Age Differences in Wellbeing: The Role of Emotion Regulation, Cognitive Biases and Coping

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Abstract

A vast amount of research is showing that despite an array of losses that accompany older age, including declines in cognition, physiology and social networks, older adults maintain a higher level of wellbeing than younger adults (Kunzmann, Little, & Smith, 2000). A decrease in the prevalence of depression and anxiety with age has also been observed (Jorm, 2000), however it is unclear why this is the case. A number of explanations have been proposed. Some researchers suggest that older adults are better at regulating their emotions. Alternatively, age-differences in cognitive processing have been implicated in the development and maintenance of emotional disorders, including attention, memory and interpretation biases. Finally, a contextual hypothesis, based on changes in life roles and demands, as well as coping has been proposed. The present thesis investigates these three hypotheses. The first paper examined age differences in emotion regulation by assessing the subjective and physiological indices of recovery from discrete emotions (happiness, sadness and anxiety), and the role of spontaneous emotion regulation in rate of recovery from these emotions. The second and third papers examined age differences in cognitive biases, specifically focusing on negative expectancy bias (i.e. making distorted predictions about the future), and interpretation bias (i.e. the tendency to assign more negative as opposed to neutral or positive meanings to ambiguous situations). Finally, the fourth paper assessed the behavioural coping strategies that younger and older adults use to cope with daily stressors. The results of this thesis will contribute to our understanding of the role emotion regulation, cognitive biases and coping play in maintaining lower levels of anxiety and depression in older adults, as well as help inform psychological treatments for these disorders.

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Statement of Candidate

I certify that the work in this thesis entitled "*Age Differences in Wellbeing: The Role of Emotion Regulation, Cognitive Biases and Coping"* has not previously been submitted for a degree nor has it been submitted as part of requirements for a degree at any other university or institution other than Macquarie University.

I also certify that the thesis is an original piece of research and it has been written by me. Any help and assistance that I have received in my research work and the preparation of the thesis itself have been appropriately acknowledged.

In addition, I certify that all information sources and literature used are indicated in the thesis.

The research presented in this thesis was approved by the Macquarie University Human Research Ethics Committee, reference number: 5201000913D, approved on the 11th of November, 2010.

Dusanka Tadic (Student ID)

13th February, 2014

General Introduction

Thesis Overview

The question of age-related differences and changes in the vulnerability to psychological disorders such as anxiety and depression is a recurrent theme in developmental, clinical and gerontological literatures. Despite an array of losses that accompany older age, including cognitive and physiological decline, as well as declines in social networks, a vast amount of research is showing that older adults maintain a higher level of subjective wellbeing than younger adults (e.g., Cacioppo et al., 2008; Kunzmann, Little, & Smith, 2000). Further, cross-sectional and longitudinal surveys generally show a decrease in anxiety and depressive symptoms and disorders as people age (Byers, Yaffe, Covinsky, Friedman, & Bruce, 2010; Goncalves & Byrne, 2013; Kessler et al., 2005; Kessler et al., 2010; Slade, Johnston, Oakley Browne, Andrews, & Whiteford, 2009). However, the question remains, why do older adults experience higher levels of wellbeing than younger adults? A number of explanations have been proposed, including measurement issues, age-related changes in the way symptoms are reported, mortality and sampling issues. However, a decrease in anxiety and depression with age is still observed when controlling for sex, marital status, education, employment status, income, race, mortality, household size and place of residence (Jorm, 2000). Also, after controlling for the unfavourable effects of poor functional health, age has been associated with high positive affect, low negative affect (Kunzmann et al., 2000) and lower prevalence of mood disorders (Kessler et al., 2010). Therefore, there is evidence to suggest that wellbeing does increase across the lifespan and researchers have started to investigate the developmental differences that might be accounting for this effect.

It is possible that these age-related changes in vulnerability may be a consequence of normal cognitive ageing. For example, some researchers have suggested that improvements in affective wellbeing in later adulthood may be a natural by-product of biological decline (Cacciopo, Berntson, Bechara, Tranel, & Hawkley, 2011). For instance, structural decline in emotion-sensitive brain areas such as the amygdala could selectively impair the processing of negative stimuli, which protects against threats to well-being. However, some studies have found an age-related increase in amygdala activation in response to positive pictures but no change in reactivity to negative pictures (e.g., Mather et al., 2004). Kisley, Woods and Burrows (2007) observed that parietal activation in response to negative pictures declines linearly with age, whereas activation in response to positive pictures is age invariant. Furthermore, neuroimaging studies indicate that brain regions which become less sensitive to negative stimuli with age are activated in older adults by stimuli other than negative valence. For example, novelty in combination with negative valence produces comparable amygdala activation in both young and older adults (Wright, Wedig, Williams, Rauch, & Albert, 2006). Such findings are incomparable with the assumption that structural degradation of brain areas responsible for processing negative material soley underlies increased well-being in older adults.

Another explanation, which has received a lot of attention, is that older adults use different emotion regulation strategies and are better at emotion regulation than younger adults (Gross, 2008). The last decade has seen a surge of literature on emotion regulation. However, early research on emotion regulation has largely focused on the period from infancy through adolescence and only recently has attention turned to looking at emotion regulation in the later years of life. Recent theoretical perspectives suggest that emotion may continue to develop with age unlike the declines seen in cognitive and physiological domains (Carstensen, Isaacowitz, & Charles, 1999). This increasing emotional development is consistent with the suggestion that emotion regulation mechanisms may underlie age differences in wellbeing.

Another area of research that can provide evidence for age differences in wellbeing is the cognitive field. Cognitive biases have been implicated in the development and maintenance of emotional disorders (Mathews & MacLeod, 2005), including attention, memory and interpretation biases. It is possible that changes in these cognitive processes with age are implicated in increases in wellbeing across the lifespan. For example older adults have been shown to have attention and memory preferences for positive emotional stimuli compared to younger adults (e.g., Charles, Mather, & Carstensen, 2003; Langley et al., 2008; Spaniol, Voss, & Grady, 2008). These changes in cognition across the lifespan may facilitate better emotion regulation and thus lead to better wellbeing. However, research into cognitive biases, in particular interpretation biases, is scarce, and it is unclear whether interpretation biases play a role in maintaining wellbeing in older adulthood.

Finally, a contextual explanation for age differences in wellbeing is also possible. Changes in life roles and demands, for example retirement and relinquishing parenting roles may lead to less daily stress. Additionally, changes in motivational goals, such as prioritising emotionally gratifying goals over knowledge and achievement (Carstensen et al., 1999) might prompt older adults to choose to structure their environment in ways that will increase the experience of positive emotions in their daily lives and decrease exposure to stressful situations (Charles & Carstensen, 2007). Furthermore, wisdom and experience with different strategies for dealing with difficult emotions may mean that older adults engage in more effective coping strategies and behaviours than younger adults (e.g., Amirkhan & Auyeung, 2007).

The present thesis investigates aspects of these three areas with respect to age-differences in wellbeing. Younger and older adults in both community and clinical samples are assessed across three separate domains 1) subjective and physiological experience of emotion regulation 2) cognitive interpretation biases and 3) behavioural coping strategies in order to shed light on the role each of these factors plays in maintaining wellbeing and/or contributing to psychopathology in older adulthood.

Theories of Emotional Development in Ageing

Previously, theories of emotional development posited that ageing was associated with increased rigidity and dysregulation of emotions (Schulz, 1985) as well as dampening of emotional experience (Buhler, 1968; Erikson, 1959). More recent research, however, suggests that the prominence of positive and satisfying emotional experiences extends into old age, and in some cases improves with age (Charles & Carstensen, 2010; Charles, Reynolds, & Gatz, 2001). Notably, older adults report that they experience fewer negative emotions, more positive emotions (Carstensen et al., 1999; Carstensen, Pasupathi, Mayr, & Nesselroade, 2000; Gross, Carstensen, Tsai, Skorpen, & Hsu, 1997) and have greater control over their emotions than younger adults (Gross et al., 1997; Lawton, Kleban, Rajagopal, & Dean, 1992). Several theories have been put forward to account for this observation of increased emotional wellbeing in older adults.

Socioemotional Selectivity Theory

According to the Socioemotional Selectivity Theory (SST; Carstensen, 2006; Carstensen et al., 1999), the perception of time plays a central role in determining the prioritisation of social goals and the execution of behaviours to achieve those goals. The theory postulates that the perception that time is expansive decreases across the lifespan, leading to age-related changes in motivation. Specifically, as age is negatively associated with the amount of life left, older adults place increasing value on emotionally meaningful goals and invest more cognitive and social resources to obtain them. Younger adults however, prioritise acquiring knowledge and preparing for the future because the future is perceived as expansive. These age-related changes in motivation may prompt older adults to devote more attention to emotion regulation so that they may minimise negative emotional experiences and optimise positive emotional experiences. Importantly, the theory does not hold age as causal; similar motivational changes are observed in other situations where there is a limited time perspective such as in younger adults suffering from terminal illness (Carstensen & Fredrickson, 1998). Similarly, under experimental conditions that extend time horizons, older adults' goals resemble that of younger adults (Fung, Carstensen, & Lutz, 1999). Thus the influence of time horizons on goals has been well established.

The SST has received a lot of attention over the past decade, and evidence to support it is accumulating. While studies have found that younger adults have a tendency to process negative information more thoroughly, and to give more weight to negative information in memory and decision making (e.g., Baumeister, Bratslavsky, Finkenauer, & Vohs, 2001), older adults have been found to pay attention to and remember emotionally positive information more than they do negative or neutral information (Charles et al., 2003; Goeleven, De Raedt, & Dierckx, 2010; Kensinger, Garoff-Eaton, & Schacter, 2007; Mather & Carstensen, 2005), a phenomenon termed '*the positivity effect*.' One study found that not only did older adults have a better memory than younger adults for positive images relative to negative images, older adults also showed greater activation of the amygdala (a brain area involved in the processing of emotion) for positive images than for negative images relative to younger adults (Mather et al., 2004). This age difference in processing of positive and negative stimuli at the basic neural level suggests that the age-related preference for positive information occurs in attention as well as memory. Overall the SST is one of the most researched and supported cognitive accounts of emotional wellbeing in ageing with over 100 peer-reviewed articles addressing the positivity effect since it first appeared in the literature.

Dynamic Integration Theory

The positivity effect theoretically reflects controlled cognition because cognitive resources are required to direct attention towards goal-relevant stimuli and away from less relevant stimuli. Labouvie-Vief (2003) argues that older adults prefer positive information because negative information, by comparison, is more cognitively demanding and thus more difficult to process due to declines in cognitive control with age. Dynamic Integration Theory suggests that reduction in cognitive control with age makes it more difficult to integrate and accept negative feelings, and therefore, older adults are thought to compensate for this by maximizing positive affect and minimizing negative affect in regulating emotions (Labouvie-Vief, 2003). However, there is evidence to rule out declines in cognitive control as the cause of positivity. For example studies have experimentally manipulated cognitive load and found that when cognitive resources are taxed (e.g. via divided attention tasks for visual and auditory stimuli) the preference for positive over negative information was reversed (Knight et al., 2007; Mather & Knight, 2005). Thus, to date the motivational explanation for the positivity effect has the most considerable support in the empirical literature.

Selection, Optimisation and Compensation

Selection, Optimisation and Compensation (SOC; Baltes & Baltes, 1990) is a meta-theory of emotional ageing that conceptualises ageing as a changing balance between gains and losses. The theory posits that people select life domains that are important to them (*Selection*) and optimize the resources they have to facilitate greater functioning and success in those domains (*Optimization*) and compensate for losses in these domains (*Compensation*) by use of alternative means to adapt to biological, psychological and socio-economic change. With advancing age adults are faced with more losses caused by declining health and cognitive functioning, death of loved ones as well as retirement. The theory states that to deal with these increasing losses older adults select fewer and more meaningful goals and activities, optimise their existing abilities through practice, and compensate for the losses of some abilities by finding other ways to accomplish tasks. For example an individual may compensate by using new technology, such as a hearing aid or by learning new skills.

Optimization and compensation processes not only generate resources, but also depend on the availability of resources. Therefore as a result of the losses that occur in later life, older adults start to focus on their more important goals and readjust their goal hierarchy. The importance of accepting losses and disengaging from goals that can no longer be pursued in old age has been suggested as necessary in order to regulate negative emotions in later life, to remain satisfied with one's performance and to avoid depression (Rothermund & Brandtstadter, 2003). The prioritisation of positive emotional experiences posited by Socioemotional Selectivity Theory can be interpreted within the Selection, Optimisation and Compensation model as a way of compensating for the cognitive, biological and social losses that occur. Adding to selective and compensatory changes in emotional preferences and strategies, it is possible that learning and practice effects make older adults more competent at emotion regulation. Older adults may become better at tailoring emotion regulation strategies to specific situation demands, and additionally these emotion regulation strategies may become less effortful over time (Blanchard-Fields, 2007; Scheibe & Blanchard-Fields, 2009).

Emotion Regulation

Nature of emotions

To understand how emotion regulation works it is important to understand the nature of emotions, how they arise and how they can be altered. The modal model of emotion (Scherer, 2000) emphasises three core features of emotions. First, emotions arise when an individual attends to and appraises a situation as personally relevant to their current goals

(Lazarus, 1991a). These goals can be conscious or unconscious, and can be triggered by situations which are external (such as the behaviour of others or encounter with a novel stimulus) or internal to the individual (such as thoughts, memories or sensations). The key component which determines the emotion experienced is the meaning the individual assigns to the situation. Second, once the emotion arises it has a multi-faceted response including changes in subjective experience (i.e. how we feel), expressive behaviour (i.e. what we express) and physiological activation (i.e. how our body reacts). This 'reaction triad' of an emotional episode is thought to vary for different emotions. Third, emotions are malleable, that is, the response tendencies can be modulated in a large number of ways. It is this feature that makes emotion regulation possible. As well as these necessary components of an emotional episode, theorists have focused on the influence of motivational factors, cognitive processes and emotion regulation processes on emotion. Combining these elements often leads to a working definition of emotion as an "episode of coordinated changes in several components (at least subjective feeling, behaviour and physiology) in response to external or internal events of major significance to the organism" (Scherer, 2000, p. 138).

Given the multi-faceted nature of emotion it is important to measure multiple domains of emotion to obtain a more accurate account of adult emotional experience. This is most feasible under controlled laboratory conditions. Although laboratory studies of emotion have been criticised to be somewhat artificial (Carstensen et al., 2000), the lab has the advantage of being an otherwise neutral environment and permits emotional stimuli to be controlled. Additionally, multiple emotions can be elicited during the same experimental session and numerous emotion response indicators can be measured simultaneously.

Process of Emotion Regulation

Emotion Regulation refers to the set of processes we use to try and modulate our experience of emotions; that is, how we influence what emotions we have, when we have them, and how we experience and express those emotions (Gross, 1998). Theoretically, positive emotions as well as negative emotions can be regulated. For example we might want to down-regulate (decrease) our experience of sadness while watching a film in a cinema, but we might want to up-regulate (increase) our experience of sadness while acting out a sad scene in a drama class. Conversely, we might want to down-regulate our experience of happiness when we are accepted into a university course and our best friend isn't, and up-regulate our experience of happiness when our friend is later accepted into a different university. Because emotions involve multi-faceted components, emotion regulation attempts involve changes in intensity of the affective response, experiential, behavioural and physiological domains.

Gross' (1998) process model proposes that emotions may be regulated at five points in the emotion-generative process and emphasises the timing of a regulation strategy as crucial to its impact and consequences. Situation selection, situation modification, attentional deployment and cognitive change are classified as 'antecedent-focused' regulation strategies, as they can be implemented to regulate emotions before the emotional response has become fully activated. *Situation selection* refers to choosing the situation to which one is to be exposed, based on the emotional consequence that situation will produce. *Situation modification* refers to changing something within the situation one is in so as to influence ones emotional state. *Attention deployment* refers to purposely shifting the focus of one's attention in the situation, choosing what to focus on or thinking of something else entirely. *Cognitive change* refers to reappraising the situation in a way so as to change the emotional response. Once the emotional response is generated, the individual's attempts to down-regulate the emotion are termed 'response-focused.' This includes *response modulation*, i.e. directly changing experiential, behavioural and physiological response tendencies once they have been activated. A variety of emotion regulation strategies may thus be implemented and each is shown to affect the type, intensity and duration of that emotion (Gross & Thompson, 2007).

Two widely used strategies for down-regulating negative emotion are *reappraisal* (antecedent-focused) and *expressive suppression* (response-focused). Reappraisal comes early in the emotion-generative process and involves generating benign or positive interpretations to neutralize a potentially emotion eliciting situation or stimulus. Expressive suppression comes later in the emotion-generative process and involves inhibiting the outwards signs of emotion. Employing an undergraduate, young adult sample, Gross and John (2003) found that reappraisal and expressive suppression had different implications for affective responding, social functioning and wellbeing. Specifically, individuals who used cognitive reappraisal experienced and expressed more positive emotion and less negative emotion than people who suppressed. Reappraisal was related to sharing emotions, both positive and negative, which led to closer relationships and being more liked by peers. Those who employed expressive suppression were less likely to share their emotions with others, reported more avoidance in close relationships, and had lesser social and emotional support.

Other experimental studies have since replicated this finding, showing that compared to expressive suppression, reappraisal seems to be more effective in regulating emotional experiences by reducing one's distress. While expressive suppression reduces the behavioural expression of emotion compared to control conditions, it does not decrease the subjective experience of negative emotion and is generally associated with reduced positive affect and life satisfaction, increased sympathetic nervous system arousal, and greater symptoms of depression and anxiety (Butler et al., 2003; Campbell-Sills, Barlow, Brown, & Hofmann, 2006b; Haga, Kraft, & Corby, 2007; John & Gross, 2004). Therefore it is not considered to be an effective strategy to regulate negative emotions in the short-term and may be related to long standing emotional and social difficulties in the long-term. In contrast, reappraisal successfully decreases both the behavioural expression and subjective experience of negative emotion, and is associated with less negative affect, less physiological arousal and increased life satisfaction (Haga et al., 2007; John & Gross, 2004; Nezlek & Kuppens, 2008).

Other commonly researched regulation strategies include distraction and redirecting attention (which fall under attention deployment) and acceptance. Distraction involves removing oneself, either cognitively or behaviourally, from the stimulus that is causing the negative affect and has been shown to effectively decrease depressed mood, potentially through the mechanism of preventing a rumination cycle (Nolen-Hoeksema & Morrow, 1993). Redirecting attention involves shifting ones gaze away from a negatively valenced stimulus. Research suggests that the ability to disengage attention predicts individual differences in emotional response to a distressing film. Those who are the slowest to disengage their attention from negative stimuli show the greatest increase in negative affect (Compton, 2000). Research on emotional acceptance suggests that it is an adaptive emotion regulation strategy (Bach & Hayes, 2002; Ma & Teasdale, 2004). Instead of actively fighting against the negative emotion by suppression (suppressing the *experience* of the emotion rather than expressive suppression) or avoidance, which has been shown to paradoxically increase negative affect (Wegner, 1994), acceptance involves allowing the experience of emotion without trying to suppress or change it. Experimental studies show that those who engage in acceptance as a regulation strategy exhibit less behavioural avoidance, less subjective anxiety and fewer catastrophic thoughts (Eifert & Heffner, 2003).

