) Profile of Mood States 3) the Centre for Epidemiological Studies Depression Scale 4) SWLS	167	Age: 18-65, Gender: female - 136 , male - 29, other - 2 Ethnicity: white (49.10%), African American/Black (8.38%), Asian (23.35%), Hispanic/Latino (4.79%), multiracial (6.59%), other (5.39%)	Correlation analysis Multiple regression Explanatory factor analysis	Curiosity trait was negatively correlated with a degree of fluctuation in daily curiosity (curiosity lability) ($r(165) = -.28$, $p < .001$), indicating tendency for people who score high on curiosity have more study daily curiosity. Curiosity lability was positively associated with depression ($B = 0.16$, $p = .04$) and negatively with life satisfaction ($B = -0.71$, $p = .002$)	1) longitudinal study 2) use of validated tools for mental health screening	1) secondary analysis 2) short duration of the experiment 3) shortened version of CEI-II	2019	Lydon-Staley DM; Zurn P; Bassett DS

The measurement of curiosity as a feeling of deprivation	Cross-sectional study design	CFD = curiosity as a feeling of deprivation; CFI = curiosity as a feeling of interest	T–Cur scale, PC scale, EC scale, 27 items designed to assess individual differences in CFD	1) Trait Anxiety 2) Trait Anger 3) Trait Depression	STPI - trait measures	321	Age: 18-40, Gender: female - 248, male - 73, Ethnicity: N/A	Factor analysis Correlation analysis	1)Intolerance component of curiosity as a feeling of deprivation indicated significant correlation with traits anxiety ($r = .11$, $p < .05$), depression ($r = .11$, $p < .05$), and anger ($r = .32$, $p < .01$) 2)Problem solving component of curiosity as a feeling of deprivation indicated significant correlation with traits depression ($r = .11$, $p < .05$), and anger ($r = .17$, $p < .05$) 3)Competence component of curiosity as a feeling of deprivation indicated significant correlation with traits anxiety ($r = -.12$, $p < .05$) and depression ($r = -.12$, $p < .05$)	1)comprehensive analysis 2) use of validated measuring tools	1) biases inherent in self-reported data 2) predominantly female participants	2004	Litman JA; Jimerson TL

Killing the cats or satisfying the human? The role of epistemic curiosity in adolescents' multidimensional well-being	Cross-sectional study design	epistemic curiosity (deprivation/interest)	5 dimensional curiosity scale (5DCR)	School Day Well-being	School Day Well-being Model	315	Age: adolescents, Gender: female - 146, male - 168, no information - 1 Ethnicity: N/A (study took place in China)	The Structural Equation Model	1)Both fastest of curiosity, were positively correlated with five categories of well-being, while effects of joyous exploration were larger ($r(313)=0.49–0.75$, $p<0.001$) and deprivation sensitivity ($r(313)=0.32–0.52$, $p<0.001$) 2)Both facets combined (epistemic curiosity) was positively associated with physical ($\beta = 0.55$, $p < 0.001$), dietary ($\beta = 0.45$, $p < 0.001$), emotional ($\beta = 0.44$, $p < 0.001$), psychological ($\beta=0.59$, $p<0.001$), and academic wellbeing ($\beta= 0.70$, $p<0.001$). 3)Joyous exploration had stronger association with wellbeing ($\beta = 0.45–0.70$, $p < 0.001$), while no significant association was detected between deprivation sensitivity and five types wellbeing in Structural Equation Model analysis. 4)Age and gender had no moderation effect on the connection between epistemic curiosity and all five types of wellbeing	1) Addressing differences in connection between curiosity and wellbeing between male and female 2) identification weaker role of the deprivation in supporting wellbeing	1) cross-sectional design that prevents causality of the relationships identification	2023	Li, T.; Huang, H.; Liu, J.; Tang, X.

A Study of the Impact of Spirituality and Curiosity on Life Satisfaction in Chinese Christian Teachers	Cross-sectional study design	joyous exploration and deprivation sensitivity	The five-dimensional curiosity measure (The 5-DC Scale)	1) The Satisfaction with Life Scale 2) The Daily Spiritual Experiences	1) SWLS 2) The Daily Spiritual Experiences Scale	108	Age: mean - 43.9, Gender: female - 69 , male - 39, other - 2 Ethnicity: Chinese	Correlation analysis Mediation analysis Multiple regression	1)Spirituality significantly correlated with three types of curiosity: joyous exploration (r = .53, p < .001), deprivation sensitivity (r = .21, p < .05), and tolerance of stress (r = .30, p < .001) 2)Satisfaction with life was positively associated with two facets of curiosity: joyous exploration (r = .16, p < .05) and tolerance of stress (r = .25, p < .001) 3)Curiosity as feeling of deprivation was negatively connected to life satisfaction (r = - .23, p < .001) 4)Among three facets of curiosity only deprivation sensitivity had significant mediation effect on of the relationships between spirituality and life satisfaction (b = - .43, 95% CI [-1.08, -0.02]) 5)Curiosity as feeling of deprivation was associated with life satisfaction while controlling for daily spirituality (B = - 0.88, b = - .23, p = .04).	1)comprehensive analysis 2) use of validated measuring tools	1) cross-sectional design that prevents causality of the relationships identification 2)considering only one measure of wellbeing	2022	Lam, C.-Y.

The measurement of perceptual curiosity	Cross-sectional survey	Perceptual curiosity (PC) (diversive and specific)	experimental perceptual curiosity questionnaire (EPCQ), Sensation Seeking Scale (SSS), The Novelty Experiencing Scale (NES)	1) Anxiety 2) Depression 3) Anger	STPI - trait measures	320	Age: undergraduate students Gender: male-118, female - 202 Ethnicity - N/A	Factor analysis Pearson Correlation	1) Divergent validity was supported as correlations of the PC with the measures of trait anxiety, anger, and depression were not statistically significant (mdn r=0.06) 2) For the males significant correlations were found for males between the PC and trait anger (r= .21; p=0.05), anger expressed towards something or someone (r= .28; p=0.01). PC (specific) had positive correlation to suppressed anger (r= .26; p=0.01) 3) For the females, correlations were found between the PC and how often they try to control anger (r=.15; p=0.05), and negative correlation of the PC(specific) and trait anxiety (r= -.15; p=0.05)	1) factor analysis utilisation 2) validity testing 3) large sample size	1) self-reported measures 2) limited information about predictive validity 3) limited generalisability	2004	Robert P. Collins, Jordan A. Litmana, Charles D. Spielberger
Measuring Epistemic Curiosity and Its Diversive and Specific Components	Cross-sectional survey	Epistemic curiosity (EC) / Trait and Stait	STPI/ Collins curiosity questionnaire	1) Anxiety 2) Depression 3) Anger	STPI - trait measures	739	Age: Gender: male-193, female - 546 Ethnicity - N/A	Factor analysis Pearson Correlation	1) validation of the diversive and specific subscales of the epistemic curiosity 2) small negative correlation between epistemic curiosity and trait anxiety (r = -.17; p = .001)	1) factor analysis utilisation 2) validity testing 3) large sample size	1) self-reported measures 2) limited information about predictive validity	2003	Litman JA; Spielberger CD

Table 4

Anagrams selected for the research

Correct solutions of the anagrams	**Estimated mean of time(seconds)**	**Anagram Easy order**	**Anagram Hard order**
Following words were characterised as very frequent (occurring 100 times or over per million)			
chair	9.7	IRCHA	
sugar	9.7	UGARS	
train	51.0		TIRNA
party	51.0		TAYPR
Following words were characterised as frequent (occurring at least 5O times per million)			
beach	7.3	HBEAC	
model	55.7		OLDME
Following words were characterised as infrequent (occurring at least once per million)			
patio	20.5	TIOPA	
cobra	20.5	OBRAC	
Following words were characterised as very infrequent (occurring less than once per million but more than once per four million)			
tango	46.8	GOTAN	
groin	46.8	OINGR	
	Total time: 319 (5.3 minutes)		

Note. Mayzner & Tresselt, 1958

Table 5

List of the multiple regressions with types of curiosity as independent variable

Number of multiple regression	Dependent variable	Independent variables
1	Depression Score (PHQ-9)	Deprivation sensitivity, Joyous exploration, Stretching, Embracing (four curiosity types)
2	Anxiety scores (GAD-7)	Deprivation sensitivity, Joyous exploration, Stretching, Embracing (four curiosity types)
3	Perceived stress scores (PSS)	Deprivation sensitivity, Joyous exploration, Stretching, Embracing (four curiosity types)
4	Task performance scores (number of solved anagrams)	Deprivation sensitivity, Joyous exploration, Stretching, Embracing (four curiosity types)

Table 6

Descriptive Statistics

	PHQ-9	GAD-7	PSS-10	CEI-II	CEI-S	CEI-E	5DCR_JE	5DCR_DS	5DCR_ST	
Valid	160	160	160	160	160	160	160	160	160	
Missing	0	0	0	0	0	0	0	0	0	
Mean	7.975	7.287	18.181	28.181	15.688	12.494	18.887	16.100	15.925	7
Median	7.000	6.000	18.000	28.000	16.000	12.000	20.000	16.000	16.000	7
Std. Deviation	5.617	5.241	7.636	8.161	4.159	4.543	5.513	5.645	6.048	2
Variance	31.547	27.464	58.313	66.602	17.298	20.641	30.390	31.864	36.573	6
Skewness	0.733	0.617	0.002	0.009	-0.142	0.128	-0.734	-0.063	0.023	-
Std. Error of Skewness	0.192	0.192	0.192	0.192	0.192	0.192	0.192	0.192	0.192	
Kurtosis	-0.106	-0.399	-0.294	-0.844	-0.561	-1.049	0.075	-0.623	-1.067	-
Std. Error of Kurtosis	0.381	0.381	0.381	0.381	0.381	0.381	0.381	0.381	0.381	
Shapiro-Wilk	0.937	0.943	0.990	0.981	0.982	0.958	0.952	0.983	0.967	
P-value of Shapiro-Wilk	< .001	< .001	0.334	0.027	0.039	< .001	< .001	0.048	< .001	
Minimum	0.000	0.000	0.000	10.000	5.000	5.000	4.000	4.000	4.000	
Maximum	24.000	21.000	37.000	46.000	25.000	23.000	28.000	28.000	28.000	1

Note. PHQ-9- Patient Health Questionnaire, GAD-7 - Generalised Anxiety Disorder, PSS 10 - Perceived Stress Scale, CEI – Curiosity Exploration Inventory-II, CEI-S – Stretching curiosity, CEI-E – Embracing curiosity, 5DCR – Five-Dimensional Curiosity Scale Revised, 5DCR-JE – Joyous Exploration, 5DCR-DS – Deprivation Sensitivity, 5DCR-ST – Stress tolerance, CES – Coping Efficacy Scale, Performance under stress – number of correctly solved anagrams during three minutes, Manipulation check – self-evaluation of stress experienced during the anagram task.