A recent meta-analysis found that the most effective strategies at down-regulating negative affect were reappraisal and distraction (Augustine & Hemenover, 2009). However, while research suggests that different emotion regulation strategies impact the subjective, physiological, and behavioural components of negative emotion in distinct ways, data is lacking regarding the effectiveness of strategies for the regulation of specific emotions. For instance, some strategies may work better to alleviate anxiety while others may be more effective for sadness or anger. Further studies are required to understand the effectiveness of different emotion regulation strategies for discrete emotions.

Emotion Regulation and Ageing

Down-regulating Negative Emotions. There is growing evidence supporting the proposition of Socioemotional Selectivity Theory on the age-related changes in emotion regulation, suggesting that older adults are more motivated to regulate negative affect and are more effective at doing so (Scheibe & Carstensen, 2010). Self-report studies consistently find that older adults report a greater ability and confidence in regulating emotions than younger adults (Gross et al., 1997; Kessler & Staudinger, 2009), and have fewer and shorter durations of experiencing negative affect (Carstensen et al., 2000). It has also been demonstrated that emotion regulation is less cognitively costly for older adults (less taxing on working memory) than younger adults, indicating that it may be less effortful (Scheibe & Blanchard-Fields, 2009). Although physiological measures have generally shown decreased reactivity to emotional stimuli in older adults most likely due to biological changes with age (Levenson, Carstensen, Friesen, & Ekman, 1991), in controlled laboratory studies there is little evidence of age differences in intensity of emotion (Charles, 2005). This indicates that emotional experiences are not dampened with age and that perhaps fewer and shorter episodes of negative affect reported by older adults could be due to superior emotion regulation. Alternatively older adults may describe their experiences of emotions differently in relation to their physiological arousal compared to younger adults. Currently there is little correlation between self-report and physiological responses to emotions in the literature. More research is required to systematically assess physiological and self-report responses to different emotions to determine if age differences in the experience of positive and negative affect are due to emotion regulation or other factors.

To date the major focus on age differences in emotion regulation has been on implied outcome of emotion regulation by measuring the degree to which positive and negative emotions are experienced at any point in time. Little research has investigated the strategies that lead to these outcomes. Some recent research has found that older adults report using more adaptive emotion regulation strategies such as reappraisal and less maladaptive emotion regulation strategies such as suppression compared to younger adults (Haga et al., 2007; John & Gross, 2004). Reappraisal was also found to partially mediate the effect of age on positive emotions, suggesting that age differences in positive emotions could be partially explained by the use of antecedent emotion regulation strategies such as reappraisal (Yeung, Wong, & Lok, 2011). Empirical studies that have specifically instructed participants to use attention deployment or expressive suppression have found that younger and older adults are equally successful at down regulating negative emotions using these strategies (Kunzmann, Kupperbusch, & Levenson, 2005), with some evidence that older adults may be more successful at employing reappraisal to regulate negative emotions (Phillips, Henry, Hosie, & Milne, 2008; Shiota & Levenson, 2009). However, others find that older adults tend to use more “passive” emotion regulation strategies such as avoidance, suppression, or withdrawal to deal with everyday problems, compared to younger adults (Blanchard-Fields, Stein, & Watson, 2004). These studies are all limited by the use of self-report, whereby participants are simply asked to rate which strategies they use or are instructed to use a specific strategy. Although emotion regulation attempts can be conscious, they can also occur automatically without conscious awareness and deliberate control (Mauss, Bunge, & Gross, 2007). A better understanding is required of the strategies that are used spontaneously by older adults to repair negative emotions which may not be deliberate or conscious. For example, eye tracking studies, where participants were not directly instructed to control their gaze, show that when put in a negative mood, older adults direct their attention to mood-incongruent positive information significantly more than younger adults (Isaacowitz, Toner, Goren, & Wilson, 2008), suggesting that older adult may use attention deployment as an emotion regulation strategy more spontaneously than younger adults.

There are far fewer studies examining age differences in the experience of discrete emotions. There is some evidence that the frequency and intensity of anger decreases with age (Birditt & Fingerman, 2003; Chipperfield, Perry, & Weiner, 2003) whereas the experience of sadness does not necessarily decrease with age and may increase (Birditt & Fingerman, 2003). One study showed that compared to younger adults, older adults reported greater subjective sadness following a film dealing with themes of death (Kunzmann & Gruhn, 2005) but did not differ in their autonomic reactions to the film. Additionally, anxious older adults are at least as vigilant to threatening information as young adults (Fox & Knight, 2005; Karin Mogg, Mathews, & Eysenck, 1992). However, no study has compared older and younger adults on rate of recovery from these discrete emotions. If older adults are better emotion regulators they should be observed to recover faster from sad and anxious moods and this suggestion has yet to be tested.

One study assessed recovery from sadness following a sad mood induction using music (Larcom & Isaacowitz, 2009). Following successful mood induction, participants rated their mood on an analog slider (0= extremely negative, 100= extremely positive) every 2 minutes for 24 minutes while competing another task. Older adults had a higher first slider rating, suggesting that older adults were faster at regulating their mood. Additionally participants were split into ‘rapid regulators’ and ‘non-regulators’ based on their first slider rating. Rapid regulators were defined as those whose first slider rating was above 50. Interestingly the young adult rapid regulators started to feel more negative i.e. had lower slider rating over repeated measurements, whereas older adults maintained their positive affective state over time. This finding suggested that the older adults who were classified as rapid regulators were actually better at regulation than the young adult rapid regulators. The authors suggest that the younger adult rapid regulators could have been using suppression which dissipated as time passed (Larcom & Isaacowitz, 2009). Additionally the older adults might have been using distraction to help increase positive mood and this might have been easier to maintain over time. Although older adults appeared to be regulating their emotions faster, it is unknown *how* they repaired their mood. Furthermore, it is not known what impact asking participants to complete another task (not specified) had on recovery. The other task would have been providing a distraction possibly making regulation easier.

Given the age differences in frequency of negative affect and the type of emotion regulation strategies used, the next step is to integrate this research and investigate the developmental differences in the relationship between discrete emotions and the strategies used to regulate them. The question that remains to be answered is whether older and younger adults recover from negative emotions at the same rate, and whether rate of emotional regulation is moderated by the use of emotion regulation strategies.

Maintaining Positive Emotion. Most research in emotion regulation and ageing has focused on negative emotion; however, the role of positive emotions in wellbeing is also an important consideration. Previous research has revealed that the frequency and intensity of experiencing positive emotions may increase across the lifespan (Carstensen et al., 2000; Mroczek, 2001). Additionally, older adults have been shown to experience greater stability of positive emotional states than younger adults, suggesting that older adults are better able to maintain positive emotions once elicited (Carstensen et al., 2000). A recent study found that variability in positive emotional experiences is associated with poorer psychological health including lower wellbeing and life satisfaction, as well as greater anxiety and depression. Keeping positive emotional experiences stable therefore appears important for wellbeing (Gruber, Kogan, Quoidbach, & Mauss, 2013). More research is required to understand the mechanism by which older adults may have more success at maintaining positive emotions than younger adults.

Summary

In summary, recent life-span theories of emotional development have suggested that emotional competencies may be exempt from the functional decline often associated with ageing. Evidence has emerged that ageing is not associated with a dampening of emotion or increased dysregulation and rigidity as previously thought. Emotion regulation success is one explanation that has gained a lot of attention by researchers to explain the increase in emotional wellbeing in older age. Self-report research suggests that older adults employ more effective emotion regulation strategies than younger adults, however to date it is unclear whether younger and older adults differ in rate of recovery from discrete negative emotions and which strategies drive more effective recovery.

Depression and Anxiety in Older adults

While evidence suggests that compared to younger adults, older adults enjoy a relatively high level of wellbeing overall, a significant proportion of older adults do suffer from clinical levels of depression and anxiety. Although anxiety disorders are less prevalent in older adults than younger adults (Wolitzky-Taylor, Castriotta, Lenze, Stanley, & Craske, 2010), a systematic review of 28 epidemiological studies of anxiety in older adults found that the prevalence of clinically significant anxiety symptoms ranged from 1.2% to 15% in community samples and 1% to 28% in clinical samples (Bryant, Jackson, & Ames, 2008). Generalized anxiety disorder is the most common anxiety disorder among older adults (Beekman et al., 1998). Similarly, while Major Depression is found to be less prevalent in older adults than younger adults (Hasin, Goodwin, Stinson, & Grant, 2005, Kessler et al., 2010), prevalence rates of geriatric depression range between .4 - 35% (Beekman, Copeland, & Prince, 1999), with a recent systematic review indicating a global point prevalence of 4.7% (Ferrari et al., 2013). Clinically significant depressive symptoms are reported in approximately 5% of community-dwelling older adults aged 65 and over (Blazer, 2003).

Furthermore, anxiety and depression are highly comorbid in both younger and older adults. In a community sample, 47% of older adults who met criteria for major depressive disorder also met criteria for an anxiety disorder and 23% with an anxiety disorder also met criteria for major depressive disorder (Beekman et al., 2000). The lifetime prevalence of developing a mood disorder in the context of Generalized Anxiety Disorder (GAD) in older adulthood is as high as 80% (Beaudreau & O'Hara, 2008). Individuals with comorbid presentations experience the greatest level of disability and distress, experience more severe symptomatology, have a more chronic course of illness and also have poorer treatment response compared to those with either condition alone (Almeida et al., 2012; Beaudreau & O'Hara, 2008; DeLuca et al., 2005). Investigating comorbid depression and anxiety is especially relevant for older adults as this comorbidity predicts more cognitive decline (DeLuca et al., 2005) and greater suicide risk (Allgulander & Lavori, 1993). However, despite this high rate of comorbidity in later life, very few studies have investigated the cognitive, emotional and behavioural risk factors of comorbid depression and anxiety in older adults. To date most studies have investigated age differences in a non-clinical sample. It is necessary to conduct studies on clinical and especially comorbid samples given the high prevalence rates of comorbidity in both younger and older adults. This is necessary in order to determine whether the same emotion processing biases, and the same protective mechanisms, operate across age and across disorders.

The world's population is aging, with the number of people aged 65 or older projected to grow from an estimated 524 million in 2010 to nearly 1.5 billion in 2050 (WHO & US National Institute of Aging, 2011). As both the proportion of older people and the length of life increase throughout the world, it is likely that we will see an increasing number of older adults seeking psychological services. Understanding the factors that contribute to continued wellbeing into older age, as well as the factors that may contribute to the increased risk of developing psychological problems is becoming increasingly important as it will help health professionals to meet service demands of this population more effectively in the future. Additionally, research shows that risk factors, presentation, comorbidity and course of illness can differ greatly across the lifespan (Lenze & Wetherell, 2011), calling for a need to study the process of psychopathology separately for younger and older adults.

Role of Emotion Regulation in Mood and Anxiety Disorders

Emotion regulation is increasingly being incorporated into models of psychopathology (e.g., Greenberg, 2002; Mennin & Farach, 2007). Several theorists argue that difficulty managing emotional responses associated with everyday events may lead people to experience longer and more severe periods of distress that may lead to clinical levels of psychopathology such as depression and anxiety (e.g., Mennin, Holaway, Fresco, Moore, & Heimberg, 2007; Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008). Indeed, a review of the Diagnostic and Statistical Manual of Mental Disorders fourth edition (APA, 1994) reveals that emotion regulation deficiencies are implicated in over 50% of Axis I disorders and 100% of Axis II disorders (Gross & Levenson, 1997). For example, "difficulty controlling worry" is a criterion for GAD. However, the relationship between emotion regulation strategies and clinical disorders is yet to be established. Most studies of emotion regulation in clinical populations have focused on suppression. Suppression is shown to mediate the relationship between intensity of negative affect and psychological distress (Lynch, Robins, Morse, & Krase, 2001). Specifically, those who experience a greater level of negative affect are more likely to suppress, and suppression leads to greater distress. Both expressive suppression, as well as suppression of unwanted thoughts are associated with depressive symptoms and hopelessness (Lynch et al, 2001).

A comparison of spontaneous emotion regulation in a clinical (mood or anxiety) and non-clinical sample (age range 18-75, average age 34) showed that clinical participants were less accepting of their emotions and spontaneously used suppression more often than did the non-clinical group (Campbell-Sills, Barlow, Brown, & Hofmann, 2006a). In a follow-up study clinical participants were instructed to either engage in acceptance or suppression during an anxiety-evoking film. Although both groups reported similar levels of subjective distress during the film, the acceptance group displayed less negative affect during the post-film recovery period. Furthermore, the suppression group displayed increased heart rate that persisted after the film compared to the acceptance group (Campbell-Sills et al., 2006b). Together this evidence suggests that avoiding or inhibiting cognitive and emotional experience is problematic and may prolong psychological distress in vulnerable populations. In contrast, the use of reappraisal is associated with less depression, less negative affect, and increased life satisfaction (Garnefski & Kraaij, 2006; Garnefski, Teerds, Kraaij, Legerstee, & van den Kommer, 2004). Healthy adults report using more reappraisal compared to individuals with clinical levels of depression and anxiety (Garnefski et al., 2002), suggesting that reappraisal may have some protective characteristics. However, a recent meta-analysis of emotion regulation strategies across psychopathology revealed that rumination, avoidance and problem solving were more strongly related to mental health than acceptance and reappraisal

(Aldao, Nolen-Hoeksema, & Schweizer, 2010). The use of maladaptive strategies has been associated with depressive symptoms for younger, middle age and older adults whereas the use of adaptive strategies generally is not related to lower levels depressive symptoms across groups (Nolen-Hoeksema & Aldao, 2011). These findings suggest that greater use of maladaptive strategies may account for emotional problems to a greater extent than lack of using adaptive regulation strategies.

Despite the clinical relevance of the construct of emotion regulation, surprisingly few studies have examined the use and effectiveness of emotion regulation strategies in older adults with clinical levels of psychopathology. Further, despite accumulating evidence that older adults may be more motivated to regulate negative emotions, there are no studies comparing age differences in the use of emotion regulation strategies in clinical samples to determine whether symptoms of psychopathology such as anxiety and depression attenuate the positivity effect observed in healthy ageing. Some recent research has shown that older adults experiencing even mild subclinical anxiety and depressive symptoms report greater difficulties in regulating their emotions compared to normal controls (Orgeta, 2011a, 2011b).

Cognition and Emotion

Link between Cognition and Emotion Regulation

Cognitive biases have not traditionally been considered emotion regulation strategies because they do not affect emotions directly, however, the mediatory role of cognitive biases on emotional responding is important to consider because they can affect the selection and the effectiveness of various regulation strategies. Indeed, recent studies have provided some evidence of a causal relationship between processing bias and vulnerability to emotional disorders (Mathews & MacLeod, 2005; Wilson, MacLeod, Mathews, & Rutherford, 2006). Thus an essential part of understanding emotion regulatory mechanisms is characterising the processes that generate emotions (Ochsner & Gross, 2005). The environment is filled with much ambiguity that is amenable to both positive/non-threatening and negative/threatening interpretations. For example the sound of footsteps behind you could be interpreted as a friendly passer-by or a potentially aggressive attacker. The interpretation of the ambiguous information is shown to influence the subsequent emotional reaction. Gross' process model (1998) of emotion regulation accounts for these interpretations as part of the cognitive change antecedent emotion regulation strategy. Specifically, appraisal and reappraisal of the stimulus influence the outcome and severity of the emotional response.

Theories of Cognition

Cognitive theories put maladaptive interpretation or appraisal processes at the core of depression and anxiety (Beck, 1976; Salkovskis, 1988). Specifically, theories of depression propose that depressed individuals tend to have a cognitive bias to interpret ambiguous information in a more negative manner. Beck (1976) theorised that depressed people exhibit a systematic bias in the way they process environmental stimuli due to the negative schemas they hold (e.g. loss, failure, rejection). Because of this bias, depressed people are thought to selectively pay attention to more negative stimuli in their environment, as well as interpret ambiguous information in the environment in a more negative way. Similarly, information processing theories of anxiety propose that activation of negative schemas (e.g. physical or psychological threat to one's personal domain) lead to a selectivity in processing threat cues and exaggerated anticipation of possible negative events in the future (Kendall & Ingram, 1987). Therefore, although there are differences between depression and anxiety in the specific cognitive structures or schema and the content of cognition (thoughts involving loss and failure in depression, and thoughts involving threat and danger in anxiety), both disorders are characterised by a tendency to process information in a negative way. This negative bias is thought to cause and maintain the features of depressed and anxious mood such as sustained negative affect (Beck & Clark, 1988). Indeed, cognitive therapy focuses on modifying these biased interpretations and dysfunctional automatic thoughts with the aim that a change in cognition will lead to a change in depressed and anxious mood.

Cognitive Interpretation Bias- Empirical Evidence

Cognitive research shows that in general anxiety is associated with an automatic attention bias (i.e. anxious individuals tend to orient their attention more rapidly toward threat related or negative stimuli), whereas individuals with depression tend to only exhibit attention biases at long exposure intervals which suggests that they strategically orient their attention toward negative stimuli, an example of avoidance (Gotlib & Joormann, 2010). On the other hand depression has been found to be more strongly associated with memory biases than anxiety, whereby depressed individuals tend to retrieve more negative memories possibly due to the fact they process the negative information to a greater extent than positive information via rumination (Nolen-Hoeksema & Morrow, 1993). While these differences in memory and attention processing between anxious and depressed presentations are well established, research on interpretation biases in these populations has found mixed results. Anxious individuals tend to show a negative interpretation bias for ambiguous stimuli, especially tasks that are based on automatic processing; however, the findings for depressed individuals are less clear (see Mathews & MacLeod, 2005 for a review).

Early studies showed a negative interpretation bias in depressed individuals (Cane & Gotlib, 1985) but were limited to self-report methodology which is argued to be susceptible to response bias effects (Lawson, MacLeod, & Hammond, 2002; Mathews & MacLeod, 1994). For example, depressed individuals may process the negative and neutral interpretations of an ambiguous stimulus but only report the negative interpretation as a product of their depressed mood. To overcome the limitation of self-report, researchers developed alternate tasks to assess interpretation bias, mainly based on priming paradigms. For example, MacLeod and Cohen (1993) developed the text comprehension task, which involves asking participants to read a set of short passages, sentences by sentence, in a self-paced manner. Each set consists of an ambiguous sentence followed by a continuation sentence which matches either the negative or the neutral meaning of the preceding sentence. Participants must press a button to receive each successive sentence and reading time is used as an index of interpretation bias, as it is assumed that reading speed of a continuation sentence will be faster if the meaning matches the perceived meaning of the preceding ambiguous sentence. By examining the pattern of comprehension latencies across different continuation sentences, it is possible to determine the types of inferences people make. Using this task, MacLeod and Cohen (1993) found that high trait anxious students interpreted ambiguous information in a more threatening manner compared to low trait anxious individuals.

Mogg, Bradbury and Bradley (2006) subsequently used the text comprehension task to test whether this bias was present in clinically depressed individuals and did not find a significant depression-related interpretation bias. One explanation proposed by the authors was that the nature of the task did not encourage self-referential processing as most of the sentences referred to other individuals (e.g., "Lisa asked her father…"). In contrast, cognitive biases in depression have been shown in tasks that require self-referential processing (Wisco & Nolen-Hoeksema, 2010). Therefore it has been suggested that self-referential encoding plays a more important role in interpretation biases in depression than anxiety. A recent study examined a negative interpretation bias in dysphoric individuals using priming and self-referent ambiguous stimuli (Hindash & Amir, 2012). Participants were primed with an unambiguous word that was either negative (e.g., clumsy) or neutral (e.g., walk), followed by a self-referential ambiguous sentence (e.g., "You carry a tray of food at the party). The task assessed both self-report (participants rated how related each word was to the sentence) and response latencies (speed of endorsement). Participants with greater dysphoric symptoms were significantly faster to endorse the association between negative words and ambiguous sentences. Importantly, the groups did not differ on endorsement rates for benign interpretations. This suggests that negative associations are primed in depression (Hindash & Amir, 2012). This is the first study to examine a negative interpretation bias using priming and self-referent ambiguous stimuli in depression.

Age Differences in Cognition

Cognitive researchers to date have developed some valuable methods to assess interpretation biases. However, to our knowledge, these tasks have rarely been used to investigate age differences in healthy and clinical adults. If older adults report having better control and regulation of their emotions, it remains possible that one explanation for this is that they have fewer negative interpretation biases, or more positive interpretation biases.

Research shows that ageing is associated with a bias toward attending to and remembering positive stimuli, including pictures, faces and words (e.g., Carstensen & Mikels, 2005; Charles et al., 2003; Knight, Maines, & Robinson, 2002; Leigland, Schulz, & Janowsky, 2004; Mather & Carstensen, 2003). These positivity effects in attention and memory may serve to improve the moods of older adults. However, very little research has compared younger and older adults on interpretation of emotional ambiguity. Recently, Cabeleira and colleagues (2010) developed a paradigm to investigate the mechanisms that underlie negative future expectancy biases that are a feature of anxiety (i.e. the tendency to expect that future events will be negative). The so called ‘Expectancy Task’ involves participants reading a series of positively valenced passages (which include positive and neutral information), negatively valanced passages (which include negative and neutral information) and ambiguously valenced passages (which include both positive and negative information). Participants are then provided with a series of future events that might occur following these passages. The future events can be either positive, negative or neutral, and participants have to rate the likelihood of each event occurring next in the context of the passages they have read previously. The pattern of ratings can reveal whether the negative future expectancy bias is pervasive, due to extrapolation or due to interpretation biases. If participants predict negative future events to occur regardless of the valence of the information in the passage, then this indicates a pervasive bias. If participants are more likely to predict negative future events following negative passages, this indicates that the bias is driven by extrapolation of current negative information into the future. However, if participants predict negative future events as more likely to occur following ambiguous than non-ambiguous passages, than this would indicate that the bias is driven by negative interpretation processes. Thus a negative interpretation bias is qualified by a negative interpretation being made following the presentation of stimuli that are ambiguous in valence (i.e. both positive and negative interpretations are possible). The Expectancy Task is beneficial as it enables researchers to assess whether participants' expectations of the future are driven by a negative interpretation bias, or other mechanisms such as extrapolation.

A recent study used this paradigm to investigate the influence of anxiety and age on negative future expectancy bias and showed that anxiety and age had independent and opposite influences on future expectancies (Steinman, Smyth, Bucks, MacLeod, & Teachman, 2013). Overall, anxious individuals had an increased expectancy for future events to be negative, which was pervasive. Older adults however, had a heightened expectancy for future events to be positive, even when the preceding information was negative, suggesting that older adults are perhaps less sensitive to negative information or have a positive interpretation bias in the presence of negative information (Steinman et al., 2013).

Cognitive-experimental methodologies such as the Expectancy Task are designed to assess selective interpretation biases in a more objective way, overcoming the high reliance on self-report measures often employed in the emotion regulation literature, which makes them vulnerable to experimental demand and response bias effects (Lawson et al., 2002). Adopting these cognitive-experimental methodologies not only overcomes response bias, but can provide a more powerful tool to investigate the contribution of automatic cognitive processes to more general emotion regulation (MacLeod & Bucks, 2011). Other studies have used signal detection theory (McNichol, 1972) to investigate response biases. For example, one study compared the interpretation of emotional faces in aging showing that younger and older adults did not significantly differ in their ability to discriminate between emotional facial expressions (Bucks, Garner, Tarrant, Bradley, & Mogg, 2008). However, older adults exhibited a response bias whereby compared to younger adults they were less likely to report anger when presented with an ambiguous facial expression that contained both angry and happy features. This result raises the interesting possibility that some of the biases toward positive emotional stimuli observed in normal ageing may be associated with a reduced tendency to report negative emotion in general, relative to positive emotions, rather than actual differences in perceptual discrimination of emotional information (Bucks et al., 2008). If the positivity effect in aging is driven by a response bias then this is consistent with the motivational hypothesis of Socioemotional Selectivity Theory (SST), where older adults prefer to endorse positive over neutral or negative stimuli. However, other research has found that age differences in emotional long term memory reflect memory retrieval rather than response bias (Spaniol et al., 2008).

Summary

From the theory and the evidence described above, it is suggested that biases in interpretation play a causal role in mediating vulnerability to anxiety and depression. The central assumption is that cognitive processes serve to shape emotions, and so dysfunctional patterns of information processing lead to dysfunctional patterns of emotional experience. However, few studies have investigated interpretation biases in older adults. To date, understanding of age differences in interpretation biases and the mechanisms underlying these is lacking and needs to be investigated further. It is also important to extend this research to clinical populations, especially to comorbid depression and anxiety as these disorders commonly co-occur. Understanding whether the cognitive biases that are present in depressed and anxious individuals are driven by the same mechanisms in individuals with both disorders has significant implications for selecting therapeutic intervention to target interpretations.

Daily Hassles and Coping Strategies

Stress and Coping

Psychological stress is defined as a relationship between the person and the environment that is appraised by the person as taxing or exceeding his or her resources and endangering his or her wellbeing (Lazarus & Folkman, 1984). Therefore the individual’s cognitive appraisal of their ability to deal with the environmental demands is a critical determinant of the stress response. Appraisal theory distinguishes between primary and secondary appraisals. Primary appraisals refer to the process of determining whether the person-environment interaction has any significance or meaning to the individual. When the person-environment interaction is appraised as either harmful, potentially threatening or challenging, coping efforts are mobilized in order to manage the situation. Secondary appraisals refer to the process of evaluating what coping resources the person has available to them, how likely it is that the coping strategy will be effective and how well they think they can execute the coping strategy. The interaction between primary and secondary appraisals and the efficacy of coping resources influences the degree of stress and the type and severity of the emotional reaction.

The coping literature has focused more specifically on how people mobilize, guide, manage, energize, and direct behaviour, emotion and orientation, or how they fail to do so under stressful conditions (Skinner & Zimmer-Gembeck, 2007). Coping is a construct related to emotion regulation. Both processes can be seen as subordinates under the umbrella of 'affect regulation' however coping is distinguished from emotion regulation both by its predominant focus on decreasing negative affect, and by its emphasis on much larger periods of time (e.g., coping with bereavement). Coping is a recursive process during which the individual makes continuous appraisals and reappraisals of the shifting person-environment relationship and applies coping tendencies to deal with these changes. Therefore appraisal and coping are seen as mediating processes that influence the short term outcomes, such as emotional response right after the encounter, and long-term outcomes such as subjective wellbeing, social functioning and health (Lazarus & Folkman, 1984).

Stress and Aging

Daily Hassles. Traditionally, research on stress and coping has focused on negative life events, demonstrating a relationship between major life change and a range of psychological problems (Marum, Clench-Aas, Nes, & Raanaas, 2013; Tennant, 2002). However there is evidence that daily hassles, the accumulation of minor day-to-day stressors including practical problems, environmental irritants, and concerns relating to family and finances, may have worse impacts on psychological and physical health than major life events, which are less frequent. Frequency and severity of everyday hassle has been associated with poorer health outcomes (DeLongis, Coyne, Dakof, Folkman, & Lazarus, 1982; Kanner, Coyne, Shaefer, & Lazarus, 1981), increased negative affect (Zautra, Affleck, Tennen, Reich, & Davis, 2005) and daily distress (Charles, Piazza, Mogle, Sliwinski, & Almeida, 2013).

However, much less research has investigated the effect of daily hassles on the wellbeing of older adults. Older adults are faced with a variety of major life changes, including loss of working roles, declining income, changes in physical health, illness and death of loved ones, which have the potentially to affect their day to day living leading to frequent and chronic hassles. Alternatively, because hassles are often a function of involvement in social roles (Lazarus, 1991), the changes associated with relinquishing work and parenting roles may result in less time pressure, and lower frequency of daily hassles in older adulthood. There is some research which suggests that even in older adults hassles are more strongly related to distress than major life events (Holahan & Holahan, 1987; Holahan, Holahan, & Belk, 1984). Frequency of hassles has been shown to be the strongest predictor of depression, psychosomatic symptoms and negative wellbeing than negative life events and perceived self-efficacy in a community sample of older adults aged between 65 and 75 years (Holahan & Holahan, 1987). Some studies have also found older adults report fewer hassles and rate these hassles as less stressful than younger adults. Older adults also report greater frequency of positive daily events, and appraise these positive events as more pleasurable than younger adults (Almeida & Horn, 2004; Whitehead & Bergeman, 2013).

Adaptive versus Maladaptive Coping Styles

Coping efforts may be adaptive or maladaptive. Given that each individual can have any number of unique personal characteristics and environments can have any number of demands, there is the potential for hundreds of different behavioural responses that can be engaged in to try and mediate these person-environment interactions to resolve stress. As a result, over the past decade researchers have spent a great deal of time conceptualising and assessing hierarchical models of coping. The analyses have converged on a small number of categories of coping that are used to classify most coping strategies identified in the literature. These include problem solving, support-seeking, escape, distraction, cognitive restructuring, rumination, helplessness, social withdrawal, emotional regulation, information seeking, negotiation, opposition and delegation, however, many other coping strategies have been explored (for a review see Skinner, Edge, Altman, & Sherwood, 2003). While there is no clear consensus on higher-order labels to categorise the multitude of coping strategies, a common way of conceptualised coping strategies has been as either approach or avoidance coping (Roth & Cohen, 1986; Skinner et al., 2003).

Approach coping is defined as any active attempt at managing the stressful situation, such as problem solving, seeking social or emotional support, planning, exercise and cognitive reappraisal. Generally, people who engage in approach coping strategies have shown positive long term mental and physical health outcomes. Avoidance coping is defined as an attempt to escape or avoid dealing with the practical or emotional consequences of the stress. This includes strategies such as social withdrawal, denial, substance use and thought suppression. People who engage in avoidant coping strategies are shown to adapt more poorly to stress, leading to less life satisfaction and negative consequences on mental and physical health (for a review see Taylor & Stanton, 2007). Cross sectional and longitudinal studies show that chronic avoidant coping is associated with greater stress-generation and subsequent anxiety and depressive symptoms (Fledderus, Bohlmeijer, & Pieterse, 2010; Holahan, Moos, Holahan, Brennan, & Schutte, 2005), making strategies that fall under avoidant coping maladaptive and a risk factor for psychopathology.

Age Differences in Coping Styles

Very few studies have investigated how ways of coping manifest themselves at later developmental stages, with most research focusing on coping changes from infancy to adolescence. As has been identified, coping styles play an important role in stress-management and have an effect on overall wellbeing (Taylor & Stanton, 2007). Identifying stressors and coping strategies that are associated with positive and negative psychological health outcomes in the later stages of life is important in highlighting potential targets for treatment and better understanding of resilience in those older adults who are functioning well.

To date, the research findings on age differences in coping are mixed. Some studies have found that proactive coping is as an important factor of successful ageing (Ouwehand, de Ridder, & Bensing, 2007; Rowe & Kahn, 1997). Several cross-sectional studies have revealed a pattern of age-related increase in the use of approach coping and an age-related decline in avoidance coping (Amirkhan & Auyeung, 2007; Diehl, 1996; McCrae, 1982). Specifically, in relation to the Selection, Optimisation and Compensation model (Baltes and Baltes, 1990), which posits that successful ageing results when there is a positive balance between gains and losses, age-related increases in approach coping suggests that older adults are more effective in their coping skills by making efforts to prevent potential losses and minimising the consequences of stressors. However, some studies have found age-related increases in avoidant coping responses (e.g., Aldwin, 1991). This can also be interpreted within the Selection, Optimisation and Compensation model suggesting age-related efforts to compensate for loss of energy in old age by avoiding active confrontation of stressors.

A third set of studies indicates that both approach and avoidance coping decline in later life (e.g., Aldwin, Sutton, Chiara, & Spiro, 1996; Brennan, Holland, Schutte, & Moos, 2012). This overall decline in coping may be a normative pattern of coping change in later life reflecting both older adult's diminished energy and resources to cope, as well as reflecting more efficient proactive or anticipatory coping with age, which prevents the experience of stress, and thus results in a less need to engage in as many coping strategies (Greenglass, 2002). Coping effectiveness may increase due to life experiences as well as due to the motivational changes that occur with age, as predicted by Socioemotional Selectivity Theory (Carstensen et al., 1999). Finally, other studies have found no differences in coping resources across the lifespan (Hamarat, Thompson, Steele, Matheny, & Simons, 2002). Interestingly a recent 20-year predictive study found that greater threat appraisal, depressive symptoms and social and financial resources were associated with higher initial level of coping (Brennan et al., 2012). Therefore the observed pattern of decline in coping into late adulthood may be modified by threat appraisals as well as the social and financial resources with which older adults enter late adulthood. These individual difference factors should be taken into account when addressing age differences in stress and coping. Furthermore, this study showed that although both approach and avoidance coping decline with age, this decline was not uniform across all strategies within these higher-order categories. For example, seeking support, an approach strategy, did not decline with age, while acceptance increased with age. Therefore a closer look at specific coping strategies may reveal important age differences in coping.

It is of no surprise that those that enter older adulthood with greater depressive symptoms and resource deficiencies exhibit greater coping efforts (Brennan et al., 2012). However, few studies have examined specifically the coping strategies used by older adults who suffer from clinical levels of psychological distress. Therefore, it is unknown whether coping efforts contribute to the development and maintenance of psychological distress differently for younger and older adults. There is some evidence that compared to non-anxious older adults, anxious older adults rely more on dysfunctional coping strategies such as mental disengagement and behavioural disengagement (Coolidge, Segal, Hook, & Stewart, 2000). A recent review found that inadequate coping strategies may be related to the onset of anxiety disorders in the elderly (Vink, Aartsen, & Schoevers, 2008). Avoidant coping was also found to predict more stress and depressive symptoms in late-middle-aged individuals (Holahan et al., 2005). This suggests that maladaptive coping styles may contribute to poorer mental health outcomes for older adults.

Summary

The manner in which age influences the stress and coping process remains poorly understood. Compared to younger adults, older adults may or may not differ in the amount of stress or hassles they experience on a day-to-day basis, the appraisal of how stressful negative interactions are, and the use of various coping strategies to deal with these stressors. Furthermore, more research comparing age-differences in coping in clinical populations is required to better understand the role of stress and coping in psychopathology and wellbeing in older adults.

The Present Thesis

Across a number of empirical studies, this thesis aims to investigate the age differences in emotion regulation, interpretation biases and stress and coping, which have all been implicated as factors that may contribute to wellbeing in the later stages of life. The present thesis consists of a general introduction, four empirical papers and an overall discussion of findings. The background literature review presented here outlines the current state of theoretical and empirical understanding of age differences in wellbeing. Paper 1 aimed to examine age differences in the subjective and physiological indices of recovery to discrete emotions (happiness, sadness and anxiety). Additionally, the role that spontaneous emotion regulation plays in rate of recovery from these emotions was investigated. Given that differences in the information processing may affect which emotion is experienced and the ease of emotion regulation, paper 2 and 3 investigate age differences in cognitive biases that may contribute to differences in wellbeing. Specifically, paper 2 examined age differences in negatively distorted predictions about the future and paper 3 reports on age differences in interpretation bias (i.e. the tendency to assign more negative as opposed to neutral or positive meanings to ambiguous situations). Once an emotion is experienced the individual needs to choose how to respond to it. Thus, paper 4 follows on from the previous papers by assessing the behavioural coping strategies that community and clinical younger and older adults use to cope with daily stressors. Finally, the general discussion presents an overview of the findings and discusses how these results integrate to inform our current knowledge of the theories and findings of age differences in wellbeing. Thesis strengths, limitations and suggestions for future research are also outlined.

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Paper 1

Age Differences in Emotion Regulation

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This paper has been prepared for publication.

Author contribution:

Mrs. Dusanka Tadic was responsible for the design of this study, collection and entry of data, analysis and write-up of this paper. Dr. Wuthrich, Professor Rapee and Dr. Kangas provided research supervision and were involved in the consultation stages of designing this study, as well as reviewing the manuscript. Dr. Taylor provided statistical supervision.

Abstract

Despite an array of losses that accompany older age, including declines in cognition, physiology and social networks, the prevalence of anxiety and depressive disorders is consistently found to be lower among older than younger adults. Some research suggests that these differences may be due to better emotion regulation among older adults. This study investigated age differences in the spontaneous use of emotion regulation by comparing older- and younger adults with clinical (Older: n = 37; age range = 60-78, *M* = 67.03, 20 females; Younger: n = 30; age range = 18-28, *M* = 21.6 years, 17 females) and non-clinical levels of anxiety and depression (Older: n = 34; age range = 60-80 years, *M* = 66.3, 22 females; Younger: n = 33; age range = 17-25 years, *M* = 18.8 years, 30 females). Participants completed self-report measures of anxiety, depression, and their typical use of emotion regulation strategies. They then completed a mood induction during which they watched videos of varying emotional content (happy, sad, and anxious) and rated the intensity and recovery of their emotions while physiological measures (galvanic skin response) were collected. Participants reported the strategies they spontaneously used during the recovery period. Older adults maintained a positive mood for longer than younger adults, while younger adults were able to recover from an anxious state faster than their older counterparts. Further, spontaneous use of reappraisal was found to predict faster recovery from negative emotions to a greater extent for older adults than younger adults. These results provide evidence of age differences in recovery of discrete emotions, and suggest that the ability to maintain positive emotions and spontaneously use reappraisal may contribute to the greater wellbeing observed in older adults.

Introduction

The finding that older adults maintain greater wellbeing than younger adults is robust (Kunzmann, Little, & Smith, 2000), however it is unclear why they do so. Many theorists have argued that older adults are better at regulating their emotions, and that this superior emotion regulation ability means that older adults live happier lives. One popular theory is that as older adults become increasingly aware that their time horizons are reducing they become more motivated to enhance emotionally gratifying experiences than young adults who prioritise future-oriented achievement goals (Socioemotional Selectivity Theory (SST); Carstensen, Isaacowitz, & Charles, 1999). This emphasis on enhancing emotionally gratifying experiences is thought to prompt older adults to devote more attention to emotion regulation (Mather & Carstensen, 2005) which drives the use of more effective regulatory strategies. Indeed, older adults have been shown to process emotional stimuli in more positive ways and to remember more positive than negative information compared to younger adults (Carstensen et al., 2011; Scheibe & Carstensen, 2010). However, many questions still remain unanswered. Do older adults experience all negative emotions as intensely as younger adults? Do older adults recover faster from negative emotions than older adults and is this the case for all negative emotions? If older adults do recover faster from negative emotions what emotion regulation strategies do they use?