Table 7

The Correlation Matrix for All Variables in The Research

Variable		*Age*	*Education*	*PHQ-9*	*GAD-7*	*PSS-10*	*CEI-II*	*CEI-S*	*CEI-E*
1. Age	*Pearson's r*	—							
	p-value	—							
2. Education	*Pearson's r*	*-0.092*	—						

	p-value	*0.248*	—						
3. PHQ-9	*Pearson's r*	*-0.013*	***-0.204****	—					
	p-value	*0.868*	*0.010*	—					
4. GAD-7	*Pearson's r*	*0.006*	*-0.144*	***0.775******	—				
	p-value	*0.944*	*0.069*	*< .001*	—				
5. PSS-10	*Pearson's r*	*-0.082*	*-0.015*	***0.545******	***0.555******	—			
	p-value	*0.305*	*0.855*	*< .001*	*< .001*	—			
6. CEI-II	*Pearson's r*	*-0.095*	*0.090*	***-0.232*****	***-0.222*****	***-0.318*******	—		
	p-value	*0.231*	*0.259*	*0.003*	*0.005*	*< .001*	—		
7. CEI-S	*Pearson's r*	*-0.042*	*0.118*	***-0.268*******	***-0.226*****	***-0.334*******	***0.932*******	—	
	p-value	*0.594*	*0.137*	*< .001*	*0.004*	*< .001*	*< .001*	—	
8. CEI-E	*Pearson's r*	*-0.132*	*0.053*	***-0.172*****	***-0.192*****	***-0.266*******	***0.943*******	***0.758*******	—
	p-value	*0.096*	*0.504*	*0.030*	*0.015*	*< .001*	*< .001*	*< .001*	—
9. 5DCR_JE	*Pearson's r*	*-0.054*	***0.164*****	***-0.279*******	***-0.217*****	***-0.330*******	***0.773*******	***0.832*******	***0.627*******
	p-value	*0.494*	*0.038*	*< .001*	*0.006*	*< .001*	*< .001*	*< .001*	*< .001*
10. 5DCR_DS	*Pearson's r*	*-0.078*	*0.008*	*0.137*	***0.180*****	*-0.045*	***0.403*******	***0.478*******	***0.286*******
	p-value	*0.325*	*0.925*	*0.084*	*0.023*	*0.571*	*< .001*	*< .001*	*< .001*
11. 5DCR_ST	*Pearson's r*	*-0.054*	*0.067*	***-0.314*******	***-0.314*******	***-0.531*******	***0.303*******	***0.309*******	***0.262*******
	p-value	*0.494*	*0.399*	*< .001*	*< .001*	*< .001*	*< .001*	*< .001*	*< .001*
12. CES	*Pearson's r*	*0.002*	*0.103*	***-0.507*******	***-0.488*******	***-0.417*******	***0.526*******	***0.515*******	***0.474*******
	p-value	*0.984*	*0.194*	*< .001*	*< .001*	*< .001*	*< .001*	*< .001*	*< .001*
13. Performance under stress	*Pearson's r*	*-0.006*	*-0.067*	*0.051*	*0.031*	*0.139*	*-0.063*	*-0.023*	*-0.091*
	p-value	*0.939*	*0.402*	*0.519*	*0.701*	*0.081*	*0.432*	*0.773*	*0.251*
14. Manipulation check	*Pearson's r*	*-0.038*	*-0.028*	*0.138*	*0.136*	*0.056*	*0.011*	*-0.028*	*0.045*
	p-value	*0.635*	*0.723*	*0.081*	*0.086*	*0.483*	*0.889*	*0.727*	*0.568*

Note. PHQ-9- Patient Health Questionnaire, GAD-7 - Generalised Anxiety Disorder, PSS 10- Perceived Stress Scale, CEI – Curiosity Exploration Inventory-II, CEI-S – Stretching curiosity, CEI-E – Embracing curiosity, 5DCR – Five-Dimensional Curiosity Scale Revised, 5DCR-JE – Joyous Exploration, 5DCR-DS – Deprivation Sensitivity, 5DCR-ST – Stress tolerance, CES – Coping Efficacy Scale, Performance under stress – number of correctly solved anagrams during three minutes, Manipulation check – self-evaluation of stress experienced during the anagram task

Table 8

Coefficients for The Depression Indicators Scores (PHQ-9)

Model		Unstandardized	Standard Error	Standardized	t	p	95% CI Lower	95% CI Upper
H_0	(Intercept)	7.975	0.444		17.960	< .001	7.098	8.852
H_1	(Intercept)	11.906	1.654		7.200	< .001	8.640	15.173
	CEI-S	-0.427	0.214	**-0.316**	-1.997	**0.048**	-0.849	-0.005
	CEI-E	0.176	0.138	0.142	1.279	0.203	-0.096	0.448
	5DCR_JE	-0.304	0.135	**-0.298**	-2.254	**0.026**	-0.570	-0.038
	5DCR_DS	0.391	0.084	**0.393**	4.671	**< .001**	0.226	0.557

Note. CEI-S – Stretching curiosity, CEI-E – Embracing curiosity, 5DCR-JE – Joyous Exploration, 5DCR-DS – Deprivation Sensitivity

Table 9

Coefficients for The Anxiety Indicators Scores (GAD-7)

Model		*Unstandardized*	*Standard Error*	*Standardized*	*t*	*p*	*95% CI Lower*	*95% CI Upper*
H_0	*(Intercept)*	*7.287*	*0.414*		*17.590*	*< .001*	*6.469*	*8.106*
H_1	*(Intercept)*	*9.880*	*1.567*		*6.305*	*< .001*	*6.785*	*12.976*
	CEI-S	*-0.321*	*0.202*	*-0.254*	*-1.583*	*0.115*	*-0.721*	*0.079*
	CEI-E	*0.024*	*0.131*	*0.021*	*0.185*	*0.853*	*-0.234*	*0.282*
	5DCR_JE	*-0.204*	*0.128*	*-0.215*	*-1.598*	*0.112*	*-0.456*	*0.048*
	5DCR_DS	*0.372*	*0.079*	***0.401***	*4.686*	***< .001***	*0.215*	*0.529*

Note. CEI-S – Stretching curiosity, CEI-E – Embracing curiosity, 5DCR-JE – Joyous Exploration, 5DCR-DS – Deprivation Sensitivity

Table 10

Coefficients for The Perceived Stress Indicators Scores (PSS-10)

							95% CI	

Model		Unstandardized	Standard Error	Standardized	t	p	Lower	Upper
H_0	(Intercept)	18.181	0.604		30.116	< .001	16.989	19.374
H_1	(Intercept)	26.881	2.323		11.571	< .001	22.292	31.470
	CEI-S	-0.425	0.300	-0.232	-1.417	0.159	-1.018	0.168
	CEI-E	-0.003	0.194	-0.002	-0.013	0.989	-0.385	0.380
	5DCR_JE	-0.307	0.189	-0.222	-1.622	0.107	-0.681	0.067
	5DCR_DS	0.236	0.118	**0.175**	2.007	**0.046**	0.004	0.469

Note. CEI-S – Stretching curiosity, CEI-E – Embracing curiosity, 5DCR-JE – Joyous Exploration, 5DCR-DS – Deprivation Sensitivity

Table 11

Significant Predictors Pairs for Exploratory Analysis

Direction of relationships	Curiosity type	Mental health indicator
Negative	Stretching Curiosity	Depression Scores
Negative	Joyous Exploration	Depression Scores
Positive	Deprivation Sensitivity	Depression Scores
Positive	Deprivation Sensitivity	Anxiety Scores
Positive	Deprivation Sensitivity	Perceived Stress Scores

Table 12

Coefficients for Stretching Curiosity

Model		*Unstandardized*	*Standard Error*	*Standardized*	*t*	*p*	*95% CI Lower*	*Upper*
H_0	*(Intercept)*	*15.688*	*0.329*		*47.711*	*< .001*	*15.038*	*16.337*
H_1	*(Intercept)*	*8.116*	*0.991*		*8.189*	*< .001*	*6.159*	*10.074*
	CES	*0.076*	*0.011*	***0.469***	*6.867*	***< .001***	*0.054*	*0.098*
	5DCR_ST	*0.139*	*0.047*	***0.202***	*2.958*	***0.004***	*0.046*	*0.232*

Note: 5DCR-ST – Stress tolerance, CES – Coping Efficacy Scale

Table 13

Coefficients for Joyous Exploration

Model		Unstandardized	Standard Error	Standardized	t	p	95% CI Lower	95% CI Upper
H_0	(Intercept)	18.887	0.436		43.338	< .001	18.027	19.748
H_1	(Intercept)	9.504	1.364		6.968	< .001	6.810	12.198
	CES	0.081	0.015	**0.379**	5.346	**< .001**	0.051	0.111
	5DCR_ST	0.229	0.065	**0.251**	3.530	**< .001**	0.101	0.357

Note. 5DCR-ST – Stress tolerance, CES – Coping Efficacy Scale

Table 14

Pathways for Mediation Analysis

Direction of the relationships between curiosity and depression	Curiosity type	Mediators	Mental health indicator
Negative	Stretching Curiosity	Coping efficacy and Stress tolerance	Depression scores
Negative	Joyous Exploration	Coping efficacy and Stress tolerance	Depression scores