Given how broad the emotion regulation field is, it is important to address emotional responding to specific emotions in a controlled and systematic way in order to make conclusions about age differences in emotion regulation. Thus the present study aimed to investigate age differences in rate of emotion regulation to discrete emotions using a multi-method approach assessing both subjective experience and physiological responses in both community and clinical samples.

Emotion Regulation Process and Strategies

The process of emotion regulation refers to an individual's attempt to influence which emotions they have, when they have them, and how they express and experience those emotions (Gross, 1998). Emotion regulation strategies are frequently classified into those that are implemented before the emotional response has become fully activated (antecedent-focused) and those implemented following the emotion to help alleviate the impact (response-focused) (Gross, 1998). Cognitive reappraisal is one antecedent-focused strategy that involves changing emotional appraisals, or interpretations of events to alter the subsequent emotional response. A large body of evidence suggests that reappraisal is associated with positive short-term and long-term outcomes such as increased positive emotion, decreased depressive symptoms and higher quality of life (Gross & John, 2003) as well as decreased peripheral response (Jackson, Malmstadt, Larson, & Davidson, 2000). Alternatively, suppression, a response-focused strategy which involves inhibiting the outward signs of an emotion, has been associated with greater negative emotion, higher depressive symptoms and less life satisfaction (Gross & John, 2003), as well as increases in peripheral (Gross, 1998) and neuroendocrine responses (Lam, Dickerson, Zoccola, & Zaldivar, 2009) thought to index negative emotions.

Redirecting attention and distraction are two strategies that involve attention deployment and are both considered to be antecedent in nature. Redirecting attention, which involves disengaging from the emotional stimuli by shifting gaze elsewhere, has been shown to be a successful self-regulation strategy (Mauss, Bunge, & Gross, 2007), whereas dysfunction in attentional disengagement has been shown to contribute to prolonged negative affect (Compton, 2000). Distraction involves removing oneself either physically (e.g., leaving the room) or cognitively (e.g., thinking about other things) from the emotional stimulus that is the trigger for negative affect, rather than simply shifting gaze, and is shown to reduce depressed mood in clinically depressed individuals (Nolen-Hoeksema & Morrow, 1993).

Age Differences in Emotion Regulation

Numerous studies have shown that older adults report fewer negative emotions, more positive emotions (Carstensen, Pasupathi, Mayr, & Nesselroade, 2000; Gross, Carstensen, Tsai, Skorpen, & Hsu, 1997) and greater control over their emotions (Gross et al., 1997; Lawton, Kleban, Rajagopal, & Dean, 1992) than younger adults. Older adults also report using more cognitive reappraisal and less expressive suppression (Haga, Kraft, & Corby, 2007; John & Gross, 2004) than younger adults. These findings have often been used as evidence that older adults are superior at regulating their emotions (Isaacowitz & Blanchard-Fields, 2012); however, reliance on self-report measures of emotion regulation limits the interpretability of these findings. Older adults' ability to execute emotion regulation goals may differ from their subjective report. This is an important consideration, particularly given evidence that emotion regulation often operates at an automatic level (Mauss et al., 2007).

Recent experimental studies have demonstrated that older and younger adults can use redirecting attention and expressive suppression with similar efficacy, as both strategies lead to similar reductions in negative emotion and physiology across ages (Kunzmann, Kupperbusch, & Levenson, 2005). However, evidence suggests that the success of cognitive reappraisal increases with age, with older adults more effectively repairing negative emotions using reappraisal than younger adults (Phillips, Henry, Hosie, & Milne, 2008; Shiota & Levenson, 2009). However, these experimental findings are based only on conscious and deliberate emotion regulation attempts, whereby the participants were induced into negative emotions via pictures, film or music and subsequently instructed to engage in a particular regulation strategy.

Far fewer studies have assessed age differences in spontaneous emotion regulation in real time. Evidence from eye tracking studies, where participants are not directly instructed to control their gaze, shows that older adults are more likely to deploy their attention towards positive and away from negative emotional stimuli than younger adults (Isaacowitz, Toner, & Neupert, 2009; Isaacowitz, Wadlinger, Goren, & Wilson, 2006). Similarly, when induced into a negative emotion, older adults tend to direct their attention to mood-incongruent positive information (Isaacowitz, Toner, Goren, & Wilson, 2008), suggesting that older adults spontaneously employ attention deployment as an emotion regulatory strategy more than younger adults. Taken together, these outcomes indicate that although younger and older adults might benefit equally when instructed to engage in a particular strategy, such as attention deployment, there may be age differences on spontaneous use of such strategies.

One study which tracked mood recovery over a 24 minute interval following a negative mood induction showed that older adults recovered from a negative emotional state at a faster rate than younger adults (Larcom & Isaacowitz, 2009). Importantly, they found that following recovery from the negative induction, older adults' mood ratings remained stable over time, whereas younger adults' mood ratings became more negative. In contrast to these findings, older adults were shown to exhibit higher ratings and greater physiological arousal in reaction to a sadness-inducing film which dealt with themes of health and loss (Kunzmann & Gruhn, 2005). Further still, one study found no age differences on rates of recovery from sadness and amusement, however, retrospectively, older adults reported less positive emotions during both film clips, contrary to previous findings (Tsai, Levenson & Carstensen, 2000). Therefore, experimental studies to date have reported mixed findings on age differences in emotion regulation and no study has linked the spontaneous use of different emotion regulation strategies to the rate of recovery from these discrete emotions. However, given the large amount of evidence supporting the predictions made by Socioemotional

Selectivity Theory (Carstensen & Mikels, 2005) that older adults are motivated to enhance positive emotions, it is likely that older adults would recover from a negative mood faster than younger adults, as found by Larcom & Isaacowitz (2009). It is also likely that older would maintain a positive mood for longer than younger adults due to the same motivational explanation. Given the mixed findings from the few studies that have compared younger and older adults on emotion recovery cited above, it is important to systematically assess rate of recovery using stimuli relevant to both age groups in a controlled environment.

The ability to recover from a negative emotion quickly may have implications for mental health and wellbeing. Indeed, difficulties in emotion regulation are considered a critical factor in the development and maintenance of psychopathology such as anxiety and depression (Aldao, Nolen-Hoeksema, & Schweizer, 2010). Individuals with depression have difficulties in disengagement from negative material, negative memory biases and cognitive control deficits which may underlie difficulties in emotion regulation (Joormann & D'Avanzato, 2010). Further, individuals with anxiety and mood disorders have also been found to rate their emotions as unacceptable, leading to greater suppression of negative emotions (Campbell-Sills, Barlow, Brown, & Hofmann, 2006). Maladaptive strategies (e.g., suppression, rumination, and avoidance) have been found to be more strongly associated with psychopathology than adaptive strategies (e.g., problem-solving, reappraisal, and acceptance), suggesting that interventions that directly target the use of maladaptive strategies may be important precursors to teaching the use of more adaptive emotion regulation skills (Aldao et al, 2010). In contrast, older adults who are found to regulate their emotions successfully display a profile of traits thought to facilitate emotion regulation ability, including lower levels of trait anxiety, neuroticism and depressive symptoms. The need to extend the empirical research on emotion regulation in ageing to the clinical population is warranted as it will illuminate whether emotion regulation differs between younger and older adults and the optimal treatment strategies to target maladaptive emotion regulation in these age groups.

The Present Study

The objective of the present study was to investigate age differences in spontaneous emotion regulation in community and clinical samples of younger and older adults. In particular, three specific aims were tested. The first aim was to examine whether older adults regulate their emotions more rapidly than younger adults, and whether this differs by type of primary emotion. In line with the Socioemotional Selectivity Theory (Carstensen et al., 1999), we hypothesised that older adults would recover faster from the sad and anxious mood inductions while maintaining a higher, more stable happy mood than younger adults, and that this pattern would be evident in both self-report and galvanic skin response.

A second aim was to test whether age differences in emotion regulation were also evident in a clinical sample of younger and older adults. Based on evidence that individuals with depression and anxiety exhibit maladaptive emotion regulation skills (e.g., Aldao et al., 2010), we hypothesised that both younger and older community-based adults would recover faster from a sad and anxious mood induction than younger and older adults with clinical levels of depression and/or anxiety. We also hypothesised that community participants would maintain a happy mood for longer than the clinical participants of both ages.

A final aim was to examine the effect of the spontaneous use of specific emotion regulation strategies on the rate of emotion regulation over time, and whether this varies by age and type of primary emotion. We hypothesised that more adaptive strategies such as reappraisal, acceptance and distraction would be associated with faster rate of emotion regulation than less adaptive strategies such as emotional suppression and redirecting attention, for both the sad and anxious moods. Additionally, older adults were expected to report spontaneously using more adaptive emotion regulation strategies than their younger counterparts; however community participants were predicted to use more adaptive regulation strategies than clinical participants.

Method

Participants

A total of 134 adults took part in this study, including 67 community participants and 67 clinically depressed and anxious participants. The community sample consisted of 33 young adults, (age range = 17-25 years, *M* = 18.8 years, *SD* = 1.9), primarily female (91%; n =30) undergraduate first-year psychology students recruited from a Sydney-based university in exchange for course credit, and 34 older adults (age range = 60-80 years, *M* = 66.3, *SD* = 5.5, 65% female; n = 22) who were community volunteers recruited via local newspaper advertisements for "happy, healthy older adult volunteers" and were reimbursed AUD$30 for their time. The clinical sample consisted of 30 younger adults, (age range = 18-28, *M* = 21.6 years, *SD* = 3, 50% female; n = 17) recruited via advertisements placed around the university campus including the counselling service unit, and 37 older adults (age range = 60-78, *M* = 67.03, *SD* = 4.3, 53% female; n = 20), recruited from a clinical trial for depressed and anxious adults aged over 60 years. All the clinical participants were screened using the Anxiety Disorders Interview Schedule (ADIS-IV; Brown, DiNardo, & Barlow, 1994) and included in the research if they met diagnostic criteria (see below for definition) for anxiety and/or depression. They were also reimbursed AUD$30 for their time. All participants were required to speak English as their first language.

Measures

Diagnostic Interview

Anxiety Disorders Interview Schedule-IV (ADIS-IV; Brown, Di Nardo, & Barlow, 1994) is a semi-structured diagnostic measure with robust psychometric properties which was used to assess all clinical participants for anxiety and depression. The older adults completed the ADIS-IV face-to-face at the university clinic. Due to feasibility issues, the younger participants completed the ADIS-IV over the telephone. All clinical participants met criteria for an anxiety and mood disorder, as qualified by a clinician severity rating of at least 4 out of 8 on the ADIS-IV. Eight young adult clinical participants only met criteria for either an anxiety or mood disorder. Summary of diagnoses is reported in Table 1. The interview was administered by graduate clinical psychology students who received extensive training on the ADIS-IV and regular supervision for diagnostic decisions by trained clinical psychologists.

Table 1

ADIS-IV Diagnoses for Younger and Older Clinical Groups

	Younger	Older
Principal Diagnoses (%)		
GAD	36.7	18.9
SPEC	0.0	5.4
SOC	20.0	5.4
OCD	0.0	2.7
MDD	16.7	45.9
DYS	13.3	8.1
ADNOS	13.3	5.4
MDNOS	0.0	8.1
Secondary Diagnoses (%)		
GAD	20.0	43.2
SPEC		13.5
SOC	6.7	16.2
MDD	30.0	8.1
DYS	6.7	2.7
PD	0.0	5.4
ADNOS	0.0	2.7
MDNOS	10.0	8.1
ADIS primary severity	*M* = 5.74 (*SD* = 1.29)	*M* = 5.97 (*SD* = 0.87)
ADIS secondary severity	*M* = 5.35 (*SD* = 1.23)	*M* = 5.14 (*SD* = 0.98)

Note. GAD = Generalized Anxiety Disorder, SPEC = Specific Phobia, SOC = Social Phobia, OCD = Obsessive Compulsive Disorder, MDD = Major Depressive Disorder, DYS = Dysthymic Disorder, ADNOS = Anxiety Disorder Not Otherwise Specified, MDNOS = Major Depressive Disorder Not Otherwise Specified, PD = Panic Disorder, ADIS = Anxiety Disorders Interview Schedule.

Symptom Measures

Depression Anxiety and Stress Scales (DASS; Lovibond & Lovibond, 1995) is a 42-item scale that measures anxiety, depression and stress symptoms over the past 7 days. The items are scored on a 4 point severity scale (*1 = does not apply to me at all, to 4 = applies to me very much, or most of the time*), with higher scores indicating more severe symptomatology. The DASS-42 has demonstrated good psychometric properties in both clinical and non-clinical adult samples (Antony, Bieling, Cox, Enns, & Swinson, 1998; Brown, Korotitsch, Chorpita, & Barlow, 1997). This scale was administered to the younger adult samples to screen for anxiety and depression and had strong internal consistency in the current sample; anxiety (α = .88), depression (α = .95).

Geriatric Anxiety Inventory (GAI; Pachana et al., 2007) is a 20 item, dichotomous scale (*agree/disagree*) developed to measure anxiety symptoms over the past 7 days in older adults (> 60 years). A larger number of positive endorsements indicate more severe anxiety symptoms. This scale has been shown to have adequate reliability and validity in clinical and non-clinical samples (Pachana et al., 2007). The GAI was found to have strong internal consistency in the older adult sample (α = .94).

Geriatric Depression Scale (GDS; Yesavage et al., 1983) is a 30-item dichotomous scale (*yes/no*) measuring the severity of depression symptoms over the past 7 days, with higher scores indicating more severe depression. The GDS has demonstrated adequate psychometric properties in clinical and non-clinical older adult samples (Dunn & Sacco, 1989; Parmelee, Lawton, & Katz, 1989). This scale was administered to the older adult samples and was also found to have strong internal consistency (α = .95).

Emotion Regulation

Emotion Regulation Questionnaire (ERQ; Gross & John, 2003) is a 10-item trait measure which assesses the habitual use of two emotion regulation strategies: cognitive reappraisal (six items) and expressive suppression (four items). Individuals rate on a scale of 1 to 7 (1 = *strongly agree* to 7 = *strongly disagree*) how strongly they agree with employing these strategies in general. Adequate convergent and discriminant validity of the scale has been demonstrated, as well as internal consistency of each subscale (reappraisal: α = .79; suppression: α = .73) (Gross & John, 2003). Adequate internal consistency for both subscales was found in the present study: reappraisal (α = .84) and expressive suppression (α = .74).

Responses to Emotions Questionnaire (REQ; Campbell-Sills et al., 2006) is an 8-item state measure which was originally developed to assess the degree to which participants used specific emotion regulation strategies in response to a trauma film. Four items assess attempts to change emotion(s); emotional suppression (*I tried to hold back or suppress my emotional reactions*); cognitive reappraisal (*I tried to think about the events depicted in the film in a way that would make me feel less distressed e.g. reminded myself it was fake*); self-distraction (*I distracted myself during the film*), and redirecting attention (*I focused on the less emotional details of the film or shifted my gaze when I thought I might see something upsetting*), and four items measure acceptance of emotion(s) without resistance (e.g., *I just let myself experience whatever emotion came up during the film*). Using a scale ranging from 0 to 8 (0 = *not at all* to 8 = *all the time*), individuals rated how much they engaged in each strategy during the induction. The single rating for each item was taken as a measure of how much the individual engaged in that particular regulation strategy. There are no published psychometric properties for this scale; however, Campbell-Sills and colleagues (2006) found that the questions pertaining to suppression of emotion correlated with a trait measure of suppression.

Cognitive Assessment

Mini Mental Status Examination (*MMSE; Folstein, Folstein & McHugh, 1975)* was used as a general measure of cognitive functioning. The maximum score on the MMSE is 30 with scores of 26 and below indicative of mild cognitive impairment. All participants scored in the normal range, (Range = 27-30, M = 29.2, SD = .86).

Mood Induction

Emotive Clips: Three emotive film clips, approximately 5 minutes long, were selected to elicit the emotions of anxiety, sadness and happiness. Anxiety and sadness were chosen as these are the most common emotions studied. These emotions are relevant to the presentation of the clinical sample as sadness is a common feature of depression and anxious mood is the key symptom of many anxiety disorders. Happiness was also included to test the assumption of Socioemotional Selectivity Theory (Carstensen et al., 1999) which would predict that older adults maintain a positive mood for longer than younger adults as they are motivated to increase positive emotions.

The anxiety clip was a scene from an American horror film *The Strangers* (Davison & Bertino, 2008), and depicted a middle aged woman being terrorized by an unseen intruder while home alone. The happiness clip was a YouTube video, and depicted an uplifting story of a monkey and a hound who become best friends (Bouju1, 2009). The sadness clip was taken from an American drama film *My Sister's Keeper* (Johnson & Cassavetes, 2009), and depicted a hospital scene in which a mother is talking to her teenage daughter who is dying from cancer. Pilot data indicated that all three clips elicited the desired emotion to a similar degree in younger and older adults. Neutral clips of approximately 3 minute durations depicting pleasant animal scenes were presented accompanied by soft classical music. Three different neutral scenes were selected rather than showing one neutral stimulus to prevent boredom and frustration due to repetition. The films were played on a 21 inch monitor and the experimenter was hidden from the participant's view.

Mood Rating Dial: Participants rated how strongly they felt the targeted emotion by turning a dial on a board from 0-7 which represented increasing strength of the relevant emotion (*0 = not at all happy/sad/anxious*, *7 = extremely happy/sad/anxious*). Participants were instructed before watching the clip that immediately after the film clip finished they were to turn the dial to the number that indicated how strongly they were feeling the specific emotion. They were told to leave the dial on the number for a few seconds and then turn it back to 'off'. The experimenter recorded each rating. The procedure was repeated every 30 seconds, following the sounding of a buzzer. Participants were demonstrated the use of the buzzer and dial before the experiment started to reduce startle and confusion.

Physiological Measurement

Galvanic Skin Response (GSR) was recorded as an index of physiological reactivity to the emotion arousing video clips. GSR was recorded during multiple baseline periods (one neutral baseline before each mood induction), during each mood induction, and for five minutes following each mood induction. GSR, measured in microsiemens (mµ), was monitored using LabChart 7.0 software linked to a PowerLab Data Acquisition System (ML865 4/35; AD instruments, 2004). Electrodes were placed on the distal phalanges of the first and middle fingers of the non-dominant hand. The signal was sampled at 1000 Hz and amplified using an external PowerLab amplifier.

Procedure

The study protocol was approved by the university Human Research Ethics Committee. At the beginning of the experimental session all participants provided signed and informed consent and demographic information. Younger adult participants then completed the DASS and ERQ before beginning the experiment. Older adult participants were administered the MMSE, GAI, GDS and ERQ before beginning the experiment[1]. Participants were attached to the skin conductance apparatus and induced into one of the three mood states (anxious, sad or happy). Order of inductions was randomized via a random number generator. Before each mood induction, baseline recordings of skin response were obtained while watching one of the three neutral film clips for 3 minutes. The neutral film clips were always played in the same order. Participants were asked to rate the strength of their mood using the

[1] Note that these data were collected as part of a larger study run by the authors. For a list of all the measures administered contact the corresponding author.

Mood Rating Dial immediately after each neutral clip, at the end of the induction clip, and every 30 seconds for five minutes following the clip. Skin response was continuously recorded. This procedure was then repeated, starting with a neutral clip for the remaining two mood states. Finally participants completed the REQ, and were debriefed before leaving. The REQ was completed once only at the end of all three inductions in order to reduce priming as participants may have been prompted to try one of the other strategies had they been made aware of them after the first induction.

Data Scoring and Analysis

Age differences in emotion recovery, indexed by self-report rating and physiological responding following the mood inductions were examined using a linear mixed model analysis of variance. Subjects were entered as a random effect, while all other factors were fixed effects. Mood induction ratings and physiological responses were within subjects factors, while age group and sample (community vs. clinical) were between subjects factors. Polynomials were conducted to investigate trends over time for mood rating and physiological response for each mood. Time 2 to time 12 were included in the analysis as we were interested in rate of change from post induction onwards. Mood rating and GSR responses were averaged across every 30 second interval during the five minute recovery period for each mood induction. The average responses for each 30 second block were subtracted from the average baseline mood rating and baseline GSR response prior to the targeted induction to obtain an average difference mood rating and GSR response. Analyses were conducted on these difference scores.

Results

Preliminary Analysis

Younger and older adult subgroups differed on most demographic variables, as summarized in Table 2. Specifically, there was a greater proportion of females in the younger community group compared to the younger clinical group and older community group, thus this was controlled for in further analyses with gender entered as a covariate. Other significant differences between younger and older adults related to differences in their stage of life for example, older adults reported higher rates of marriage, income, and more medication use (see Table 2 for details).

Table 2

Demographic Information for Younger and Older, Community and Clinical Groups

Variable	Clinical		Community		F/X^2	*p*
	Younger (*N* = 30)	Older (*N* = 37)	Younger (*N* = 33)	Older (*N* = 34)		
	N (%)	*N (%)*	*N (%)*	*N (%)*		
Sex					12.73	.005
Female	17 (56.7)$_c$	20 (54.1)	30 (90.9)$_{bc}$	22 (64.7)$_b$		
Male	13 (43.3)$_c$	17 (45.9)	3 (9.1)$_c$	12 (35.3)		
Education					48.46	<.001
High school or below	18 (60)$_c$	13 (35.1)	31 (93.9)$_{bc}$	5 (15.2)$_b$		
Certificate or diploma	3 (10)	12 (32.4)	0 (0)$_b$	11 (33.3)$_b$		
Bachelor or Postgraduate	9 (30)$_c$	12 (32.4)	2 (6.1)$_{cb}$	17 (51.5)$_b$		
Income					66.53	<.001
Less than $500 per week	29 (96.7)$_a$	23 (62.2)$_{ad}$	33 (100)$_b$	5 (16.1)$_{bd}$		
More than $500 per week	1 (3.3)$_a$	14 (37.8)$_{ad}$	0 (0)$_b$	26 (83.9)$_{bd}$		
Marital status					71.95	<.001
Never married	29 (96.7)$_a$	4 (10.8)$_a$	32 (97)$_b$	1 (2.9)$_b$		
Married or defacto	1 (7.8)$_a$	11 (29.7)$_{ad}$	1 (3)$_b$	22 (64.7)$_{bd}$		
Separated or divorced	0 (0)$_a$	16 (43.2)$_{ad}$	0 (0)$_b$	4 (11.8)$_{bd}$		
Widowed	0 (0)$_a$	6 (16.2)$_a$	0 (0)$_b$	7 (20.6)$_b$		
Ethnicity					23.83	<.001
Australian	16 (53.3)$_a$	35 (94.6)$_a$	23 (69.7)$_b$	32 (94.1)$_b$		
Other	14 (46.7)$_a$	2 (5.4)$_a$	10 (30.3)$_b$	2 (5.9)$_b$		
Medication					21.97	<.001
Yes	7 (24.1)$_a$	24 (64.9)$_a$	8 (24.2)$_b$	22 (64.7)$_b$		
No	22 (75.9)$_a$	13 (35.1)$_a$	25 (75.8)$_b$	12 (35.3)$_b$		

Note. F = Fisher's exact test for for analyses that have cell sizes less than 10
Distributions in each row that share subscripts were found to be significantly different
$_a$ = significant difference between younger and older clinical participants
$_b$ = significant difference between younger and older community participants
$_c$ = significant difference between younger clinical and younger community participants
$_d$ = significant difference between older clinical and older community participants

Total scores on the DASS depression and anxiety subscales, the GAI and GDS were converted to z scores to conduct between group analyses on symptom severity. Descriptive statistics are reported in Table 3. Z scores were computed separately within each age group using means and standard deviations from the distribution obtained for each age group. This was necessary as younger and older adults completed different measures of anxiety and depression. There was a main effect of sample, F (2, 129) = 85, p < .001). As expected, clinical participants were significantly more depressed (Community: M = -.65, SD = .65; Clinical: M = .62, SD = .85), F (1, 130) = 92.36, p < .001) and anxious than community participants (Community: M = -.711, SD =.57; Clinical: M = .71, SD = .81), F (1, 130) = 138.09, p < .001). There was no significant main effect of age group, F (2, 129) = .254, p = .776, or age group by sample interaction, F (2, 129) = 2.68, p = .072. The results showed that younger community participants were significantly more anxious than the older community participants (Younger: M = -.54, SD = .69; Older: M = -.88, SD = .36, F (1, 130) = 5.36, p = .022) but did not differ on depression (Younger: M = -.54, SD = .75; Older: M = -.75, SD = .53, F (1, 130) = 1.06, p = .305). There were no age differences on anxiety (Younger: M = .59, SD = .96; Older: M = .80, SD = .67, F (1, 130) = .31, p = .580) and depression (Younger: M = .59, SD = .91; Older: M = .65, SD = .81, F (1, 130) = .39, p = .536) in the clinical group.

Table 3.

Descriptive Statistics for DASS, GAI, GDS and the converted z scores for younger and older community and clinical groups

	Community				Clinical			
	Young		Older		Young		Older	
	Mean (SD)	Range	Mean (SD)	Range	Mean (SD)	Range	Mean (SD)	Range
DEPRESSION	8.06 (7.83)	0-32	10.03 (1.85)	8-17	19.80 (9.43)	4-40	14.95 (2.83)	8-22
Z-score	-.54 (.75)	-1.31- 1.76	-.75 (.53)	-1.33-1.23	.59 (.91)	-.93- 2.53	.65 (.81)	-1.33-2.65
ANXIETY	6.48 (5.29)	0-25	.85 (2.20)	0-11	15.20 (7.40)	1-30	11.19 (4.11)	2-19
Z-score	-.54 (.69)	-1.38-1.87	-.88 (.36)	-1.02-.77	.59 (.91)	-.9.-2.53	.80 (.81)	-1.33-2.65

Note. Younger adults completed the Depression and Anxiety subscales of the Depression Anxiety and Stress Scales. Older adults completed the Geriatric Anxiety Inventory and Geriatric Depression Scale.

Emotion Recovery

Manipulation check

No significant effect of mood induction order was found on pre induction ratings for age group, F (5, 372) = 1.29, p = .273 or sample, F (5, 372) = .66, p = .656. Likewise, no significant effect of mood induction order was found on post induction ratings for age group, F (5, 373) = 1.09, p = .366 or sample, F (5, 373) = 5.26, p = .130. Independent t-tests revealed that the mood induction manipulations were effective at inducing a significant increase in the desired mood. Both younger and older community and clinical participants significantly increased their self-reported rating for happy, sad and anxious video clips from pre to post induction (all ps < .001; see Table 4 for descriptives). However, significant interactions between time and sample, F (1, 1) = 5.776, p = .018, time and mood, F (2, 246) = 96.030, p = .000, and time, mood and age group, F (2, 246) = 7.053, p = .001, were found for the change in ratings from pre to post induction. The three way interaction involving age showed that older adults had significantly higher happiness ratings than younger adults at pre induction, F (1, 123) = 4.41, p = .038, and older adults had significantly lower anxiety ratings than younger adults post-induction, F (1, 123) = 5.97, p = .016. There were no significant age differences for sadness ratings pre- or post- induction. Despite these age differences, the largest effect size was for time (ηp^2 = .827). The time by mood by age group interaction accounted for only 5.4% of the variance. These findings suggest that the mood inductions successfully increased relevant moods for both younger and older adults.

Table 4.

Descriptive statistics for self-report rating pre-induction, post-induction and every 30 seconds for the five minute recovery period for young and older community and clinical groups.

		Community				Clinical			
		Young		Older		Young		Older	
Mood	Time	Mean (SD)	Range	Mean (SD)	Range	Mean (SD)	Range	Mean (SD)	Range
Happy	Pre	4.06 (1.48)	0-6	4.26 (1.54)	1-7	2.64 (1.79)	0-6	3.69 (1.78)	0-7
	Post	5.97 (.85)	4-7	5.35 (1.30)	2-7	4.00 (1.98)	0-7	4.86 (1.44)	1-7
	30 sec	5.52 (.83)	4-7	4.88 (1.59)	0-7	3.57 (1.89)	0-6	4.57 (1.54)	1-7
	60 sec	4.97 (1.13)	1-7	4.50 (1.64)	0-7	3.21 (1.83)	0-6	4.06 (1.51)	0-7
	90 sec	4.64 (1.14)	1-7	4.24 (1.63)	0-7	3.04 (1.88)	0-6	3.63 (1.54)	0-7
	120 sec	4.42 (1.23)	0-6	4.09 (1.68)	0-7	2.57 (1.62)	0-5	3.57 (1.61)	0-7
	150 sec	4.12 (1.39)	0-6	4.03 (1.70)	0-7	2.79 (1.77)	0-7	3.34 (1.64)	0-7
	180 sec	4.06 (1.39)	0-6	4.03 (1.52)	0-6	2.37 (1.62)	0-5	3.26 (1.54)	0-6
	210 sec	3.79 (1.54)	0-6	3.97 (1.43)	0-6	2.44 (1.61)	0-5	2.97 (1.47)	0-6
	240 sec	3.70 (1.59)	0-6	3.90 (1.50)	0-6	2.32 (1.63)	0-5	2.84 (1.51)	0-6
	270 sec	3.55 (1.68)	0-7	3.90 (1.50)	0-6	2.20 (1.66)	0-5	2.74 (1.44)	0-5
	300 sec	3.42 (1.58)	0-6	3.90 (1.50)	0-6	2.12 (1.74)	0-5	2.80 (1.32)	0-5
Sad	Pre	1.15 (1.79)	0-6	.29 (.94)	0-5	.93 (1.46)	0-5	1.25 (1.65)	0-5
	Post	5.30 (1.81)	0-7	5.24 (1.63)	1-7	4.50 (1.83)	0-7	4.83 (2.04)	0-7
	30 sec	5.12 (1.65)	1-7	4.62 (2.09)	0-7	3.93 (1.84)	0-7	4.49 (2.19)	0-7

	60 sec	4.52 (1.89)	0-7	3.47 (2.48)	0-7	3.20 (1.81)	0-6	3.94 (2.09)	0-7
	90 sec	3.67 (1.90)	0-6	2.97 (2.28)	0-7	2.77 (1.61)	0-6	3.43 (2.06)	0-7
	120 sec	2.88 (1.93)	0-6	2.62 (2.36)	0-7	2.20 (1.42)	0-5	2.91 (2.11)	0-7
	150 sec	2.27 (1.83)	0-6	2.15 (2.18)	0-7	2.07 (1.22)	0-4	2.49 (2.04)	0-7
	180 sec	2.24 (1.94)	0-6	1.94 (2.24)	0-7	1.69 (1.39)	0-4	2.38 (2.0)	0-6
	210 sec	1.88 (1.76)	0-6	1.76 (2.01)	0-7	1.37 (1.18)	0-4	2.13 (1.91)	0-6
	240 sec	1.73 (1.79)	0-6	1.58 (2.03)	0-7	1.15 (1.17)	0-3	2.13 (1.72)	0-6
	270 sec	1.64 (1.88)	0-7	1.42 (2.01)	0-7	1.16 (1.25)	0-4	2.00 (1.64)	0-6
	300 sec	1.48 (1.77)	0-6	1.36 (2.0)	0-7	.96 (1.10)	0-3	1.80 (1.54)	0-6
Anxious	Pre	.88 (1.14)	0-4	.41 (.86)	0-4	.83 (1.44)	0-5	1.74 (1.87)	0-6
	Post	5.27 (1.66)	2-7	3.94 (2.31)	0-7	4.63 (1.81)	0-7	4.25 (1.73)	1-7
	30 sec	4.27 (2.08)	1-7	2.97 (2.21)	0-7	3.90 (1.92)	0-6	3.17 (1.83)	0-7
	60 sec	3.64 (2.04)	0-7	2.18 (1.98)	0-6	3.23 (1.79)	0-6	2.33 (1.96)	0-7
	90 sec	2.76 (1.97)	0-7	1.47 (1.71)	0-5	2.77 (1.78)	0-6	1.81 (1.88)	0-7
	120 sec	2.12 (1.83)	0-6	1.12 (1.41)	0-5	2.13 (1.83)	0-5	1.53 (1.73)	0-6
	150 sec	1.70 (1.67)	0-5	.91 (1.14)	0-3	1.72 (1.71)	0-5	1.56 (1.63)	0-6
	180 sec	1.45 (1.66)	0-5	.68 (.91)	0-3	1.45 (1.53)	0-5	1.53 (1.56)	0-5
	210 sec	1.24 (1.44)	0-5	.53 (.78)	0-2	1.15 (1.61)	0-5	1.42 (1.62)	0-5
	240 sec	1.03 (1.33)	0-4	.33 (.61)	0-2	.74 (1.43)	0-5	1.25 (1.55)	0-5
	270 sec	.88 (1.16)	0-4	.33 (.61)	0-2	.62 (1.27)	0-4	1.26 (1.46)	0-4
	300 sec	.69 (.97)	0-3	.36 (.62)	0-2	.76 (1.33)	0-4	1.19 (1.52)	0-5

Self-reported Mood Ratings

To test aims 1 and 2, a mixed-model analysis with age group (younger, older) and sample (clinical, community) as between subject factors and mood (happy, sad, and anxious) and time from the end of induction (times 2-12) as within-subject factors was conducted on the self-reported mood ratings (see Figure 1). The analysis showed a main effect of time, F (10, 3917.54) = 218.87, p <.001, which indicated an overall reduction in self-report ratings over time and a main effect of mood, F (2, 3921.16) = 529.32, p < .001, however the main effect of sample was not significant, F (1, 127.34) = 2.93, p = .090. There were significant interactions between time and mood, F (20, 3916.47) = 7.52, p < .001), time and age group, F (10, 3917.51) = 2.70, p = .003, mood and age group, F (2, 3921.18) = 63.38, p < .001, and mood and sample, F (2, 3921.20) = 5.93, p = .003. A three-way interaction was also found

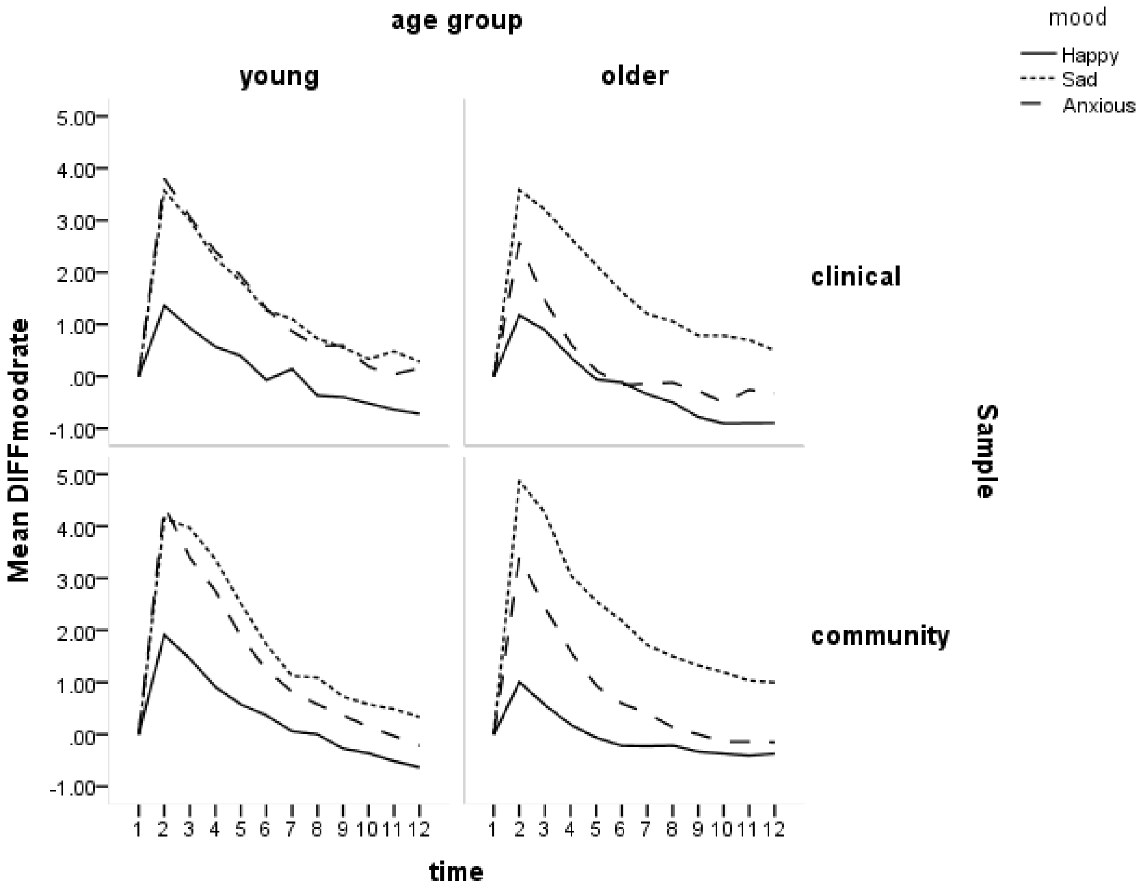

Figure 1. Mean self-report mood rating for each age group, sample and mood.

Note: DIFFmoodrate = difference score (rating at time *x* minus pre induction rating).

between age group, sample and mood, F (2, 3921.16) = 5.84, p = .003. As the two-way interactions not involving time were subsumed in the three-way interaction we did not interpret them separately. Follow-up interaction contrasts showed that the difference between the effect of age group for the clinical and community samples was significantly different for happy vs. sad mood, t (3918.7) = -3.64, p < .001, as well as anxious vs. sad mood, t (3918.02) = -2.36, p = .018, however there was no significant difference on the effect of age group for the different samples on happy vs. anxious mood, *t* (3918.27) = -1.19, *p* = 236. Specifically, clinical older adults were significantly less anxious than clinical younger adults, *F* (1, 157.67) = 13.88, *p* < .001, and community older adults were significantly more sad than community younger adults, *F* (1, 152.51) = 4.55, *p* = .034, which appeared to be driving the three-way interaction.