Figures

Figure 1

PRISMA Flow Diagram Illustrating Study Selection Process

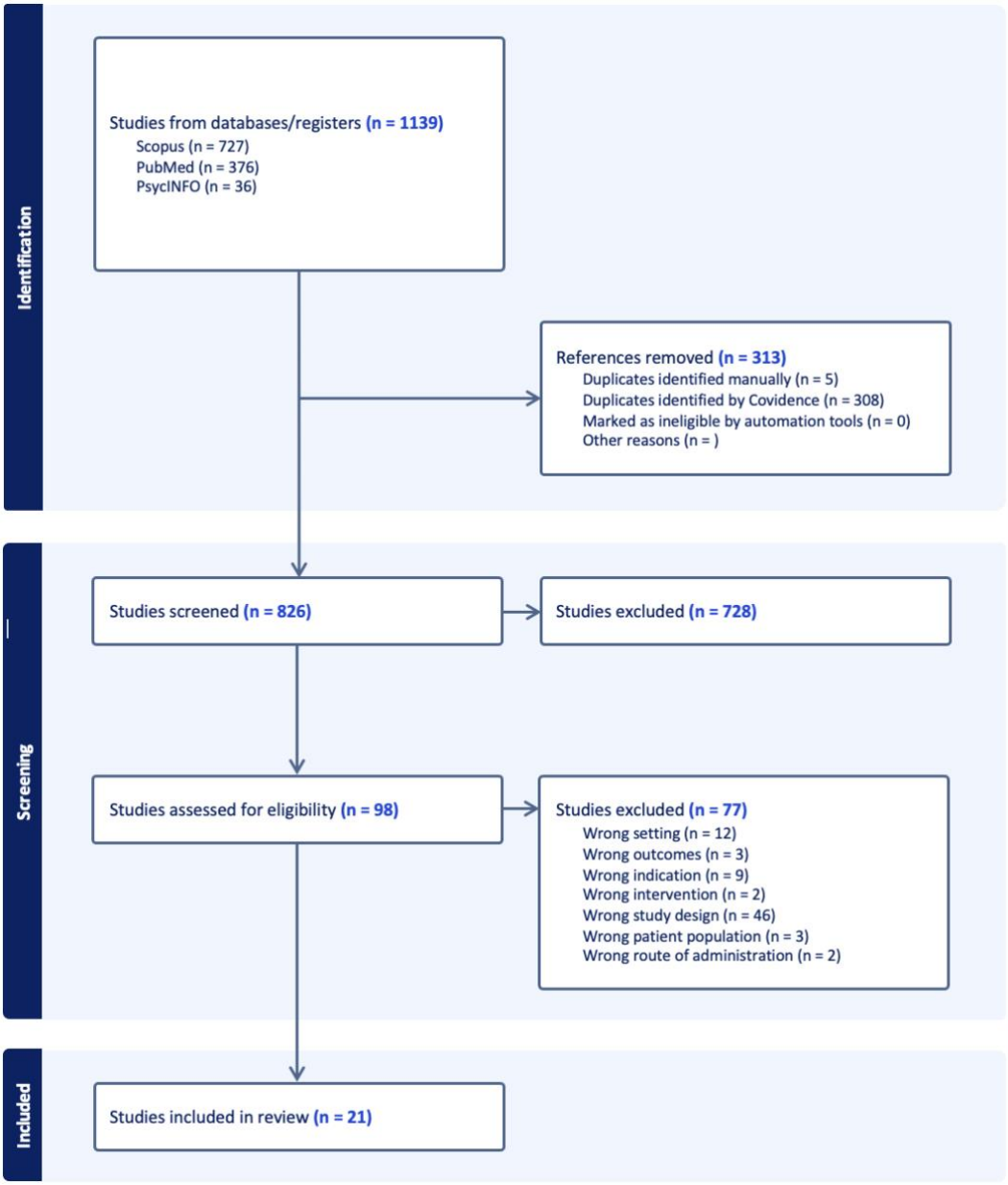


Figure 2

Study Design Summary

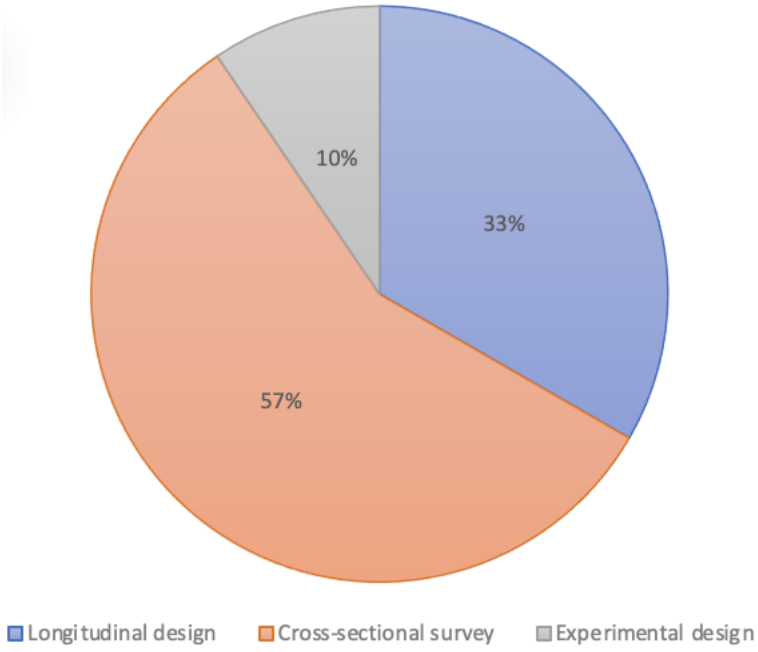


Figure 3

Analysis Methods Distribution

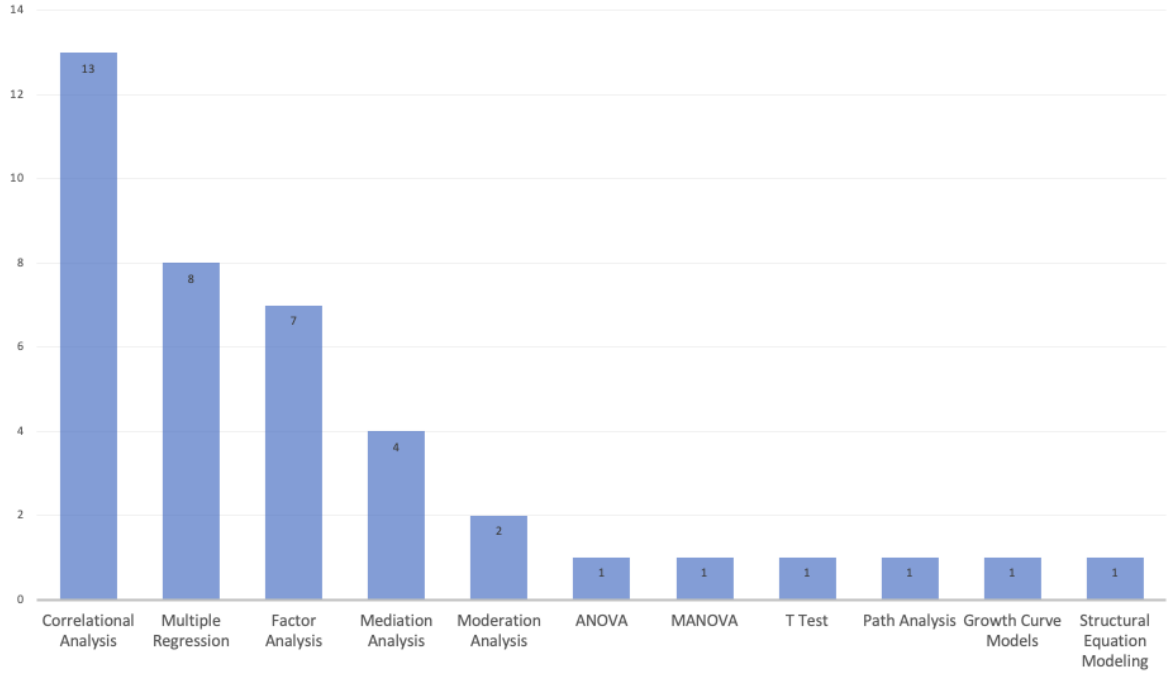
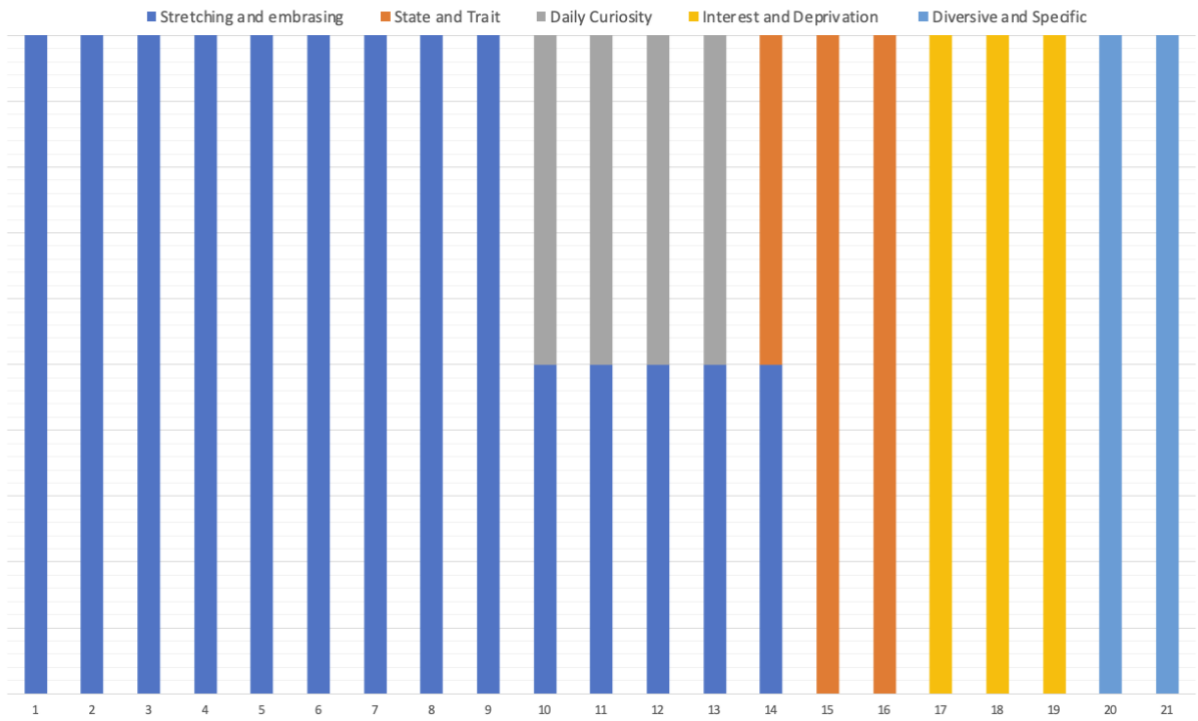


Figure 4

The Measures of Curiosity in Each Article



Note: this figure illustrates curiosity measures in each study selected for the review

Figure 5

Wellbeing and Mental Health Indicators Identified in The Selected Articles

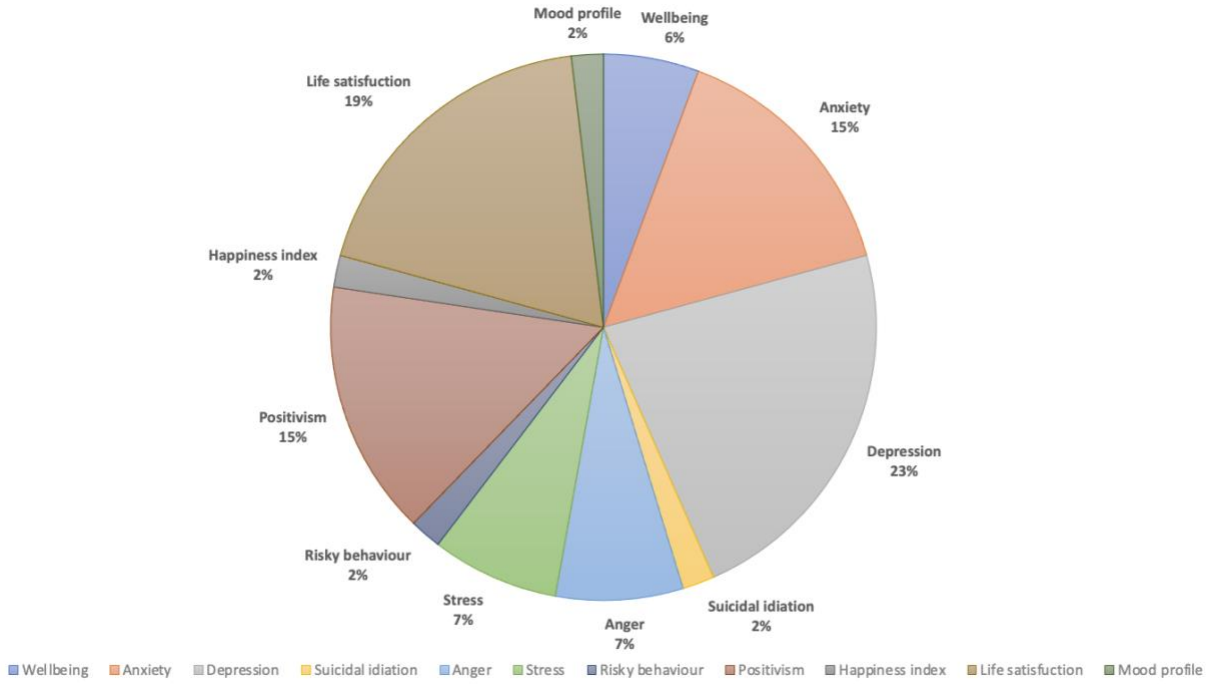
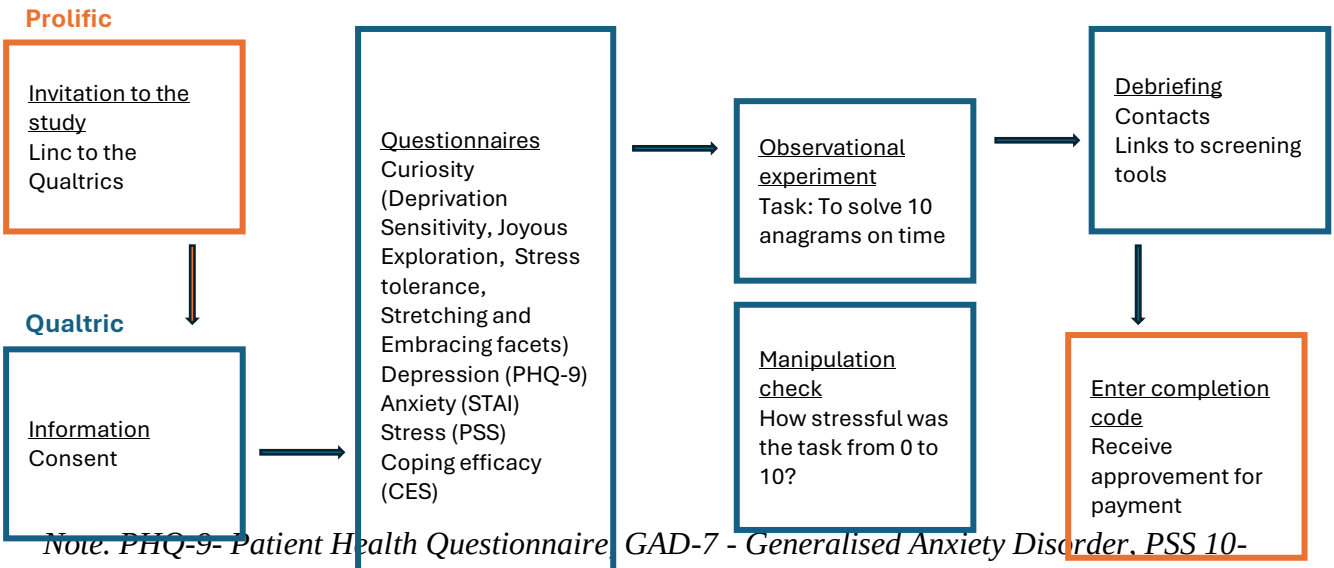


Figure 6

Research design flow chart



Note. PHQ-9- Patient Health Questionnaire, GAD-7 - Generalised Anxiety Disorder, PSS 10-Perceived Stress Scale, CEI-II – Curiosity Exploration Inventory-II, 5DCR – Five-Dimensional Curiosity Scale Revised, CES – Coping Efficacy Scale

Figure 7

Descriptive Statistics for The Observational Experiment

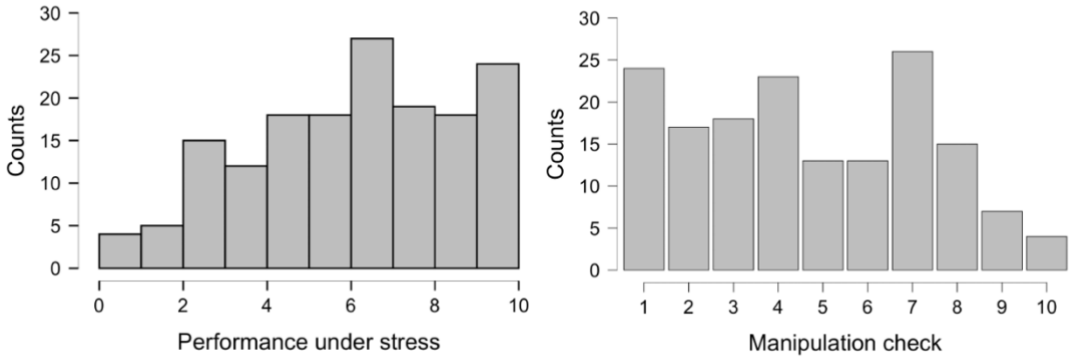
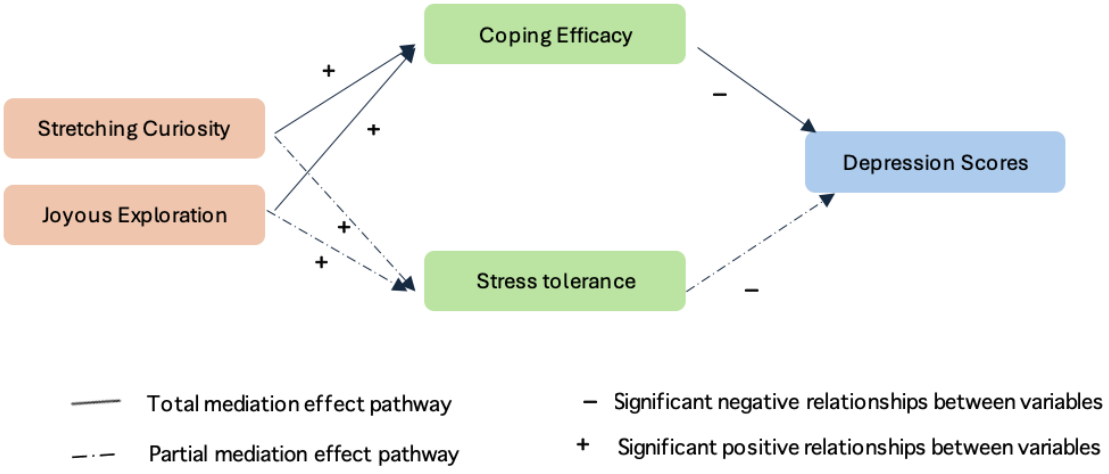


Figure 8

Significant Mediations of the Exploratory Analysis



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Appendix A

Prospero Protocol

NIHR | National Institute for Health Research

The interactions between curiosity, coping mechanisms, and well-being: a systematic review

Citation

Alisa Priemysheva, Matthias Gruber, Shazia Akhtar. The interactions between curiosity, coping mechanisms, and well-being: a systematic review. PROSPERO 2024 CRD42024453663 Available from: https://www.crd.york.ac.uk/prospero/display_record.php?ID=CRD42024453663

Review question [1 change]

What does the existing empirical research suggest about how curiosity affects well-being, mental health and coping with stress?

Searches [2 changes]

A search strategy will be developed to identify relevant studies according to the review question (Aromataris & Riitano, 2014; Siddaway et al., 2019). The following electronic databases will be selected for the search to provide advanced search preferences: PubMed, Scopus, and APA PsycNet. The search strategy will be designed to capture all relevant literature and include a combination of keywords related to curiosity and wellbeing. The search will limited to articles published in English. There will be no limitation on publication date or country of publication. Tool PICO (Population, Intervention, Comparison, Outcome) was used to identify key aspects of the review and search terms. Only human studies will be included in the review. According to the latest information, the Scopus database possesses coding issues if the search is filtered by human studies. Therefore instead of filtering for human studies, indicators of animal studies will be added in the search terms under exclusion criteria. Boolean operators (AND, OR, NOT) will be applied to the advanced search by Title and Abstract in the selected databases. The search terms will include: "curiosity " AND "well-being" OR "wellbeing" OR "stress" OR "coping" OR "mental health" OR "psychological health" OR "anxiety" OR "depression" OR "depressive" OR "coping efficacy" OR "effective coping" NOT "psychiatric" OR "cancer education" OR "animal" OR "mice" OR "mouse" OR "rat" OR "rats" OR "smoking" OR "cigarettes" OR "infant".

Types of study to be included

Included:

• Randomized controlled trials (RCTs)

• Non-randomized studies: non-randomized controlled trials, interrupted time series, controlled before-and-after studies, and cohort studies are eligible for inclusion.

• All languages as long as articles were translated into English

• Unpublished studies (e.g., conference abstracts, trial protocols)

Excluded:

• Animal studies

• Studies of curiosity in the context of enduring physical and mental health conditions

• Studies of curiosity in the context of education

Condition or domain being studied

Curiosity can be broadly defined as intrinsic motivation for seeking novelty and challenging interactions with the world. These abilities are suggested to facilitate strength in withholding distress, partially by allowing one to remain open to new knowledge and psychological awareness. A growing body of research suggests curiosity to be an asset for human well-being and coping mechanisms.

Participants/population

Inclusion criteria: Adolescents and adults without enduring physical or mental health conditions (i.e., focusing on subclinical relationships regarding curiosity and mental health, mild and moderate mental health conditions)

Exclusion criteria: People with enduring physical or mental health conditions (e.g. cancer, stroke, or psychopathology e.g. schizophrenia, recurrent depressive disorder, anxiety disorders, etc.)

Intervention(s), exposure(s) [1 change]

This study aims to explore would the phenomenon of curiosity (exposure) influences or affects in any way wellbeing (outcome). Different types of curiosity can meet the criteria for inclusion when they are clearly defined in the study or are part of existing theories (eg. stretching and embracing curiosity, interest-based or curiosity as a feeling of deprivation).

Inclusion criteria: Phenomenon of curiosity measured quantitatively utilising validated questionnaires and tests.

Exclusion criteria: phenomenon of curiosity that is not defined in the research, measured qualitatively or not measured at all.

Comparator(s)/control [1 change]

Not applicable as this review explores would the phenomenon of curiosity (exposure) influences or affects in any way wellbeing (outcome). No control conditions or groups are planned to explore.

Context

There will be no restrictions on the setting the intervention took place.

Main outcome(s) [1 change]

This review aims to identify factors connected to curiosity (exposure) and wellbeing (outcome). Outcomes can suggest a connection between curiosity and multiple measures of wellbeing and mental health indicators that will be analysed in the review.

Inclusion criteria: Defined and quantitatively measured wellbeing. Quantitative measures of mental health include questionnaires for anxiety, depression, stress, and coping.

Exclusion criteria: qualitative measures of wellbeing and mental health, undefined wellbeing or curiosity.

Additional outcome(s)

Not applicable

Data extraction (selection and coding) [1 change]

After conducting the search described in the above sections, selected articles will be uploaded to the Confidence systematic review management program. Search and exclusion of duplicates will be performed automatically by this system. The remaining studies will be screened by two reviewers independently with the help of inclusion and exclusion criteria. The screening will take place in two stages. During the first stage reviewers will be screening the studies by the title and abstract, and excluded articles will be recorded by confidence. Selected articles will then be reviewed during a full-text review stage, and reasons for exclusion will be recorded by the Covidence. Guided by the exclusion and inclusion criteria reviewers will select articles to be included in to review. All discrepancies in both stages regarding exclusion or reasons for exclusion of the studies will be resolved through discussions between the reviewers. In the case where a resolution will not be reached supervisors of this review will take part in a resolution of disagreement.

An Excel spreadsheet will be used for the extraction of the data for all included in the review articles by one reviewer. For each of the studies included in the review following data will be extracted and documented in the table: title of the article, names of the authors, year of publication, sample size, demographics (age, gender, ethnicity), study design, types of curiosity evaluated in the study, types of well-being and measures of mental health indicators, measurement tools, analysis method, results (key findings, effect size, p-value), strengths and limitations of each study and possible implications of results will be also included.

Risk of bias (quality) assessment

Two separate risk of bias assessments will be conducted, the revised Cochrane Risk of Bias tool for randomized trials (RoB 2) for randomised control trials and the Risk Of Bias In Non-Randomized Studies of Interventions (ROBINS-I) for all other studies.

Strategy for data synthesis [3 changes]

At least 10 articles will be needed to satisfy the criteria for the current review synthesis. Synthesis without meta-analysis (SWiM) protocol will be utilised for the synthesis of the data. With the possibility of large discrepancy in the data of this review, meta-analysis may not be possible to perform. Curiosity is a complex phenomenon with a growing body of research defining it in a variety of ways. Hence, in the first stage of the synthesis, it is suggested to group data according to a type of curiosity evaluated in the study. Search terms for this review suggest a wide variety of indicators of well-being and mental health can be present in the results. Therefore, for every type of curiosity subgroups by the type of well-being or mental health indicators will be formed. As this review does not have limitations in date of the publications grouping according to the research progression can also be performed. Where possible methodology tools used to evaluate outcomes can also be grouped for synthesis and reporting. Additionally, grouping according to the type of connection between curiosity and wellbeing (e.g. mediation, direction of the effect, moderation).

Every study described in the review will be evaluated by sample size, direction of the effect, and p-value. The connection between curiosity and well-being is not defined, therefore one of the synthesis methods for the current review will be identifying if there is a direction of the effect. In the case where the number of the studies included in the review will exceed 15, experimental and longitudinal studies will take priority for detailed description (study design, analysis methods, limitations). It is suggested that the majority of research will be correlational. Therefore, it is expected to evaluate the consistency of the effect across studies.

Analysis of subgroups or subsets

None planned

Contact details for further information

Alisa Priemysheva
ap20adg@herts.ac.uk

Organisational affiliation of the review

University of Hertfordshire
Website: https://www.herts.ac.uk/

Review team members and their organisational affiliations

Ms Alisa Priemysheva. University of Hertfordshire
Dr Matthias Gruber. Cardiff University
Dr Shazia Akhtar. University of Hertfordshire

Type and method of review [2 changes]

Narrative synthesis, Systematic review, Other

Anticipated or actual start date

15 August 2023

Anticipated completion date

09 June 2024

Funding sources/sponsors

Not applicable

Conflicts of interest

Language

English

Country

England

Stage of review

Review Ongoing

Subject index terms status

Subject indexing assigned by CRD

Subject index terms

MeSH headings have not been applied to this record

Date of registration in PROSPERO

02 April 2024

Date of first submission

11 August 2023

Stage of review at time of this submission [1 change]

The review has not started

Stage	Started	Completed
Preliminary searches	No	No
Piloting of the study selection process	No	No
Formal screening of search results against eligibility criteria	No	No
Data extraction	No	No
Risk of bias (quality) assessment	No	No
Data analysis	No	No

The record owner confirms that the information they have supplied for this submission is accurate and complete and they understand that deliberate provision of inaccurate information or omission of data may be construed as scientific misconduct.