Linear trends in self-reported responses over time were used to test time effects. Time was thus treated as a numeric, rather than categorical variable. The trend analysis showed an overall significant linear main effect over time, *F* (1, 4022.62) = 19.75.41, *p* < .001. Age group, sample and mood all interacted with time in a linear fashion, *F* (1, 4022.40) = 23.20, *p* < .001, and *F* (1, 4022.62) = 5.62, *p* = .018 and *F* (2, 4014.23) = 60.81, *p* < .001, respectively. There was also a significant age group by sample by mood by linear time interaction, *F* (7, 4015.37) = 3.76, *p* < .001. Polynomial contrasts were conducted to investigate this four-way interaction. The results are reported below grouped by mood condition.

For happiness, the results showed that younger adults (-.241) in the community sample recovered faster than older adults (-.147) in the community sample, *t* (1244.31) = 5.74, *p* < .001. Additionally, older adults (-.221) in the clinical sample recovered faster than older adults in the community sample, *t* (1245.85) = 4.48, *p* < .001. For sadness, the only significant difference indicated that younger community participants recovered faster than younger clinical participants, *t* (1277.45) = -2.65, *p* = .008. For anxiety, younger community adults recovered faster than the older community adults, *t* (1252.67) = 3.36, *p* = .001. Additionally, younger clinical adults recovered faster than the older clinical adults, *t* (1254.25) = 6.15, *p* < .001. Finally, older adults in the community sample were found to recover faster than older adults in the clinical sample, *t* (1254.68) = 4.06, *p* < .001.

Galvanic Skin Response (GSR)

The same mixed-model analysis conducted on the self-report rating was conducted on the skin response data (see Figure 2). Analysis of the pre- and post-induction data (time points 1 and 2) revealed significant main effects for time, F (1, 629.10) = 17.47, p < .001, and mood, F (2, 629.43) = 3.82, p = .022. GSR rates significantly increased from pre- (*M* = .68, *SE* = .21) to post-induction (*M* = 1.05, SE = .21), see Table 5 for means. The greatest overall physiological response was for anxiety (*M* = .96, *SE* = .22), followed by happiness (*M* = .94, SE = .22) and sadness (*M* = .695, *SE* = .22). There was also an age group by time interaction, F (1, 629.10) = 4.86, p = .028, indicating that younger adults had a greater GSR increase from pre to post–induction (M difference = .55 mμ) than did older adults (M difference = .18 mμ). However, the time by age group interaction accounted for only 6.8% of the variance compared to 22.6% by the overall effect of time.

Table 5.

Descriptive statistics for self-report rating pre-induction, post-induction and every 30 seconds for the five minute recovery period for young and older community and clinical groups.

		Community				Clinical			
		Young		Older		Young		Older	
Mood	Time	Mean (SD)	Range	Mean (SD)	Range	Mean (SD)	Range	Mean (SD)	Range
Happy	Pre	1.01 (2.59)	-2.23- 8.83	.52 (1.86)	-4.76- 4.49	.99 (2.92)	-6.24- 8.81	.64 (2.35)	-5.27- 6.01
	Post	1.55 (3.26)	-2.85- 9.58	.61 (2.04)	-4.81- 4.88	1.41 (3.42)	-6.97- 10.47	.82 (2.46)	-5.36- 5.82
	30 sec	2.08 (3.66)	-2.87-12.55	.98 (2.24)	-4.81- 5.86	1.83 (3.66)	-6.53- 10.36	1.15 (2.64)	-5.30- 6.16
	60 sec	2.00 (3.43)	-2.76-11.24	.98 (2.19)	-4.77- 5.40	1.82 (3.76)	-6.57- 10.31	1.15 (2.69)	-5.33- 6.17
	90 sec	1.81 (3.22)	-2.84- 10.58	.89 (2.13)	-4.78- 5.30	1.69 (3.70)	-6.74- 9.67	1.11 (2.69)	-5.32- 6.18
	120 sec	1.80 (3.20)	-2.72- 10.05	.90 (2.15)	-4.77- 5.50	1.46 (3.52)	-6.80- 9.12	1.01 (2.66)	-5.36- 5..84
	150 sec	1.71 (3.16)	-2.83- 10.08	.78 (2.16)	-4.78- 5.43	1.26 (3.44)	-6.77- 8.67	.94 (2.73)	-5.51- 6.04
	180 sec	1.66 (3.16)	-2.79- 10.15	.91 (2.17)	-4.81- 5.41	1.04 (3.47)	-6.82- 8.36	.84 (2.77)	-5.83- 6.25
	210 sec	1.81 (3.42)	-2.81- 12.32	.93 (2.16)	-4.84- 5.18	.98 (3.59)	-6.79- 7.97	.90 (2.63)	-5.54- 6.87
	240 sec	1.71 (3.39)	-2.82- 12.25	.93 (2.16)	-4.85- 5.28	1.01 (3.64)	-6.76- 7.90	.82 (2.62)	-5.60- 6.61
	270 sec	1.71 (3.39)	-2.88- 11.29	.88 (2.15)	-4.87- 5.65	1.48 (3.59)	-6.94 – 7.85	.95 (2.36)	-3.86- 6.24
	300 sec	1.33 (3.24)	-2.93- 11.46	.86 (2.15)	-4.88- 5.47	1.39 (3.45)	-6.52- 7.33	.92 (2.37)	-3.87- 6.15
Sad	Pre	.98 (3.25)	-2.95- 10.71	.07 (1.69)	-4.89- 3.50	.81 (2.56)	-5.69- 4.33	.27 (2.16)	-4.45- 3.93
	Post	1.58 (3.24)	-3.06 - 10.63	.20 (1.93)	-4.94- 3.89	1.01 (2.49)	-4.74- 5.04	.64 (2.46)	-4.54-4.25
	30 sec	2.10 (3.85)	-3.01- 13.36	.56 (2.13)	-4.98- 4.42	1.48 (2.91)	-4.93- 5.64	.87 (2.84)	-4.90- 5.50
	60 sec	2.34 (3.71)	-2.61- 12.40	.86 (2.11)	-4.96- 4.48	1.60 (2.98)	-4.68- 6.01	1.06 (2.85)	-4.99- 5.59

	90 sec	2.29 (3.60)	-2.54- 11.66	.88 (2.10)	-4.95- 4.74	1.27 (2.84)	-4.82- 5.23	1.03 (2.81)	-5.07- 5.56
	120 sec	2.15 (3.49)	-2.56- 11.66	.84 (2.10)	-4.95- 4.66	1.09 (2.80)	-5.05- 4.74	.97 (2.78)	-5.12- 5.24
	150 sec	2.19 (3.59)	-2.71- 11.63	.87 (2.07)	-4.95- 4.90	1.04 (2.80)	-5.38- 5.06	.93 (2.76)	-5.37- 5.02
	180 sec	2.15 (3.69)	-2.79- 11.58	.87 (2.06)	-4.96- 4.82	.93 (2.97)	-5.64- 5.21	.84 (2.75)	-5.47- 4.88
	210 sec	2.08 (3.59)	-2.83- 11.40	.87 (2.05)	-4.96- 4.96	.99 (3.04)	-5.60- 5.67	.77 (2.77)	-5.64- 4.87
	240 sec	2.00 (3.49)	-2.87- 11.01	.94 (2.07)	-4.97- 4.92	1.03 (3.16)	-5.70- 5.74	.75 (2.91)	-5.70- 5.10
	270 sec	1.92 (3.38)	-3.02- 10.41	1.00 (2.07)	-4.98- 4.92	1.03 (3.18)	-5.51- 5.70	.76 (2.94)	-5.45- 5.08
	300 sec	2.17 (3.34)	-2.70- 10.10	.98 (2.07)	-4.99- 4.92	1.26 (3.46)	-5.81- 7.69	.89 (2.76)	-5.45- 5.05
Anxious	Pre	.87 (3.05)	-4.57- 9.65	.93 (2.08)	-4.95- 5.39	.75 (3.01)	-6.81- 5.69	.36 (2.20)	-5.70- 5.22
	Post	1.48 (3.03)	-2.86- 9.54	.98 (2.29)	-4.92- 6.47	1.71 (3.29)	-7.34- 8.32	.55 (2.36)	-5.85- 5.95
	30 sec	2.83 (3.33)	-1.94- 11.32	1.45 (2.50)	-4.83- 7.00	2.11 (3.37)	-8.29- 7.12	1.03 (2.62)	-5.78- 6.88
	60 sec	2.83 (3.63)	-2.08- 11.98	1.39 (2.41)	-4.83- 6.36	1.87 (3.22)	-8.43- 6.60	.96 (2.58)	-5.85- 6.80
	90 sec	2.54 (3.52)	-2.22- 11.00	1.30 (2.35)	-4.83- 6.10	1.71 (3.13)	-8.49- 5.92	.89 (2.58)	-5.87-6.65
	120 sec	2.58 (3.46)	-2.44- 10.89	1.24 (2.35)	-4.81- 6.22	1.60 (2.98)	-8.48- 5.55	.84 (2.53)	-5.91- 6.57
	150 sec	2.55 (3.57)	-2.63- 11.06	1.23 (2.35)	-4.81- 6.19	1.48 (3.06)	-8.55- 5.66	.77 (2.52)	-5.92- 6.58
	180 sec	2.44 (3.55)	-2.80- 10.68	1.39 (2.33)	-4.83- 6.10	1.34 (3.06)	-8.81- 5.51	.67 (2.55)	-5.98- 6.60
	210 sec	2.36 (3.34)	-2.80- 10.77	1.33 (2.33)	-4.85- 6.10	1.58 (2.78)	-8.93- 5.33	.69 (2.59)	-6.04- 6.59
	240 sec	2.30 (3.40)	-2.89- 11.47	1.23 (2.30)	-4.86- 5.87	1.48 (2.91)	-9.15- 5.77	.62 (2.62)	-6.03- 6.41
	270 sec	2.15 (3.29)	-3.19- 10.61	1.21 (2.31)	-4.89- 5.78	1.59 (2.85)	-9.15- 5.47	.47 (2.70)	-5.99- 6.29
	300 sec	2.05 (3.42)	-3.26- 11.73	1.29 (1.97)	-2.68- 5.70	1.52 (2.87)	-9.24- 4.96	.58 (2.67)	-6.07- 6.41

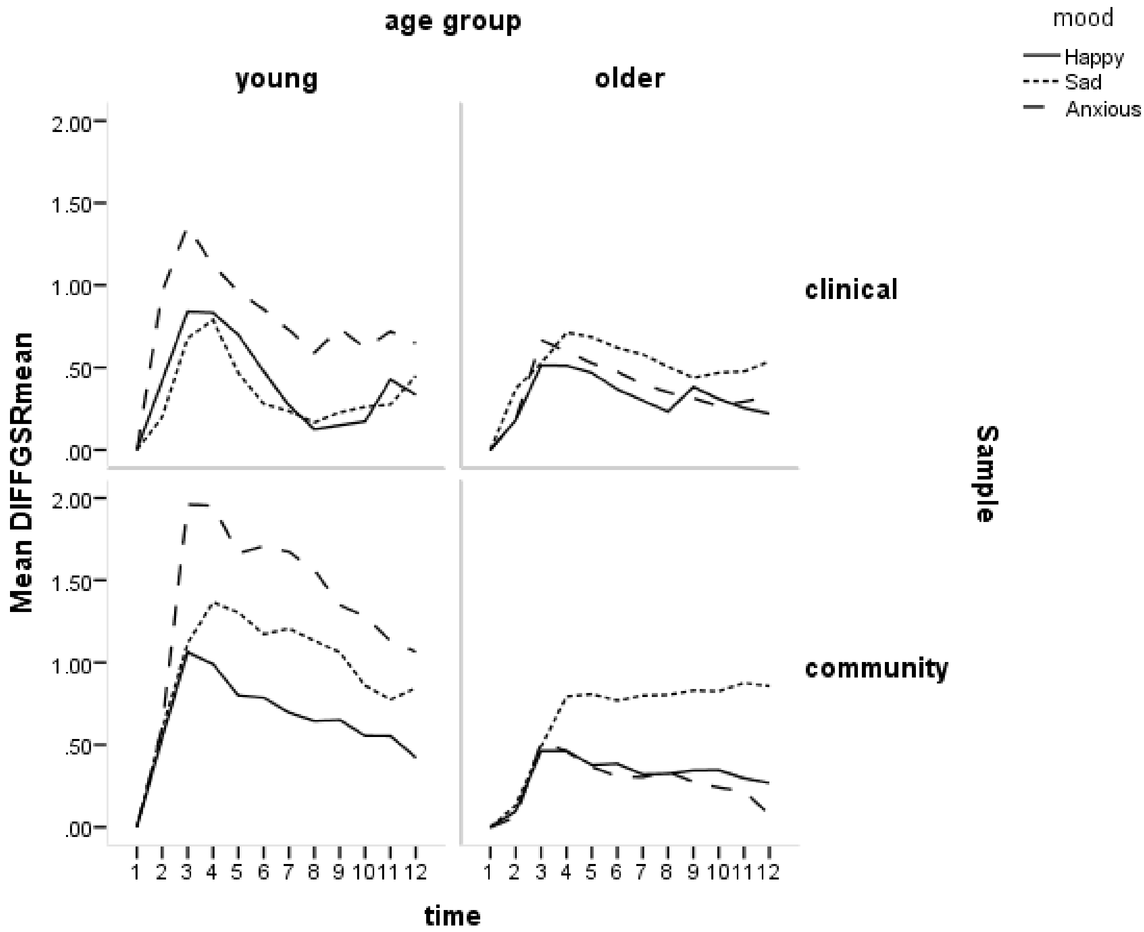

Figure 2. GSR response across time for each age group, sample and mood.

The overall mixed model analysis conducted to test effects of GSR rates post induction showed significant main effects of time, F (10, 3844.06) = 6.03, p < .001, and mood, F (2, 3847.73) = 17.20, p < .001, but no main effect of age group, F (1, 126.57) = 3.83, p = .052 or sample, F (1, 126.71) = 1.18, p = .280. The greatest physiological response was for the anxious (M = .74, SE = .08), followed by sad (M = .66, SE = .08), and happy (M = .46, SE = .08) mood.

Furthermore, a three-way interaction was evident between age, mood and sample, F (2, 3847.77) = 3.73, p = .024. Interaction contrasts showed that younger and older adults in the community sample differed significantly in their GSR responsiveness for anxiety relative to sadness, *t* (3954.50) = -6.06, *p* <.001. Younger adults showed a more elevated response to anxiety compared to sadness, whereas older adults showed a reduction in response to anxiety relative to sadness. Further, in the community group, the difference in GSR responsiveness for anxiety relative to happiness was significantly greater for the younger adults than the older adults, *t* (3953.89) = -5.81, *p* <.001. In the clinical group there was also a significant difference between younger and older adults in their responsiveness to sadness relative to anxiety, *t* (3955.18) = -4.53, *p* < .001. Again younger adults showed greater responsiveness to anxiety than sadness, whereas older adults showed greater responsiveness for sadness compared to anxiety. Further younger adults in the clinical group showed less responsiveness to sadness relative to happiness, whereas the opposite was found for older adults in the clinical group who responded more to sadness than happiness, *t* (3963.86) = 2.60, *p* < .001.

In terms of age differences younger community participants showed greater responsiveness to anxiety than older adults, *F* (1, 160.30) = 20.17, *p* < .001. However, within age-groups, community older adults showed significantly more responsiveness to sadness compared to anxiety than did clinical older adults, *t* (3955.92) = -2.15, *p* = .032. Clinical younger, relative to community younger adults showed significantly less responsiveness to sadness compared to happiness, *t* (3958.04) = -3.41, *p* = .001, and more responsiveness to anxiety compared to happiness, *t* (3961.50) = -2.82, *p* = .005.

Emotion Regulation Strategies and Rate of Recovery

Descriptive statistics for the Emotion Regulation Questionnaire (trait measure) and Responses to Emotions Questionnaire (state measure) are reported in Table 6. A 2 (age group; young, older) by 2 (sample; clinical, community) by 2 (trait emotion regulation strategy; reappraisal, suppression) repeated measures ANOVA, with gender as a covariate, was conducted to test for age and sample differences on the use of trait emotion regulation strategies. The main effect of strategy, F (1, 129) = 1.77, p = .185, age group, F (1, 129) = .02, p = .891, and sample, F (1, 129) = 1.22, p = .808, were not significant, however a significant strategy by sample interaction, F (1, 129) = 25.85, p <.001, emerged. Community participants reported utilizing significantly more reappraisal than clinical participants (M= 5.15, SD = 1.00 and M = 4.29, SD = 1.09, respectively), F (1, 129) = 20.54, p < .001, n^2 = .14, whereas clinical participants reported utilizing significantly more suppression compared to community participants, (M = 3.88, SD = 1.36 and M = 3.29, SD = 1.18, respectively), F (1, 131) = 6.34, p = .013, n^2 = .05.

A 2 (age group; young, older) by 2 (sample; clinical, community) by 2 (mood; sad, anxious) by 5 (state emotion regulation strategy; acceptance, reappraisal, suppression, redirecting attention, distraction) repeated measured ANOVA with gender as a covariate, was conducted to test for age and sample differences on the use of spontaneous state emotion regulation strategies on the Responses to Emotions Questionnaire. Results showed main effects of age group, F (1, 128) = 8.80, p =.004, sample, F (1, 128) = 6.00, p =.016, and strategy, F (4, 512) = 10.81, p <.001. Significant interactions emerged between strategy and sample, F (3.35, 428.29) = 2.68, p = .041, strategy and age group, F (3.35, 428.29) = 4.25, p = .002, and strategy, mood, and sample, F (3.66, 468.85) = 3.05, p = .020. The strategy by age group interaction revealed that younger adults used more suppression (M = 3.28, SD = 2.34) than older adults (M = 2.27, SD = 2.40), F (1, 128) = 7.60, p = .007. Younger adults also used more distraction (M = 2.43, SD = 2.15) than older adults (M = 1.35, SD = 1.79), F (1, 128) = 13.13, p < .001, and more redirecting attention (M = 2.66, SD = 2.53), than older adults (M = 1.70, SD = 1.82), F (1, 128) = 8.76, p = .004. Pairwise comparisons of strategy, mood and sample indicated no significant differences in the use of spontaneous strategies for sadness, however for anxiety community participant were more accepting of the experience of anxiety (M = 5.08 , SD = 1.51) than clinical participants (M = 4.43 , SD = 1.51), F (1, 128) = 6.00, p =

.016. In contrast, clinical participants used more distraction (M = 2.86, SD = 2.13) than community participants (M = 1.68, SD = 2.12), F (1, 128) = 9.83, p = .002, and more redirecting attention (M = 3.17, SD = 2.29) than community participants (M = 1.89, SD = 2.28), F (1, 128) = 9.916, p = .002.

Table 6.