The record owner confirms that they will update the status of the review when it is completed and will add publication details in due course.

Versions

02 April 2024

Appendix B

Quality Evaluation Table

This table appendix consists of a table that represents a quality analysis of 21 studies included in the systematic literature review. The global rating indicates the overall quality of the paper with weak (1 point), moderate (2 points), or strong (3 points) quality research.

Title of article	Selection Bias	Study design	Confounders	Date collection method	Analysis	Global rating
ANGER, CURIOSITY, AND OPTIMISM	2	1		3	1	1
Induced Mood and Curiosity	2	3		1	2	2
The neglected relationship between social interaction anxiety and hedonic deficits: differentiation from depressive symptoms	3	3	2	3	3	3
Curiosity and wellbeing	2	3	3	3	3	3
The good, the bad (and the ugly): The role of curiosity in subjective well-being and risky behaviours among adolescents	2	3	2	3	3	3
Exploring the association between curiosity and subjective well-being: the mediating role of self-efficacy beliefs in Hindi-speaking youth	3	4	3	3	3	3
Curious people are less affected by social rejection	3	3	2	2	3	3
Who self-initiates gratitude interventions in daily life? An examination of intentions, curiosity, depressive symptoms, and life satisfaction	2	3	2	2	3	3
Subjective well-being as a mediator for curiosity and depression	2	3	2	2	3	3
Did curiosity kill the cat? Evidence from subjective well-being in adolescents	3			2	1	2
Curiosity for information predicts wellbeing mediated by loneliness during COVID-19 pandemic	2	3	3	2	2	3
Curiosity improves coping efficacy and reduces suicidal ideation severity among military veterans at risk for suicide	2	2	2	3	3	3
Personality, effective goal-striving, and enhanced well-being: comparing 10 candidate personality strengths.	2	2	2	2	3	3
Daily Stressor-Related Negative Mood and its Associations with Flourishing and Daily Curiosity	1	2	3	2	3	2
Curiosity and pathways to well-being and meaning in life: Traits, states, and everyday behaviors	2	3	3	3	3	3

Within-person variability in curiosity during daily life and associations with well-being	1	2	2	2	3	2
The measurement of curiosity as a feeling of deprivation	2	3	3	3	3	3
Killing the cats or satisfying the human? The role of epistemic curiosity in adolescents' multidimensional well-being	2	3	3	2	2	2
A Study of the Impact of Spirituality and Curiosity on Life Satisfaction in Chinese Christian Teachers	1	2	1	2	3	1
The measurement of perceptual curiosity	2	3	2	2	3	3
Measuring Epistemic Curiosity and Its Diversive and Specific Components	2	3	2	3	3	3

Appendix C

Quantitative Research Pre-registration Form

This appendix contains the pre-registration form that was submitted as a part of the pre-registration process in the OSF platform before data collection (https://osf.io/4z2p8).

Study Information

1. Title (required)

The relationship between different types of curiosity and mental health indicators.

2. Authors (required)

Alisa Priemysheva

Shazia Akhtar

Matthias Gruber

3. Description (required)

A growing body of research indicates that curiosity can significantly contribute to mental health and wellbeing. Multiple studies have consistently demonstrated a robust positive correlation between curiosity and wellbeing. However, there exist certain discrepancies in understanding the relationship between curiosity and mental health within the broader concept of wellbeing, particularly regarding its association with stress, which remains relatively under-explored. One additional challenge within this field is attributed to the multifaceted nature of curiosity. Different types of curiosity are linked to distinct cognitive and emotional processes. Therefore, this project aims to assess various types of curiosity in relation to key indicators of mental health, including anxiety, depression, and stress. Moreover, to contextualise curiosity within a framework of stress coping, we will investigate its connection to stress tolerance and coping efficacy.

4. Hypotheses (required)

1) Curiosity will show negative relationships with indicators of depression, anxiety, and stress.
2) Curiosity will show positive relationships with task performance scores.
3) Coping efficacy will be positively connected to curiosity.
4) Coping efficacy and stress tolerance will have mediating effects on the relationships between curiosity and indicators of mental health.

Design Plan

In this section, you will be asked to describe the overall design of your study. Remember that this research plan is designed to register a single study, so if you have multiple experimental designs, please complete a separate preregistration.

5. Study type (required)

   This cross-sectional study will be set as an online experiment using the platform Qualtrics.

6. Blinding (required)

   No blinding is involved in this study.

7. Is there any additional blinding in this study?

8. Study design (required)

Between-subjects correlation and experimental study design. Questionnaires will be used to gather scores of curiosity, coping efficacy, depression, anxiety, and stress. It follows by the objective measure of performance under time pressure. Participants will be offered to solve a timed anagram task.

Randomisation (optional)

N/A

Sampling Plan

10. Existing data (required)

Preregistration prior to creation of data.

11. Explanation of existing data (optional)

N/A

12. Data collection procedures (required)

The recruitment will take place among healthy participants over 18 years old. Participants must have access to a computer and the internet which allows them to participate in the online experiment. Participants must be able to read and understand English fluently. For recruitment, the platform Prolific will be used which allows people to participate in the research and will be compensated for their participation. This platform will provide tools for advertisement and will offer to take part in the research for participants who will be suitable to inclusion criteria. Participation will compensated according to the suggested rates on the platform.

13. Sample size (required)

The results of the power analysis suggested a target sample size of 129 participants. We will be aiming to recruit up to 160 in case of necessary exclusion of the data.

14. Sample size rationale (optional)

The software program G*Power was utilised to perform a power analysis. Our goal was to obtain .95 power to detect a medium effect size of .15 at the standard .05 alpha error probability. Analysis was calculated with 6 total predictors and 4 tested predictors.

15. Stopping rule (optional)

N/A

Variables

16. Manipulated variables (optional)

N/A

17. Measured variables (required)

Ten variables will be Curiosity (Deprivation Sensitivity (revised 5DC), Joyous Exploration (revised 5DC), Stretching(CE-II), Embracing(CE-II)), Stress tolerance(revised 5DC), Depression (PHQ-9), Anxiety (STAI), Stress (perceived stress), Coping efficacy (CES), performance under stress(timed anagram task).

18. Indices (optional)

N/A

Analysis Plan

You may describe one or more confirmatory analysis in this preregistration. Please remember that all analyses specified below must be reported in the final article, and any additional analyses must be noted as exploratory or hypothesis generating.

A confirmatory analysis plan must state upfront which variables are predictors (independent) and which are the outcomes (dependent), otherwise it is an exploratory analysis. You are allowed to describe any exploratory work here, but a clear confirmatory analysis is required.

19. Statistical models (required)

For each questionnaire and subscale, we will create an average score across all items from the particular subscale. These average scores will be used in the following analyses.

Five multiple regression and mediation analyses will be used for the analysis of the data.

Four multiple regressions will have as predictors curiosity types (Deprivation, Interest, Stretching, and Embracing). Dependant variables for these regressions will be Depression scores, Anxiety scores, Perceived stress scores, and task performance scores respectively.

Multiple regression 1:

Independent variables: Deprivation, Interest, Stretching, Embracing (four curiosity types)

Dependent variable: Depression Score (PHQ-9)

Multiple regression 2:

Independent variables: Deprivation, Interest, Stretching, Embracing (four curiosity types)

Dependent variable: Anxiety scores (GAD-7)

Multiple regression 3:

Independent variables: Deprivation, Interest, Stretching, Embracing (four curiosity types)

Dependent variable: Perceived stress scores (PSS)

Multiple regression 4:

Independent variables: Deprivation, Interest, Stretching, Embracing (four curiosity types)

Dependent variable: task performance scores.

Fifth multiple regression will use coping efficacy measures and stress tolerance as predictors. Dependant variables will be the type of curiosity detected as significant predictors of the mental health scores in previous regressions.

Multiple regression 5:

Independent variables: Coping efficacy (CES), Stress tolerance(5DC)

Dependent variable: EITHER Deprivation OR Interest OR Stretching OR Embracing (depending on the above findings).

For each significant relationship of a particular type of curiosity with a mental health outcome (Multiple regression 1-4), different versions of multiple regression 5 will be

run (for each significant curiosity type that showed a relationship with a mental health measure).

Exploratory analysis will be performed utilising mediation analyses. Number of the mediation analyses will depend on the significant predictors of the regression analysis described above. Independent variables will be the types of curiosity detected as significant predictors in previous regression analysis. Mediator variables will be coping efficacy and/or stress tolerance measures. Dependent variables will be measures of mental health indicators indicated having significant correlation above in the regression analysis.

Mediation analysis type 1:

Independent variable: EITHER Deprivation OR Interest OR Stretching OR Embracing (depending on the above findings)

Mediator variable: EITHER Coping efficacy (CES) OR Stress tolerance (5DC) (depending on the above findings)

Dependent variable: EITHER Depression (PHQ-9), Anxiety (STAI), Stress (perceived stress) (depending on the above findings)

Mediation analysis type 2:

The same variables will be used as in mediation analysis 1, but the independent variable and mediator variable will be swapped in order to test the specificity of the mediating variable. Mediation analysis 2 will therefore test whether a type of curiosity will mediate the effects of coping efficacy or stress tolerance on mental health indicators.

Independent variable: EITHER Coping efficacy (CES) OR Stress tolerance (5DC) (depending on the above findings)

Mediator variable: EITHER Deprivation OR Interest OR Stretching OR Embracing (depending on the above findings)

Dependent variable: EITHER Depression (PHQ-9), Anxiety (STAI), Stress (perceived stress) (depending on the above findings)

20. Transformations (optional)

N/A

21. Inference criteria (optional)

N/A

22. Data exclusion (optional)

The data will be excluded from the final analysis if participants fail at least one out of 3 attention checks. Outliers (+/-3 standard deviation) will be excluded from the final data analysis.

Appendix D

Ethics Approval

This appendix contains the ethical approval for this study that was granted by the Health, Science, Engineering and Technology Ethics Committee with Delegated Authority of the University of Hertfordshire.

University of Hertfordshire UH

HEALTH, SCIENCE, ENGINEERING AND TECHNOLOGY ECDA

ETHICS APPROVAL NOTIFICATION

TO	**Alisa Priemysheva**
CC:	**Shazia Akhtar**
FROM	**Dr Rebecca Knight, Health, Science, Engineering and Technology ECDA**
DATE	**18/04/2024**

Protocol number:	**LMS/PGR/UH/05602**
Title of study:	The relationship between different types of curiosity and stress: mental health perspective

Your application for ethics approval has been accepted and approved with the following conditions by the ECDA for your School and includes work undertaken for this study by the named additional workers below:

Matthias Gruber (Cardiff University)

General conditions of approval:

Ethics approval has been granted subject to the standard conditions below:

Permissions: Any necessary permissions for the use of premises/location and accessing participants for your study must be obtained in writing prior to any data collection commencing. Failure to obtain adequate permissions may be considered a breach of this protocol.

External communications: Ensure you quote the UH protocol number and the name of the approving Committee on all paperwork, including recruitment advertisements/online requests, for this study.

Invasive procedures: If your research involves invasive procedures you are required to complete and submit an EC7 Protocol Monitoring Form, and copies of your completed consent paperwork to this ECDA once your study is complete.

Submission: Students must include this Approval Notification with their submission.

Validity:

This approval is valid:

From: 18/04/2024

To: 30/07/2024

Please note:

Failure to comply with the conditions of approval will be considered a breach of protocol and may result in disciplinary action which could include academic penalties.
Additional documentation requested as a condition of this approval protocol may be submitted via your supervisor to the Ethics Clerks as it becomes available. All documentation relating to this study, including the information/documents noted in the conditions above, must be available for your supervisor at the time of submitting your work so that they are able to confirm that you have complied with this protocol.

Should you amend any aspect of your research or wish to apply for an extension to your study you will need your supervisor's approval (if you are a student) and must complete and submit form EC2.
Approval applies specifically to the research study/methodology and timings as detailed in your Form EC1A. In cases where the amendments to the original study are deemed to be substantial, a new Form EC1A may need to be completed prior to the study being undertaken.

Failure to report adverse circumstance/s may be considered misconduct.
Should adverse circumstances arise during this study such as physical reaction/harm, mental/emotional harm, intrusion of privacy or breach of confidentiality this must be reported to the approving Committee immediately.

Appendix E

Information and Consent Form

This appendix contains an example of the information that participants of the research needed to read before commencing the study. To start participation they needed to give their consent.

Welcome to our research!

You are being invited to complete an online survey as part of a final year course being undertaken by Alisa Priemysheva, a Clinical Psychology Doctorate student at the School of Life and Medical Sciences, University of Hertfordshire, UK.

Please read the following information carefully before deciding whether to take part. Please ask if there is anything unclear or if you would like more information.

You are eligible to take part in this study if you are 18 or over and a native English speaker, and have no diagnosis of a learning disability.

The Study

The purpose of the study is to enhance our understanding of the role of curiosity and coping efficacy in maintaining mental health. We aim to explore different types of curiosity in relation to some measures of depression, stress and anxiety. We aim to expand on our understanding of the relationships between curiosity and mental health, and to identify the role of coping efficacy and stress tolerance in these relationships.

What does taking part involve?

If you agree to take part in this study, you will be asked to complete an online survey/questionnaire. This survey/questionnaire will ask about your mental health, mood, habits, and behaviour. It will take you approximately 10-15 minutes to complete.

Do I have to take part?

No. It is up to you to decide whether or not to take part. You are free to withdraw from the study at any time and without giving a reason. If you choose not to take part, you do not need to do anything further. You will also complete a small exercise involving solving a cognitive puzzle.

Are there any benefits or risks for me if I take part?

You may not directly benefit from this research; however, we hope your participation in the study may expand our understanding of how people can maintain mental health. Your participation will help to inform clinical practice and further research in this field.

There are no expected high risks for participants. However, participants will be asked to respond to questions about their mental health, identity and life habits. Some of the questions may be uncomfortable to think about. Some people can feel stressed when completing timed tasks.

Any data that you provide will be treated as confidential and the questionnaire is anonymous.

All data from the study will be stored securely on my university One Drive cloud storage system which only I have access to and will be deleted under secure conditions in 10 years.

What will happen to the findings of this study?

The findings will be used to produce data to answer my research questions.

Has this study received ethical approval?

This study has been approved by the University of Hertfordshire Social Sciences, Arts and Humanities, Ethics Committee with Delegated Authority (SSAH ECDA). The Ethics Protocol number for this study is LMS/PGR/UH/05602.

If you would like to receive more information and for any other queries about this project you can contact me by email (a.priemysheva@herts.ac.uk) or my Supervisor, Shazia Akhtar (s.akhtar8@herts.ac.uk)

Although we hope this is not the case, if you have any complaints or concerns about any aspect of the way you have been approached or treated during this study, please write to the University's Secretary and Registrar at the following address:

Secretary and Registrar

University of Hertfordshire

College Lane

Hatfield, Hertfordshire

AL10 9AB

United Kingdom

If you do not wish to participate in this survey, just close your browser.

If you are interested in taking part, please read the statements below and then click 'yes' to record your consent to participate.

- I confirm that I have read the study information. I have had the opportunity to consider the information and ask questions. Any questions have been answered satisfactorily
- I understand that my participation is voluntary, and I am free to withdraw from the study at any time without giving a reason
- I am 18 or over

Appendix F

Demographic Form

This appendix contains an example of the information that participants of the research needed to complete at the beginning of the study.

Questions about you.

Q1 Age:

Q2 Gender:

Male

Female

Non-binary / third gender

Other (self-identify) I prefer not to say

Q3 How many years of formal education (including school) have you received?

Q4 What is your ethnicity?:

Asian / Asian British

Black / African / Caribbean / Black British

White

Mixed / Multiple ethnic groups

Other ethnic group

Appendix G

Study Debriefing

This appendix contains an example of the information that participants of the research saw at the end of the study. They could use the links to be redirected to the NHS websites.

Study Debriefing

Title of study: The relationship between different types of curiosity and mental health indicators

Aims of the study

This study aims to enhance our understanding of the role of curiosity and coping efficacy in maintaining mental health. We aim to explore different types of curiosity in relation to some measures of depression, stress and anxiety. We aim to expand on our understanding of the relationships between curiosity and mental health and to identify the role of coping efficacy and stress tolerance in these relationships.

How was this determined?

We collected information about participants' mental health and their traits of curiosity and coping efficacy. After completing data collection we will analyse the relationships between phenomena to address the aims of the study.

What if you feel discomfort or have more questions about the topic of this research?

During the experiment, you were asked to fill screening tool, used in clinical settings to screen for depression, anxiety, and stress. If some of the questions made you feel unsure you can find more information on the official NHS website.

To receive information about urgent mental health:

https://www.nhs.uk/nhs-services/mental-health-services/where-to-get-urgent-help-for-mental-health/

To learn more about depression:
https://www.nhs.uk/mental-health/conditions/depression/
To learn more about anxiety:
https://www.nhs.uk/mental-health/conditions/anxiety/
To learn more about stress:
https://www.nhs.uk/mental-health/feelings-symptoms-behaviours/feelings-and-symptoms/stress/

Appendix H

The Curiosity and Exploration Scale (CEI-II)

This appendix contains an example of The Curiosity and Exploration Scale (CEI-II) built into the Qualtrics software.

Instructions: rate the statements below for how accurately they reflect the way you generally feel and behave. Do not rate what you think you should do, or wish you do, or things you no longer do. Please be as honest as possible.

	Very slightly or not at all (1)	A little (2)	Moderatelly (3)	Quite a bit (4)	Extremely (5)
1. I actively seek as much information as I can in new situations.	○	○	○	○	○
2. I am the type of person who really enjoys the uncertainty of everyday life.	○	○	○	○	○
3. I am at my best when doing something that is complex or challenging.	○	○	○	○	○
4. Everywhere I go, I am out looking for new things or experiences.	○	○	○	○	○
5. I view challenging situations as an opportunity to grow and learn.	○	○	○	○	○
6. I like to do things that are a little frightening.	○	○	○	○	○
7. I am always looking for experiences that challenge how I think about myself and the world.	○	○	○	○	○
8. I prefer jobs that are excitingly unpredictable.	○	○	○	○	○
9. I frequently seek out opportunities to challenge myself and grow as a person.	○	○	○	○	○
10. I am the kind of person who embraces unfamiliar people, events, and places.	○	○	○	○	○

Appendix I

The Five-Dimensional Curiosity Scale Revised (5DCR)

This appendix contains an example of the Five-Dimensional Curiosity Scale Revised (5DCR) built into the Qualtrics software. The last question in this example contains the attention check and is not a part of an original questionnaire.

Below are statements people often use to describe themselves. Please use the scale below to indicate the degree to which these statements accurately describe you. There are no right or wrong answers.

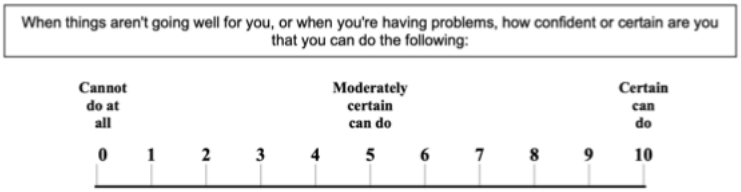
	1 – Does not describe me at all	2 – Barely describes me	3 – Somewhat describes me	4 – Neutral	5 – Generally describes me	6 – Mostly describe me
1. I view challenging situations as an opportunity to grow and learn.	○	○	○	○	○	○
2. I seek out situations where it is likely that I will have to think in depth about something.	○	○	○	○	○	○
3. I enjoy learning about subjects that are unfamiliar to me.	○	○	○	○	○	○
4. I find it fascinating to learn new information.	○	○	○	○	○	○
5. Thinking about solutions to difficult conceptual problems can keep me awake at night.	○	○	○	○	○	○
6. I can spend hours on a single problem because I just can't rest without knowing the answer.	○	○	○	○	○	○

7. I feel frustrated if I can't figure out the solution to a problem, so I work even harder to solve it.	○	○	○	○	○	○
8. I work relentlessly at problems that I feel must be solved.	○	○	○	○	○	○
9. The smallest doubt can stop me from seeking out new experiences.	○	○	○	○	○	○
10. I cannot handle the stress that comes from entering uncertain situations.	○	○	○	○	○	○
11. I find it hard to explore new places when I lack confidence in my abilities.	○	○	○	○	○	○
12. It is difficult to concentrate when there is a possibility that I will be taken by surprise.	○	○	○	○	○	○
13. For this question, simply select option 3 - Somewhat describes me.	○	○	○	○	○	○

Appendix J

The Coping Self-Efficacy Scale (CES)

This appendix contains an example of The Coping Self-Efficacy Scale (CES) built into the Qualtrics software.



For each of the following items, choose a number from 0 - 10, using the scale above.

When things aren't going well for you, how confident are you that you can:

	0	1	2	3	4	5	6	7	8	9	10
1. Sort out what can be changed, and what can not be changed.	○	○	○	○	○	○	○	○	○	○	○
2. Get emotional support from friends and family.	○	○	○	○	○	○	○	○	○	○	○
3. Find solutions to your most difficult problems.	○	○	○	○	○	○	○	○	○	○	○
4. Break an upsetting problem down into smaller parts.	○	○	○	○	○	○	○	○	○	○	○
5. Leave options open when things get stressful.	○	○	○	○	○	○	○	○	○	○	○
6. Make a plan of action and follow it when confronted with a problem.	○	○	○	○	○	○	○	○	○	○	○

7. Take your mind off unpleasant thoughts.	○	○	○	○	○	○	○	○	○	○	○
8. Keep from feeling sad.	○	○	○	○	○	○	○	○	○	○	○
9. Stop yourself from being upset by unpleasant thoughts.	○	○	○	○	○	○	○	○	○	○	○
10. Make new friends.	○	○	○	○	○	○	○	○	○	○	○
11. Get friends to help you with the things you need.	○	○	○	○	○	○	○	○	○	○	○
12. Make unpleasant thoughts go away.	○	○	○	○	○	○	○	○	○	○	○
13. Think about one part of the problem at a time.	○	○	○	○	○	○	○	○	○	○	○

Appendix K

The Patient Health Questionnaire (PHQ-9)

This appendix contains an example of The Patient Health Questionnaire (PHQ-9) built into the Qualtrics software.

Over the last 2 weeks, how often have you been bothered by any of the following problems?

	Not at all 0	Several days 1	More than half the days 2	Nearly every day 3
1. Little interest or pleasure in doing things	○	○	○	○
2. Feeling down, depressed, or hopeless	○	○	○	○
3. Trouble falling or staying asleep, or sleeping too much	○	○	○	○
4. Feeling tired or having little energy	○	○	○	○
5. Poor appetite or overeating	○	○	○	○
6. Feeling bad about yourself—or that you are a failure or have let yourself or your family down	○	○	○	○
7. Trouble concentrating on things, such as reading the newspaper or watching television	○	○	○	○
8. Moving or speaking so slowly that other people could have noticed? Or the opposite—being so fidgety or restless that you have been moving around a lot more than usual	○	○	○	○
9. Thoughts that you would be better off dead or of hurting yourself in some way	○	○	○	○

Appendix L

Generalized Anxiety Disorder-7 (GAD-7)

This appendix contains an example of the Generalised Anxiety Disorder-7 Questionnaire (GAD-7) built into the Qualtrics software.

Over the last 2 weeks, how often have you been bothered by any of the following problems?

	Not at all 0	Several days 1	More than half the days 2	Nearly every day 3
1. Feeling nervous, anxious or on edge	○	○	○	○
2. Not being able to stop or control worrying	○	○	○	○
3. Worrying too much about different things	○	○	○	○
4. Trouble relaxing	○	○	○	○
5. Being so restless that it is hard to sit still	○	○	○	○
6. Becoming easily annoyed or irritable	○	○	○	○
7. Feeling afraid as if something awful might happen	○	○	○	○

Appendix M

The Perceived Stress Scale (PSS-10)

This appendix contains an example of The Perceived Stress Scale (PSS-10) built into the Qualtrics software. The last question in this example contains the attention check and is not a part of an original questionnaire.