Descriptive Statistics for the Emotion Regulation Questionnaire (ERQ) and Responses to Emotions Questionnaire (REQ)

	Community				Clinical			
	Young		Older		Young		Older	
	Mean (SD)	Range	Mean (SD)	Range	Mean (SD)	Range	Mean (SD)	Range
ERQ								
Reappraisal	5.10 (0.9)	3.50-7.00	5.22 (1.10)	3.33-7.00	4.19 (1.17)	1.00-7.00	4.37 (1.04)	2.00-6.50
Suppression	3.22 (1.08)	1.25-6.25	3.35 (1.28)	1.25-6.50	4.06 (1.25)	1.00-6.00	3.74 (1.44)	1.00-6.00
REQ (Sad)								
Reappraisal	2.76 (2.29)	0-8.00	2.94 (2.64)	0-8.00	3.47 (2.33)	0-8.00	3.66 (2.64)	0-8.00
Suppression	2.76 (2.11)	0-7.00	2.29 (2.36)	0-8.00	2.93 (2.27)	0-7.00	2.72 (2.88)	0-8.00
Acceptance	5.30 (1.48)	1.00-8.00	5.02 (1.50)	0-7.50	4.84 (1.34)	2.00-7.75	5.31 (1.72)	2.00-8.00
Redirecting	2.18 (2.27)	0.-8.00	1.32 (1.64)	0-5.00	2.13 (2.22)	0-7.00	1.72 (1.83)	0-6.00
Distraction	1.67 (1.71)	0-6.00	0.94 (1.65)	0-8.00	2.07 (2.16)	0-8.00	1.36 (1.55)	0-6.00
REQ (Anxious)								
Reappraisal	3.91 (2.55)	0-8.00	3.94 (2.97)	0-8.00	5.23 (2.67)	0-8.00	4.00 (2.45)	0-8.00
Suppression	3.06 (2.14)	0-7.00	2.03 (2.35)	0-8.00	4.37 (2.72)	0-8.00	2.03 (2.02)	0-8.00
Acceptance	5.21 (1.61)	1.00-8.00	4.87 (1.50)	0-7.50	3.89 (1.37)	1.00-6.00	5.03 (1.43)	2.50-8.00
Redirecting	2.76 (2.51)	0-8.00	1.41 (1.79)	0-6.00	3.90 (3.09)	0-8.00	2.06 (1.96)	0-6.00
Distraction	2.18 (1.89)	0-6.00	1.32 (2.27)	0-8.00	3.93 (2.53)	0-8.00	1.64 (1.68)	0-6.00

We further investigated whether participants' retrospective reports of the spontaneous emotion regulation strategies they used during the film-clip inductions influenced the emotion recovery ratings over time differentially for the different subgroups. The results from the mixed model analysis indicated that all of the five state emotion regulation strategies interacted with time in a linear fashion only. Therefore, since there were no interactions with the quadratic term it was removed from the analysis, and the rate of linear change between time 2 (post induction) and time 5 (1.5 minutes post induction) was evaluated as this is where most of the recovery was occurring. The mixed model analysis of linear change over time revealed a significant five-way interaction between reappraisal, sample, age group, mood and time, F (1, 897.56) = 5.05, p = .025. No other strategies interacted with linear change over time. Interaction contrasts were investigated for reappraisal at the mean separately for the sad and anxious moods. When comparing rate of recovery following the sad induction, community older adults recovered significantly faster (slope = -.824) than the clinical older adults (slope =-.460), B = .364, SE = .132, t (897.78) = 2.76, p = .006. The age group by sample by time interaction was marginally significant, B = -*.383*, SE = .193, t (897.65) = -2.00, p = .048. Similarly, when comparing the rate of recovery following the anxiety induction, community younger adults recovered significantly faster (slope = -.833), than clinical younger adults (slope = -.491), B = .342, SE = .147, t (897.64) = -2.33, p = .020. Additionally, clinical older adults recovered significantly faster (slope = -.816), than clinical younger adults (slope = -.491), B = -.324 SE = .144, t (897.54) = -2.25, p = .025. The three way age group by sample by time interaction was not significant, B = -.346, SE = .195, t (897.53) = 1.78, p = .076.

Discussion

This study aimed to investigate age differences in spontaneous emotion regulation to sadness, anxiety and happiness. Specifically, it was hypothesised that older adults would recover faster from the sad and anxious mood inductions while maintaining a higher, more stable happy mood than younger adults, and that this pattern would be evident in both self-report and galvanic skin response. It was also hypothesised that older adults would report spontaneously using more adaptive emotion regulation strategies than their younger counterparts. The results of this study revealed a number of key findings. First, no age differences were evident on rates of recovery from sadness, while for anxiety younger adults were found to recover faster than older adults. These results do not support our hypothesis. In contrast, older adults were found to maintain a happy mood for longer than younger adults as predicted. Second, age differences were found on the spontaneous use of emotion regulation strategies for anxiety, with younger adults reporting greater use of suppression, distraction and attention deployment than older adults. Finally, there was evidence that the successful employment of reappraisal increased with age as older clinical adults recovered faster than younger adults from the anxious mood when using reappraisal, as predicted.

Age differences in the rate of recovery

The finding that younger adults recovered faster from anxiety than older adults in both the community and clinical samples was contrary to expectations. Given evidence that older adults report greater control over their emotions (Gross et al., 1997) and are thought to be more motivated to enhance positive emotions (Carstensen et al., 1999) we expected older adults to recover from anxiety at a faster rate, at least in the community sample. Therefore, this result suggests that younger adults are better at regulating anxiety. Younger adults reported using more suppression, distraction and redirecting attention during the recovery periods. Although these strategies, especially suppression, are usually considered poor regulation strategies, it may be that these strategies are useful under certain conditions, such as within laboratory mood inductions. Although previous studies have found that instructions to suppress negative emotions in a laboratory setting did not alleviate subjective distress (e.g., Gross & Levenson, 1997), in this study we looked at the effect of spontaneous use of suppression. Thus, in a brief anxiety induction in the laboratory, younger adults may benefit from suppression, distraction and redirecting attention to reduce subjective experience of anxiety.

However, the interpretation of this result is difficult because older adults did not react as strongly to the anxiety clip as the younger adults. Smaller self-report mood ratings for anxiety post-induction were consistent with smaller GSR response which showed that older adults were less physiologically responsive to the anxious film clip than younger adults. This might indicate that the content of the anxious film clip was less relevant for older adults. Although care was taken to select video stimuli that was suitable for both age groups, it is very difficult to equate relevance of video stimuli across age, as younger and older adults may differ in terms of the themes that are most salient at these different stages of life. Future studies would benefit from establishing mood induction stimuli that induce similar initial distress and are valid to use with both younger and older adults. Since the older adults in this study were induced significantly less into the anxious mood compared to the younger adults, their emotion recovery curve was not as steep as they did not have as far to come down before returning to baseline. An alternative explanation is that older adults used more effective antecedent strategies thus resulting in less anxiety at post induction. Kunzmann and Gruhn (2005) found that older adults responded more strongly to the anxious induction once they were not able to avoid the emotional stimuli. The design of the current mood induction did not control for what participants did during the video induction. Participants were instructed to watch the video clip, however it is possible that they physically or cognitive detached themselves from the stimuli, for example by looking away or thinking about something else. Indeed, the current results indicate that older adults were more successful at engaging in reappraisal for the anxious induction. Thus older participant may have reappraised the anxious stimulus in a more positive light, for example thinking “it’s just a movie,” which might explain why older adults reported less anxiety and were less physiologically responsive to the anxious clip.

Interestingly, although there were no age differences on the self-reported use of spontaneous reappraisal during the recovery periods, when they did engage in reappraisal older adults were more successful at reducing their experience of anxiety than younger adults. Specifically, spontaneous use of reappraisal led to a faster rate of recovery from anxiety for clinical older compared to clinical younger adults. Community younger adults were also more successful at reducing anxiety using reappraisal than clinical younger adults. Together these findings suggest that the value of reappraisal is especially limited among younger clinical adults, and that perhaps effectiveness of reappraisal improves with age. This has implications for treatment, perhaps indicating that teaching reappraisal through cognitive strategies such as thought challenging may require more time with younger populations.

For sadness, community older adults benefited more from reappraisal than clinical older adults. This is in line with previous research which shows that even mild depressive symptoms impair the use of adaptive emotion regulation strategies (Orgeta, 2011). Since sadness is a primary symptom of depressive disorders these findings suggest that older adults who are depressed are less likely to use reappraisal spontaneously to try and regulate their sad moods. Interestingly, younger adults in the community sample also reported using more reappraisal than younger adults in the clinical sample, but reappraisal was not found to lead to faster recovery from sadness for younger adults. Together, the findings for sadness indicate that depression and anxiety impair emotion regulation success in both younger and older adults; however, older community adults benefit more from reappraisal for sadness than younger adults or older clinical adults. This is consistent with the findings for anxiety, and again suggests that reappraisal success increases with age, and it the greatest for older adults who are free form symptoms of psychopathology.

Consistent with previous research (Larcom & Isaacowitz, 2009), we found that older adults maintained a happy mood for longer than younger adults. This is in line with Socioemotional Selectivity Theory (Carstensen et al., 1999) which postulates that older adults are more motivated to enhance positive emotional experiences. However, age differences were not apparent on rate of emotion recovery from happiness in the clinical sample, where younger and older adults decreased their happiness at the same rate. Hence clinical levels of depression and anxiety seem to affect the ability to maintain a positive mood in the same way for younger and older adults. Interestingly, older community adults were able to maintain a positive mood significantly longer than older clinical adults, whereas the same was not true among the younger adults. These findings are consistent with research that shows greater wellbeing among older adults in the community (Kunzmann et al., 2000). Considering the above findings, it could be hypothesised that the greater level of wellbeing with increasing age that is reported in the literature may be partly accounted for by older adults' ability to maintain a positive mood, and not their ability to regulate negative emotions, as is suggested by the majority of the existing research.

Limitations and conclusions

The main limitation of this study is the use of an undergraduate university student sample to represent young adults from the community. This sample differed from the other three samples in terms of demographic variables such as gender and education, which may have impacted the results. Although we accounted for between-group differences in gender by including gender as a covariate, we did not have sufficient power to assess within-group differences on gender. One meta-analysis found that woman are more likely than men to report engaging in most types of emotion regulation (Tamres, Janicki, & Helgeson, 2002). Another study of a large community sample of men and women aged 25 to 75 years found that women reported using reappraisal and acceptance more than men, but no gender differences were found in suppression of emotion (Nolen-Hoeksema & Aldao, 2011). However, fewer gender differences have been found in moment-by moment emotional experiences (Barrett, Robin, Pietromonaco, & Eyssell, 1998; Kring & Gordon, 1998), suggesting that gender differences in self-reports of global emotionality are strongly influenced by gender role expectations. Studies using momentary assessments of emotions generally find no differences in men's and women's responses to emotion eliciting stimuli or in everyday emotional experiences, suggesting that men are just as aware of their emotions from moment to moment as women are (e.g., Grossman & Wood, 1993; Wild, Erb, & Bartels, 2001). The mean gender differences in emotion regulation are small even when they are statistically significant (Nolen-Hoeksema, 2012; Nolen-Hoeksema & Aldao, 2011; Tamres et al., 2002). Therefore, gender may not have had such a large impact on our analysis of moment to moment ratings of subjective experience. More research on spontaneous emotion regulation is required to determine gender differences and its relationship to psychopathology. The most accurate way to control for gender differences would be to select gender matched samples.

Further, we assessed 'happy, healthy' older adults who self-selected to do the study via local newspaper advertisements and so they may not be representative of the greater community. Both our older adults samples were fairly young and highly educated, thus may not be representative of the general population of older adults in the community. Future research should aim to replicate these findings in more representative samples of younger and older adults. We also were unable to conduct inter-rater reliability on the ADIS data as the phone interviews with younger adult participants were not recorded. This is a limitation of the current study as we do not know how reliable the clinical diagnoses are.

Furthermore, although we assessed spontaneous rate of recovery, we still relied on participants' retrospective self-reports of the strategies they had used to regulate their emotions. This assumes that participants had a good level of insight into the regulation strategies that they automatically employ. Since emotion regulation processes can occur at the unconscious level, there is still a possibility that participants were not employing the strategies they reported. There is a need to develop more covert measures of automatic emotion regulation, not only to compare age differences, but to better understand the process of emotion regulation itself. Studies have begun to investigate the neural correlates of different types of emotion regulation. For example, functional magnetic resonance imaging research confirmed differential temporal sequence of reappraisal and suppression and showed that these two emotion regulation strategies were associated with differential responding of the limbic system (Goldin, McRae, Ramel, & Gross, 2008). Once the neural correlates of emotion regulation strategies are further delineated, this technique may be useful in the future to compare automatic emotion regulation processes. Additionally, event related potentials (ERP) and electroencephalogram (EEG) may be useful methods for capturing automatic emotional responding and regulation (Hajcak, MacNamara & Olvet, 2010).

Age cohort effects need to be considered when making conclusions about age differences in emotional responding. It is possible that the acceptability of emotional expression in the current culture differs greatly to the culture in which the older adults involved in this study were raised. Given the poor correlation between self-report and physiology in this study, and previous studies, we cannot be sure the extent to which the intensity of the self-report emotion ratings is influenced by cohort effect. Likewise, the laboratory setting is artificial and how an individual responds to discrete emotions in such an environment may be very different to how they respond and manage their emotions in their day-to-day lives, where they have much greater control over what stimuli they are exposed to. Finally, we conducted a post hoc power analyses using GPower (Faul, Erdfelder & Buchner, 2007) to determine if we had adequate power to detect the effect of interest. The age group by sample by mood interaction for self-report mood ratings was of interest as this was a significant three way interaction. With a sample size of 134 and the desired power of .80, the post hoc analysis revealed that we had enough power to detect an effect size of .072, a medium sized effect according to eta squared size conventions (see Murphy & Myors, 2004). The observed effect size of the interaction of interest was .001, a very small effect. Therefore we did not have enough power to detect such a small effect and these finding needs to be considered with caution.

In conclusion, this study adds to the growing literature on age differences in emotion regulation by demonstrating that younger and older adults report using different strategies to regulate their emotions in real time and that this differs based on the type of primary emotion. This has implications for addressing emotion regulation skill in therapy as it may provide important insights into the habitual regulation strategies that may be associated with maintenance of sad and anxious affect. We suggest that future research should take context into account when assessing age differences in emotion regulation ability as it may not always be appropriate of helpful to down-regulate sadness and anxiety (e.g., sadness at a funeral, or anxiety when trying to remove oneself from an unsafe situation). Future research on age differences in emotion regulation should focus on understanding the conditions under which younger and older adults might need to down-regulate or up-regulate negative emotions.

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Paper 2

Age Differences in Negative Expectancy Bias in Co-morbid Depression and Anxiety

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Mrs. Dusanka Tadic was responsible for the design of this study, collection and entry of data, analysis and write-up of this paper. Miss Cabeleira and Professor MacLeod were involved in the consultation stages during the write-up and analysis of this paper. Dr. Wuthrich and Professor Rapee provided research supervision and were involved in reviewing the manuscript.

Abstract

Anxious individuals report negatively distorted predictions about the future, termed the *negative expectancy bias*. In contrast, ageing is associated with an inflated expectancy for positive events in the future. A recent study by Steinman, Smyth, Bucks, MacLeod and Teachman (2013) reported a negative expectancy bias in young adults and positive expectancy bias in older adults with high trait anxiety. The current study extends these findings to a clinical population of younger and older adults with comorbid depression and anxiety (Older adults: n = 37; age range = 60-78 years; *M* = 66.9; females = 20; Younger adults: n = 30; age range = 18-28 years; *M* = 21.6 years; females = 17) compared to a community control group (Older adults: n = 33; age range = 60-80 years; *M* = 66.5; females = 22; Younger adults: n = 25; age range = 17-25 years; *M* = 18.8 years; females = 22). Results suggest that psychopathology and ageing have independent and opposing effects; consistent with Steinman et al. Clinical participants had a reduced expectancy for positive events, regardless of the emotional valence of the information being positive or negative. An inflated expectancy for positive events was associated with increasing age. Furthermore, age moderated the negative expectancy bias but only for ambiguous passages, suggesting a greater negative interpretation bias for clinical older adults. However this was driven by a larger positive relative to negative expectancy bias for older adults in the clinical group than older adults in the control group. Implications for theoretical models and treatment of depression and anxiety across the lifespan are discussed.

Introduction

Understanding the emotional functioning of elderly members of the community has become increasingly important due to the massive growth in the numbers of elderly members in society and due to evidence that emotional functioning may differ in advanced age from the younger years (Carstensen, Isaacowitz, & Charles, 1999; Carstensen & Mikels, 2005). It is vital to understand whether the mechanisms that underpin emotion dysfunction in the elderly do or do not differ from those that underpin such dysfunction in younger adults as this will help inform the strategies used to assist older adults to overcome emotional dysfunction in the future.

Information processing mechanisms are known to be implicated in emotional psychopathology. For example individuals with high trait anxiety and depression are shown to process and remember information in a way that may make them more susceptible to developing and maintaining emotional pathology (for a review see Mathews & MacLeod, 2005; Beck & Clark, 1988; Berna, Lang, Goodwin, & Holmes, 2011; A.K. MacLeod, Tata, Kentish, Carroll, & Hunter, 1997; Andrew K. MacLeod, Tata, Kentish, & Jacobsen, 1997; Miranda & Mennin, 2007). There is also evidence that the cognitive mechanisms that govern selective information processing change with advanced age. Specifically, research shows that ageing is associated with a bias toward attending to and remembering positive stimuli, including pictures, faces and words (e.g., Carstensen & Mikels, 2005; Knight, Maines, & Robinson, 2002; Leigland, Schulz, & Janowsky, 2004). This pattern of attention and memory processing may serve to improve the moods of older adults. However, there is an absence of research that contrasts the cognitive basis of clinical emotional psychopathology in older and younger adults, thus making it difficult to make any conclusions about potential age differences in the cognitive mechanisms that underlie psychopathology.

There is anecdotal evidence to suggest that negative expectancies concerning the future may be implicated in emotional psychopathology. This tendency to expect that future events will be negative has been termed a ‘negative expectancy bias.’ Although an anxiety-linked negative expectancy bias has been well documented, evidence regarding interpretation of emotional ambiguity in depression is less robust with some studies failing to find evidence of a negative expectancy in depressed individuals (Mogg, Bradbury, & Bradley, 2006). Methodological factors, such as a high reliance on self-report, and the importance of using self-referential stimuli have been suggested as possible explanations for these mixed findings (Rude, Covich, Jarrold, Hedlund, & Zentner, 2001; Wisco & Nolen-Hoeksema, 2010). To date, current paradigms have not been able to isolate the exact mechanisms that drive a negative expectancy bias in anxious and depressed individuals.