For each question choose from the following alternatives 0- Never 1 - Almost never 2 - Sometimes 3 - Fairly often 4 - Very often

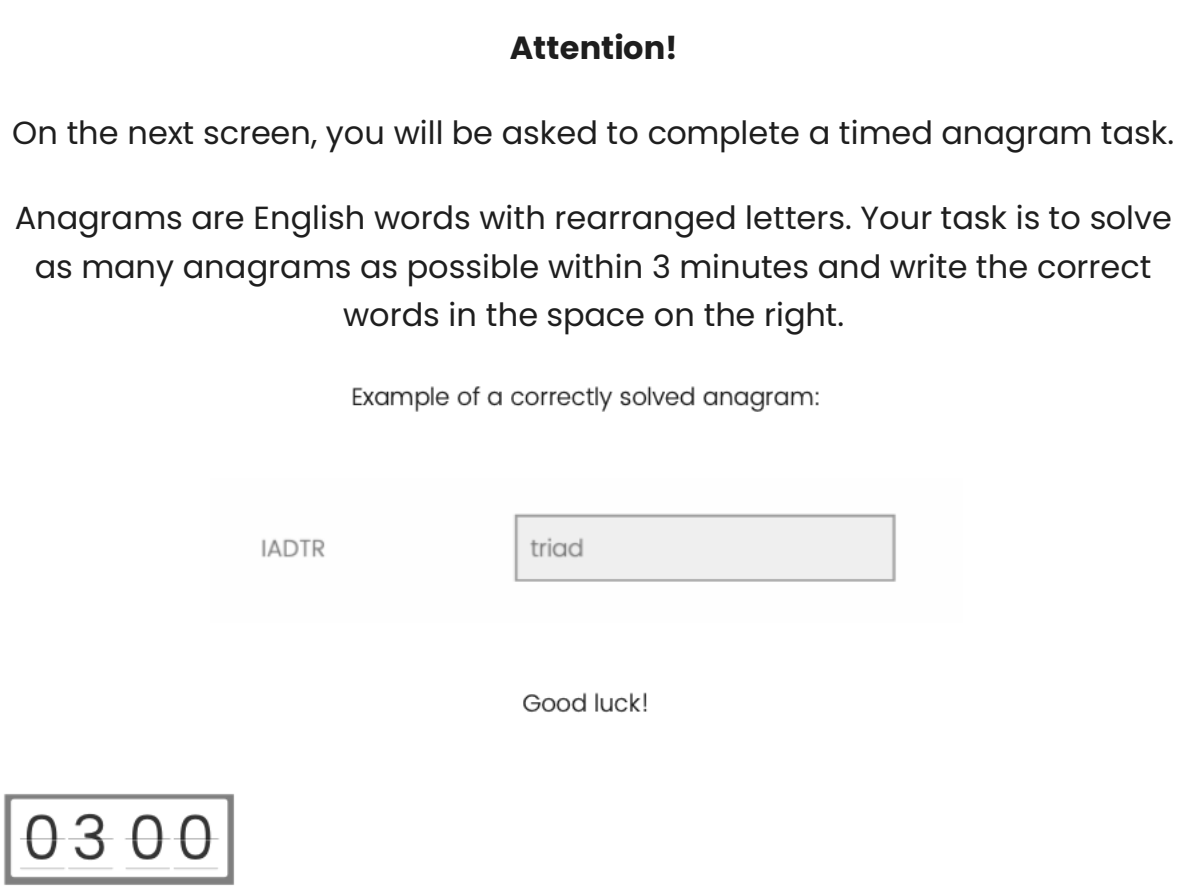
	Never 0	Almost never 1	Sometimes 2	Fairly often 3	Very often 4
1. In the last month, how often have you been upset because of something that happened unexpectedly?	○	○	○	○	○
2. In the last month, how often have you felt that you were unable to control the important things in your life?	○	○	○	○	○
3. In the last month, how often have you felt nervous and "stressed"?	○	○	○	○	○
4. In the last month, how often have you felt confident in your ability to handle your personal problems?	○	○	○	○	○
5. In the last month, how often have you felt that things were going your way?	○	○	○	○	○

6. In the last month, how often have you found that you could not cope with all the things that you had to do?	○	○	○	○	○
7. In the last month, how often have you been able to control irritations in your life?	○	○	○	○	○
8. In the last month, how often have you felt that you were on top of things?	○	○	○	○	○
9. In the last month, how often have you been angered because of things that happened that were outside of your control?	○	○	○	○	○
10. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?	○	○	○	○	○
11. For this question, simply select 'Sometimes - 2'.	○	○	○	○	○

Appendix N

Anagram Task

This appendix contains an example of an anagram task built into the Qualtrics software. Participants were able to read through the instructions and study the example of an anagram. After they were able to start the task and see the countdown for three minutes.



Solve anagrams

IRCHA 

TAYPR 

OLDME 

TIOPA 

HBEAC 

UGARS 

OBRAC 

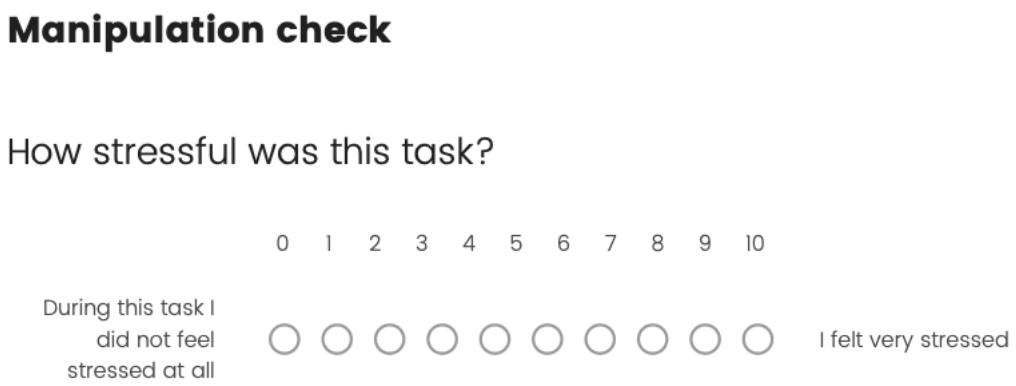
GOTAN 

TIRNA 

OINGR 

Appendix O

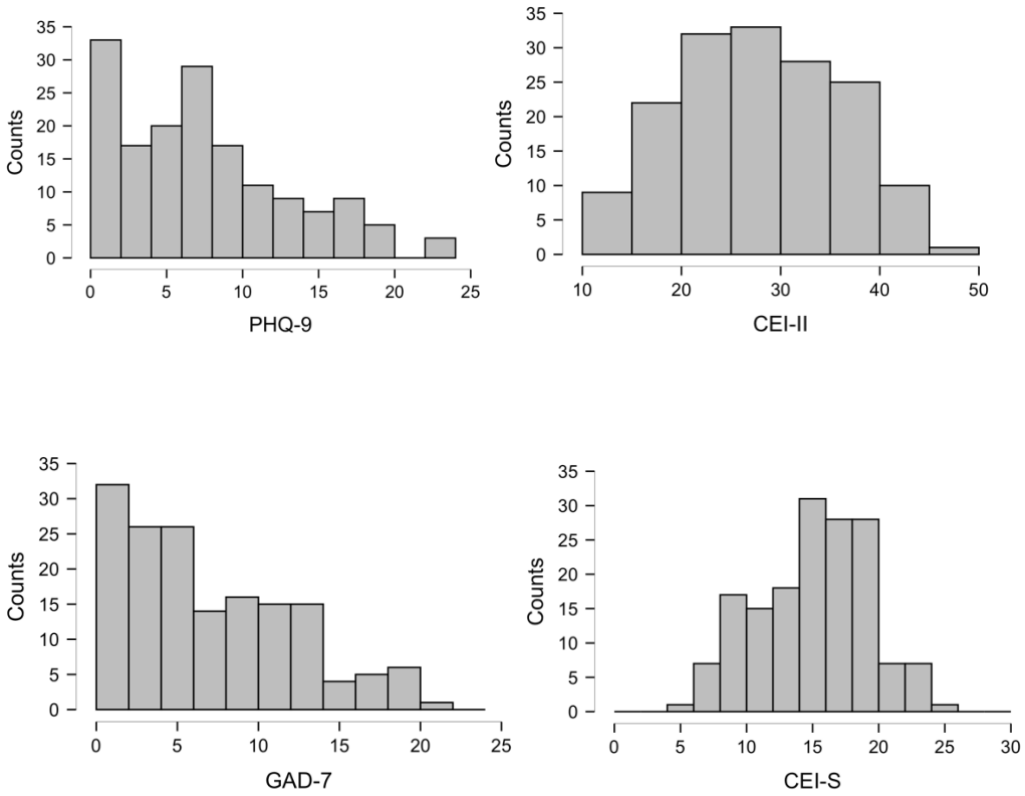
Manipulation Check

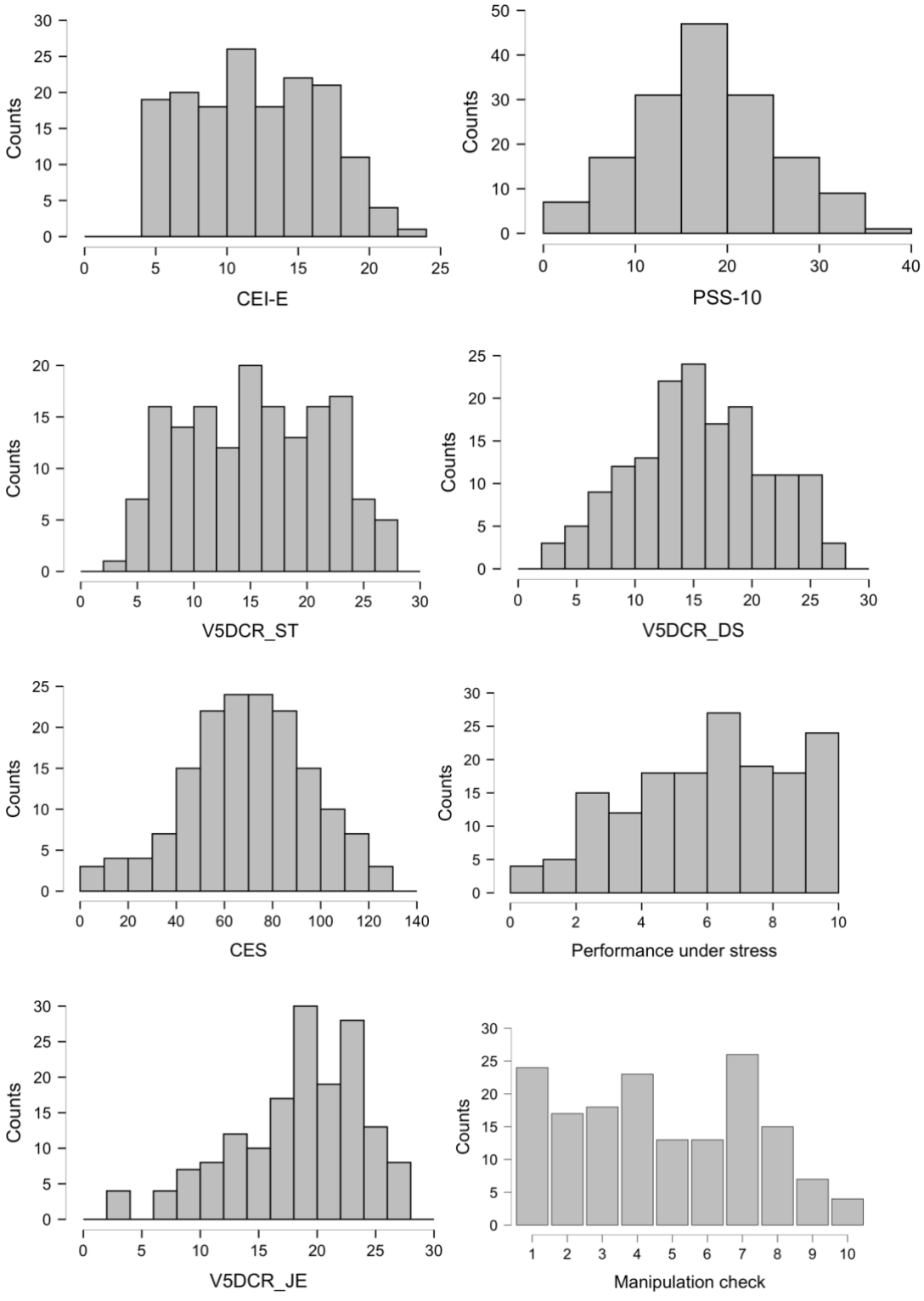


Appendix P

Distribution Plots for Key Variable

PHQ-9- Patient Health Questionnaire, GAD-7 - Generalised Anxiety Disorder, PSS 10 - Perceived Stress Scale, CEI – Curiosity Exploration Inventory-II, CEI-S – Stretching curiosity, CEI-E – Embracing curiosity, V5DCR – Five-Dimensional Curiosity Scale Revised, V5DCR-JE – Joyous Exploration, V5DCR-DS – Deprivation Sensitivity, V5DCR-ST – Stress tolerance, CES – Coping Efficacy Scale, Performance under stress – number of correctly solved anagrams during three minutes, Manipulation check – self-evaluation of stress experienced during the anagram task.




Counts
CEI-E
PSS-10
V5DCR_ST
V5DCR_DS
CES
Performance under stress
V5DCR_JE
Manipulation check

Appendix Q

The Descriptive Statistics for Gender Across Key Variables

	PHQ-9				GAD-7				PSS-10			
	Female	Male	Non-binary / third gender	Prefer not to say	Female	Male	Non-binary / third gender	Prefer not to say	Female	Male	Non-binary / third gender	Prefer not to say
Valid	78	76	4	2	78	76	4	2	78	76	4	2
Missing	0	0	0	0	0	0	0	0	0	0	0	0
Mean	8.013	7.974	6.000	10.500	7.359	7.171	6.250	11.000	19.103	18.105	19.250	17.500
Std. Deviation	5.293	6.062	4.082	4.950	5.202	5.468	1.500	0.000	4.235	5.072	4.646	0.707
Minimum	1.000	0.000	2.000	7.000	0.000	0.000	5.000	11.000	8.000	0.000	13.000	17.000
Maximum	24.000	24.000	10.000	14.000	19.000	21.000	8.000	11.000	27.000	28.000	24.000	18.000

	CEI-II				CEI-S				CEI-E			
	Female	Male	Non-binary / third gender	Prefer not to say	Female	Male	Non-binary / third gender	Prefer not to say	Female	Male	Non-binary / third gender	Prefer not to say
Valid	78	76	4	2	78	76	4	2	78	76	4	2
Missing	0	0	0	0	0	0	0	0	0	0	0	0
Mean	26.974	29.132	32.500	30.500	15.128	16.053	19.000	17.000	11.846	13.079	13.500	13.500
Std. Deviation	8.737	7.495	8.699	2.121	4.391	3.826	5.354	0.000	4.748	4.363	4.041	2.121
Minimum	10.000	14.000	24.000	29.000	5.000	8.000	13.000	17.000	5.000	6.000	8.000	12.000
Maximum	46.000	44.000	40.000	32.000	24.000	25.000	24.000	17.000	23.000	21.000	17.000	15.000

	V5DCR_JE				V5DCR_DS				V5DCR_ST			
	Female	Male	Non-binary / third gender	Prefer not to say	Female	Male	Non-binary / third gender	Prefer not to say	Female	Male	Non-binary / third gender	Prefer not to say
Valid	78	76	4	2	78	76	4	2	78	76	4	2
Missing	0	0	0	0	0	0	0	0	0	0	0	0
Mean	17.782	19.803	23.000	19.000	15.321	16.447	20.750	24.000	16.603	15.474	12.500	13.500
Std. Deviation	6.092	4.797	2.582	1.414	6.161	4.941	3.862	0.000	5.999	6.070	7.000	4.950
Minimum	4.000	7.000	20.000	18.000	4.000	5.000	17.000	24.000	4.000	6.000	5.000	10.000
Maximum	28.000	28.000	26.000	20.000	28.000	26.000	25.000	24.000	28.000	27.000	21.000	17.000

	CES				Performance under stress				Manipulation check			
	Female	Male	Non-binary / third gender	Prefer not to say	Female	Male	Non-binary / third gender	Prefer not to say	Female	Male	Non-binary / third gender	Prefer not to say
Valid	78	76	4	2	78	76	4	2	78	76	4	2
Missing	0	0	0	0	0	0	0	0	0	0	0	0
Mean	68.782	72.803	66.750	55.500	6.936	6.079	6.250	8.500	4.564	5.000	3.500	1.000
Std. Deviation	26.956	25.107	18.228	3.536	2.110	2.855	2.754	2.121	2.463	2.698	3.000	0.000
Minimum	9.000	8.000	41.000	53.000	2.000	0.000	3.000	7.000	1.000	1.000	1.000	1.000
Maximum	122.000	130.000	83.000	58.000	10.000	10.000	9.000	10.000	10.000	10.000	7.000	1.000

Appendix R

Mediation Analysis for Joyous Exploration and Depression Scores

1) Coping Efficacy as a Mediator

Direct effects

					95% Confidence Interval	
	Estimate	Std. Error	z-value	p	Lower	Upper
5DCR_JE → PHQ-9	-0.013	0.014	-0.950	0.342	-0.040	0.014

Note. Delta method standard errors, normal theory confidence intervals, ML estimator.

Indirect effects

					95% Confidence Interval	
	Estimate	Std. Error	z-value	p	Lower	Upper
5DCR_JE → CES → PHQ-9	-0.038	0.009	-4.393	< .001	-0.054	-0.021

Note. Delta method standard errors, normal theory confidence intervals, ML estimator.

Total effects

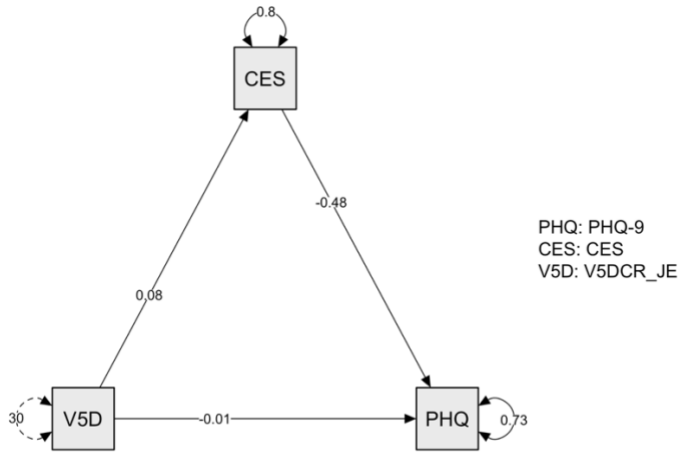
					95% Confidence Interval	
	Estimate	Std. Error	z-value	p	Lower	Upper
5DCR_JE → PHQ-9	-0.051	0.014	-3.678	< .001	-0.078	-0.024

Note. Delta method standard errors, normal theory confidence intervals, ML estimator.

R-Squared

	R^2
PHQ-9	0.261
CES	0.190

Path plot



2) Stress Tolerance as a Mediator

Direct effects

						95% Confidence Interval	
		Estimate	Std. Error	z-value	p	Lower	Upper
V5DCR_JE	→ PHQ-9	-0.035	0.014	-2.500	0.012	-0.063	-0.008

Note. Delta method standard errors, normal theory confidence intervals, ML estimator.

Indirect effects

						95% Confidence Interval	
		Estimate	Std. Error	z-value	p	Lower	Upper
V5DCR_JE → V5DCR_ST →	PHQ-9	-0.015	0.006	-2.601	0.009	-0.027	-0.004

Note. Delta method standard errors, normal theory confidence intervals, ML estimator.

Total effects

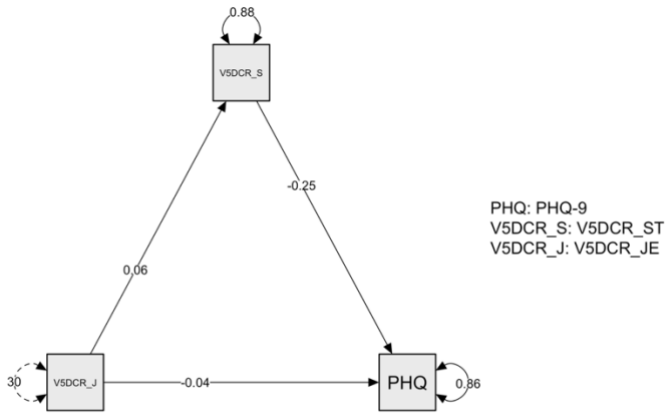
							95% Confidence Interval	
			Estimate	Std. Error	z-value	p	Lower	Upper
V5DCR_JE	→	PHQ-9	-0.051	0.014	-3.678	< .001	-0.078	-0.024

Note. Delta method standard errors, normal theory confidence intervals, ML estimator.

R-Squared

	R^2
PHQ-9	0.133
V5DCR_ST	0.113

Path plot



Appendix S

Mediation Analysis for Stretching Curiosity and Depression Scores

1) Coping Efficacy as a Mediator

Direct effects

					95% Confidence Interval	
	Estimate	Std. Error	z-value	p	Lower	Upper
CEI-S → PHQ-9	-0.002	0.019	-0.122	0.903	-0.040	0.035

Note. Delta method standard errors, normal theory confidence intervals, ML estimator.

Indirect effects

					95% Confidence Interval	
	Estimate	Std. Error	z-value	p	Lower	Upper
CEI-S → CES → PHQ-9	-0.062	0.013	-4.855	< .001	-0.087	-0.037

Note. Delta method standard errors, normal theory confidence intervals, ML estimator.

Total effects

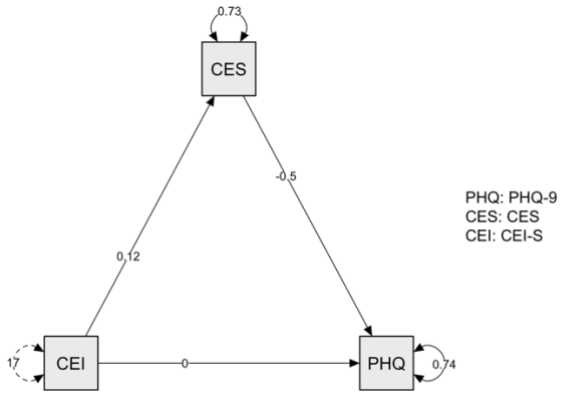
					95% Confidence Interval	
	Estimate	Std. Error	z-value	p	Lower	Upper
CEI-S → PHQ-9	-0.064	0.018	-3.522	< .001	-0.100	-0.029

Note. Delta method standard errors, normal theory confidence intervals, ML estimator.

R-Squared

	R^2
PHQ-9	0.257
CES	0.266

Path plot



2) Stress Tolerance as a Mediator

Direct effects

						95% Confidence Interval	
		Estimate	Std. Error	z-value	p	Lower	Upper
CEI-S	→ PHQ-9	-0.045	0.019	-2.442	0.015	-0.082	-0.009

Note. Delta method standard errors, normal theory confidence intervals, ML estimator.

Indirect effects

						95% Confidence Interval	
		Estimate	Std. Error	z-value	p	Lower	Upper
CEI-S	→ V5DCR_ST → PHQ-9	-0.019	0.007	-2.575	0.010	-0.033	-0.005

Note. Delta method standard errors, normal theory confidence intervals, ML estimator.

Total effects

						95% Confidence Interval	
		Estimate	Std. Error	z-value	p	Lower	Upper
CEI-S	→ PHQ-9	-0.064	0.018	-3.522	< .001	-0.100	-0.029

Note. Delta method standard errors, normal theory confidence intervals, ML estimator.

R-Squared

	R^2
PHQ-9	0.131
V5DCR_ST	0.095

Path plot