In a recent study, Steinman et al. (2013) reported the first direct age comparisons of negative expectancy bias using a new paradigm, The Expectancy Bias Task, developed by Cabeleira et al (2010). This task presents participants with positively valanced, negatively valanced or ambiguous information (containing both positive and negative elements) and then evaluates the extent to which they expect positive and negative future events to occur. This paradigm allows the examination of three possible hypotheses that may underlie a negative expectancy bias. First, it is possible that clinical individuals may have a more negative expectancy bias, compared to non-clinical individuals, regardless of the valence of the information presented. This would suggest that clinical individuals expect future events to be more negative than positive, regardless of whether the preceding information was negative or positive. This has been referred to as a “pervasive expectancy bias” (Steinman, Smyth, Bucks, MacLeod, & Teachman, 2013). Alternately, it is possible that a more negative expectancy bias will be shown in clinical individuals, compared to non-clinical individuals, only following information of a particular valence. For example, compared to non-clinical individuals, clinical individuals may disproportionately infer that negative future events are more likely to occur than positive future events only following negatively valenced information, suggesting that clinical individuals are extrapolating information about the future from the previously presented information to a greater extent than non-clinical individuals. This has been referred to as an "extrapolation bias" by Steinman et al. (2013). Thirdly, it is possible that compared to non-clinical individuals, clinical individuals have a more negative expectancy bias following ambiguous information only. This is referred to as an "interpretation bias," and would occur if clinical individuals assign more weight to negative over positive information, leading to a more negative overall impression of the information. Finally, it could be that older adults or clinical participants react to emotionally valenced stimuli less or more strongly, respectively, regardless of their valence. The expectancy bias paradigm allows this final possibility to be ruled out as positive and negative expectancies are calculated by comparing positive and negative future event ratings relative to neutral future event ratings.

Steinman et al. (2003) examine expectancy biases across the lifespan in a non-clinical sample of participants aged 18 to 82 years. Participants were presented with scenarios containing positive, negative and ambiguous information. Half of the scenarios were related to social concerns and half to physical concerns and scenarios were developed to be relevant for both younger and older adults. Participants were then asked to rate the likelihood that future events would be positive or negative. An expectancy bias index was calculated by subtracting average likelihood ratings for negative events from average likelihood ratings for positive events such that larger scores indicated positive expectancy bias, while negative scores indicated a negative expectancy bias. Their results showed that heightened anxiety was associated with a reduced expectancy for positive future events regardless of the valence of current information, consistent with a pervasive expectancy bias. At the same time older age was associated with a heightened expectancy for positive events occurring in the future, which was strongest when processing socially relevant scenarios, or negative scenarios. The authors concluded that anxiety and ageing have independent and opposing effects. Specifically, it appears that anxious individuals generally expect fewer positive events to occur regardless of the preceding information. On the other hand older age is associated with less emotional extrapolation from negative events, perhaps indicating that with age, individuals become less influenced by negative information.

While this study provided interesting evidence that age and anxiety have distinct effects on future expectancies, it is important to extend these findings to a clinical sample in order to determine whether these mechanisms of expectancy bias differ between high trait individuals and those suffering clinical emotional pathology. Hence the aim of the current study was to extend the findings of Steinman et al. (2013) to a clinical population and determine whether clinical levels of emotional dysfunction and age have independent or moderating effects on negative expectancy bias. While Steinman et al. calculated a bias index to simultaneously account for ratings of both positive and negative events, this combined score prevented them from concluding whether the observed expectancy biases were driven by a lower degree of positive expectancy bias or a greater degree of negative expectancy bias. We investigated positive and negative expectancy separately for unambiguous and ambiguous events in order to get greater insight into the mechanisms underlying expectancy bias. Consistent with previous findings that age and anxiety have independent and opposing effects on expectancy bias (Steinman et al, 2013), we hypothesised that 1) compared to younger adults, older adults would have a heightened expectancy for positive events occurring in the future which would be driven by an extrapolation bias. 2) compared to community controls, both younger and older clinical adults would exhibit a pervasive negative expectancy bias. These results will enable us to determine whether 1) negative expectancy bias differentially characterises emotional psychopathology in older and younger adults; 2) negative expectancy bias characterises emotional psychopathology to an equivalent degree in older and younger adults, but the information processing mechanisms which drive the negative expectancy bias differ in these older and younger individuals; or 3) negative expectancy bias characterises emotional psychopathology to an equivalent degree in older and younger adults, and reflects the same underlying mechanisms which drive the negative expectancy bias.

Method

Participants

There were a total of 125 participants including a clinical group (*n* = 67) and community control group (*n* = 58). All participants in the clinical group met Diagnostic and Statistical Manual of Mental Disorders 4th edition (DSM-IV; American Psychiatric Association, 2000) criteria for both a mood disorder and anxiety disorder, except for 8 young adults who only met criteria for either a mood or anxiety disorder. Summary of diagnoses is found in Table 1. The clinical sample included 37 older adults (age range = 60-78 years; *M* = 66.9; *SD* = 4.3, females = 20) and 30 younger adults (age range = 18-28 years; *M* = 21.6 years; *SD* = 3, females = 17). Older adults in the clinical group were recruited from a group program designed to treat comorbid depression and anxiety in older adults at Macquarie University, while younger adults in the clinical group were recruited via advertisements placed on the internet (i.e., Gumtree free classifieds) and in the Student Counseling Service at Macquarie University.

The community control group included 33 older adults (age range = 60-80 years; *M* = 66.5; *SD* = 5.4, females = 22), and 25 younger adults (age range = 17-25 years; *M* = 18.8 years; *SD* = 2.0, females = 22). Participants were included if they scored in the non-clinical or mild range on self-report measures of anxiety and depression. Older adults scored below 9 on the Geriatric Anxiety Inventory (Pachana et al., 2007) and below 20 on the Geriatric Depression Scale (Yesavage et al., 1983). The younger participants scored below 10 on the anxiety subscale and 14 on the depression subscale of the Depression, Anxiety and Stress Scale (Antony, Bieling, Cox, Enns, & Swinson, 1998). Older adults in the control group were recruited via local newspaper advertisements and younger adults were undergraduate students at Macquarie University who participated for course credit. All other participants in the control and clinical group received $30 for participation.

Table 1. *ADIS-IV Diagnoses for Younger and Older Clinical Groups*

	Younger	Older
Principal Diagnoses		
GAD	36.7	18.9
SPEC	0	5.4
SOC	20.0	5.4
OCD	0	2.7
MDD	16.7	45.9
DYS	13.3	8.1
ADNOS	13.3	5.4
MDNOS	0	8.1
Secondary		
GAD	20.0	43.2
SPEC	0	13.5
SOC	6.7	16.2
MDD	30.0	8.1
DYS	6.7	2.7
PD	0	5.7
ADNOS	0	2.7
MDNOS	10.0	8.1
ADIS primary	M = 5.74 (SD = 1.29)	M = 5.97 (SD = 0.87)
ADIS secondary	M = 5.35 (SD = 1.23)	M = 5.14 (SD = 0.98)

Note. GAD = Generalized Anxiety Disorder, SPEC = Specific Phobia, SOC = Social Phobia, OCD = Obsessive Compulsive Disorder, MDD = Major Depressive Disorder, DYS = Dysthymic Disorder, ADNOS = Anxiety Disorder Not Otherwise Specified, MDNOS = Major Depressive Disorder Not Otherwise Specified, PD = Panic Disorder, ADIS = Anxiety Disorders Interview Schedule.

Measures

Diagnostic Interview

Anxiety Disorders Interview Schedule for DSM-IV (ADIS-IV; Brown, Di Nardo, & Barlow, 1994) was used to diagnose depression and anxiety according to DSM-IV criteria. Only participants in the clinical sample were screened using the ADIS-IV. The ADIS-IV is scored using a clinician severity rating from 0-8, with scores of 4 or above indicating clinical severity. Graduate clinical psychology students, who received extensive training in making diagnostic decisions and regular supervision by trained clinical psychologists, administered the ADIS-IV. Older adults in the clinical group completed the ADIS-IV face-to-face as part of their assessment for treatment. Younger participants in the clinical group completed the ADIS-IV over the phone. All clinical participants met criteria for an anxiety and/ a mood disorder.

Symptom Measures

Depression Anxiety and Stress Scales (DASS; Lovibond & Lovibond, 1995) is a 42-item scale that measures the presence of depression, anxiety and stress symptoms over the past week. The depression and anxiety subscales were administered to younger adult participants in both the clinical and control groups. The DASS has been shown to exhibit good psychometric properties in both clinical and non-clinical adult populations (Brown, Korotitsch, Chorpita, & Barlow, 1997; Lovibond & Lovibond, 1995). In this sample internal consistency was adequate: anxiety (Cronbach's alpha = .88), depression (Cronbach's alpha = .95).

Geriatric Anxiety Inventory (GAI; Pachana et al., 2007) is a 20-item scale asking participants to rate whether they agree or disagree with experiencing a range of anxiety symptoms over the past week. This scale was developed with older adult samples and has been shown to have adequate reliability and validity in clinical and non-clinical populations (Pachana et al., 2007). This scale was administered to older adults in both the clinical and control group in the current study, and was found to have strong internal consistency (α = .94).

Geriatric Depression Scale (GDS; Yesavage et al., 1983) is a 30-item scale measuring the severity of depression symptoms over the past week using a yes or no rating. Higher scores indicate more severe depression over the past week. The GDS has demonstrated adequate psychometric properties in clinical and non-clinical older adult samples (Dunn & Sacco, 1989; Parmelee, Lawton, & Katz, 1989). This scale was administered to older adults in both the clinical and control group in the current study, and was found to have strong internal consistency (α = .95).

<u>Cognitive Assessment</u>

Mini Mental Status Examination (MMSE; Folstein, Folstein & McHugh, 1975) is a brief cognitive screening instrument, used to determine the presence of cognitive decline in older adults. A score of 26/30 or lower is indicative of cognitive impairment. All older adult participants in this study scored in the normal range (Range = 27-30; *M* = 29.2; *SD* = .86).

<u>Assessment of Expectancy Bias</u>

Expectancy Task: The Expectancy Task (Cabeleira et al., 2010) is designed to assess the tendency to anticipate negative or positive events (i.e., an ‘expectancy bias’). Participants are asked to imagine themselves experiencing 64 scenarios that vary in the extent to which they describe negative, positive, or neutral events (Scenario Presentation Component, see below). Participants are then asked to judge the likelihood of the occurrence of a specific, immediately following event for each scenario (Expectancy Rating Component, see below). These following events vary in valence and are either positive, neutral, or negative.

In the Scenario Presentation Component, participants are asked to read and imagine themselves in a number of scenarios. Each scenario is described by six statements: a Title, an Orienting Sentence, and four events (see Appendix for examples). The Title remains in the centre of the computer screen during the presentation of a scenario and the other five statements appear directly below and only remain on the screen until a participant presses the spacebar to signal that he or she has read the statement and requires the next statement to be presented. The four events presented in a scenario may be shown in any of two main types of scenarios, including Unambiguous scenarios (negative *or* positive) and Ambiguous scenarios (negative *and* positive). Unambiguous scenarios include either two negative and two neutral events (Negative Passage Valence) or two positive and two neutral events (Positive Passage Valence). In Ambiguous scenarios, two negative and two positive events are presented. The order of valenced events within a scenario was counterbalanced (e.g., positive followed by neutral versus neutral followed by positive). Scenarios were presented in four blocks of 16 (64 scenarios in total) during the Scenario Presentation Component, unlike Steinman et al (2013) who presented blocks of 8. Each block of 16 scenarios was followed by the Expectancy Rating Component.

In the Expectancy Rating Component, participants were asked to think about the likelihood of different future events for each of the 16 scenarios they had previously read. On each trial, participants were presented with the Title and Orienting Sentence from one of the previously read scenarios and four rows of stars in the place of the four events previously presented (see Appendix). The Title and Orienting Sentence remained on the screen while participants were asked to rate the perceived likelihood that each of three specific future events would occur next within the scenario. These specific future events included one negative, one positive and one neutral event, presented in a random order and displayed in the middle of the screen, underneath the Title, Orienting Sentence and rows of stars. Participants were required to use a scale ranging from 1 ("*very unlikely to happen next*") to 4 ("*very likely to happen next*"), displayed at the bottom of the screen, to rate the subjective likelihood of each event.

Scenario Event Sets. Each of the 64 scenarios presented during the task was derived from its own Scenario Event Set. Each Scenario Event Set represented a hypothetical scenario and included 11 items: a Title, an Orienting Sentence, and nine candidate events. Three of the nine candidate events were positive, three were negative, and three were neutral (see Appendix). The four events presented in any scenario during the task were selected from its Scenario Event Set, such that the type of scenario (i.e., Unambiguous vs. Ambiguous) and/or Passage Valence condition for that scenario (i.e., Unambiguous Negative vs. Unambiguous Positive) was accounted for. Two of the three events for each valence were randomly selected for display in a specific scenario in the Scenario Presentation Component of the task, while the third event of each valence was presented as a future event in the Expectancy Rating Component of the task.

Scenario Event Sets covered a range of types of information, relating to either social or physical concerns. These Scenario Event Sets were previously validated by an independent sample of 16 raters (see Cabeleira et al., 2010), with valence of events being rated as consistent with the intended valence of each event (i.e., negative, positive, or neutral). Moreover, Positive and Negative Passages were rated to have similar valence intensity.

Procedure

The Macquarie University Human Research Ethics Committee approved all study procedures. The data for this study were collected as part of a larger study conducted by the authors (Tadic, Wuthrich, Rapee, Kangas, & Taylor, 2013)[2]. Signed informed consent was obtained at the beginning of each experimental session. Younger adults completed the DASS at home and brought it to the experimental session, while older adults completed the GAI and GDS followed by the MMSE at the experimental session. Participants then completed the Expectancy Task. Eight practice trials followed by 64 experimental trials of the Expectancy Task were subsequently completed. Participants were then debriefed before the end of the session.

Results

Descriptive statistics

Demographic information is reported in Table 2. Younger and older adults differed on most demographic variables including income, marital status, ethnicity, education and medications use. There was no age difference in gender distribution between the age groups.

[2] For a complete list of tasks, measures and randomisation order please contact the primary author.

Table 2

Demographic Information for Younger and Older, Clinical and Control Groups

Variable	Clinical Younger (N = 30)	Clinical Older (N = 37)	Control Younger (N = 25)	Control Older (N = 33)	F/X^2	*p*
	N (%)	*N (%)*	*N (%)*	*N (%)*		
Sex					8.69	.033
Female	17 (56.7)$_c$	20 (54.1)	22 (88.0)$_c$	22 (66.7)		
Male	13 (43.3)$_c$	17 (45.9)	3 (12.0)$_c$	11 (33.3)		
Education					39.63	<.001
High school or below	18 (60.0)$_c$	13 (35.1)	23 (92)$_{bc}$	5 (15.2)$_b$		
Certificate or diploma	3 (10.0)	12 (32.4)	0 (0)$_b$	10 (31.2)$_b$		
Bachelor or Postgraduate	9 (30.0)$_c$	12 (32.4)	2 (8.0)$_{bc}$	17 (53.1)$_b$		
Income					59.22	<.001
Less than $500 per week	29 (96.7)$_a$	23 (62.2)$_{ad}$	25 (100)$_b$	5 (16.7)$_{bd}$		
More than $500 per week	1 (3.3)$_a$	14 (37.8)$_{ad}$	0 (0)$_b$	25 (83.3)$_{bd}$		
Marital status					121.34	<.001
Never married	29 (96.7)$_a$	4 (10.8)$_a$	24 (96.0)$_b$	1 (3.0)$_b$		
Married or defacto	1 (3.3)$_a$	11 (29.7)$_{ad}$	1 (4.0)$_b$	22 (66.7)$_{bd}$		
Separated or divorced	0 (0)$_a$	16 (43.2)$_{ad}$	0 (0)	3 (9.1)$_d$		
Widowed	0 (0)$_a$	6 (16.2)$_a$	0 (0)$_b$	7 (21.2)$_b$		
Ethnicity					23.27	<.001
Australian	16 (53.3)$_a$	35 (94.6)$_a$	18 (72.0)$_b$	31 (93.9)$_b$		
Other	14 (46.7)$_a$	2 (5.4)$_a$	7 (28.0)$_b$	2 (6.1)$_b$		
Medication					19.43	<.001
Yes	7 (24.1)$_a$	24 (64.9)$_a$	7 (28.0)$_b$	24 (64.9)$_b$		
No	22 (75.9)$_a$	13 (35.1)$_a$	18 (72.0)$_b$	13 (35.1)$_b$		

Note. F = Fisher's exact test for for analyses that have cell sizes less than 10
Distributions in each row that share subscripts were found to be significantly different
$_a$ = significant difference between younger and older clinical participants
$_b$ = significant difference between younger and older community participants

[c] = significant difference between younger clinical and younger community participants
[d] = significant difference between older clinical and older community participants

Depression and anxiety means, standard deviations and ranges are presented in Table 3. Z scores were computed separately within each age group using means and standard deviations from the distribution obtained for each age group. This was necessary as younger and older adults completed different measures of anxiety and depression. Participants in the clinical group were significantly more depressed, and anxious than those in the control group, F (1,121) = 126.0, p <.001 and F (1, 121) = 183.07, p < .001, respectively. Follow up comparisons showed that both younger and older adults in the clinical group were significantly more depressed than those in the control group, and significantly more anxious, than those in the control group (all p's <.001). There were no significant differences between younger and older adults on depression in either the clinical, F (1,121) = .098, p = .755, or control group, F (1,121) = .170, p = .681. There were also no significant differences between younger and older adults on anxiety in either the clinical, F (1,121) = 1.84, p = .177, or control group, F (1,121) = .968, p = .327.

Table 3

Depression and Anxiety Scores by Sample Group (Clinical, Control) and Age Group (Younger, Older)

	Clinical		Control	
Variable	Younger (*N* = 30)	Older (*N* = 37)	Younger (*N* = 25)	Older (*N* = 33)
Depression				
Range	4-40	8-22	0-12	8-17
Mean (SD)	19.8 (9.4)	15.0 (2.9)	4.9 (3.4)	10.0 (1.9)
Anxiety				
Range	1-30	2-19	0-9	0-7
Mean (SD)	15.2 (7.4)	11.2 (4.1)	4.7 (3.2)	0.6 (1.3)

Note. For younger adults the Depression scores are obtained using the DASS-depression subscale, and the anxiety scores are obtained using the DASS-Anxiety subscale. For older adults the depression sores are obtained using the Geriatric Depression Scale and the anxiety scores are obtained using the Geriatric Anxiety Inventory.

Evidence of Expectancy Bias

To examine the presence of expectancy bias and whether the mechanism differed by age group and sample, we examined patterns of expectancy bias separately for Unambiguous and Ambiguous passages.

Expectancy Bias in Unambiguous passages

Mean probability ratings for negative and positive future event statements are presented in Table 4. A repeated measures analysis of variance (ANOVA) with two between-subjects factors of Sample Group (Control, Clinical), and Age Group (Younger, Older), and two within-subjects factors of Passage Valence Condition (Negative, Positive) and Future Valence Condition (Negative, Positive) was conducted on the unambiguous (positive or negative) passages. A significant main effect of Future Valence was evident, F (1, 121) = 304.27, $p < .001$, $\eta_p^2 = .715$, indicating a positive expectancy bias such that participants rated positive future events ($M = 2.8$, $SD = 0.3$) as more likely to occur than negative future events ($M = 2.1$, $SD = 0.4$). No other main effects were significant (all p's > .05)[3].

[3] An initial analysis including scenario type (social and physical) did not find any age group or sample group differences by scenario type, thus all further analyses were conducted collapsed across scenario type.

Table 4

Summary of Mean Probability Ratings for Negative, Positive and Neutral Future Event Statements, with Mean Ratings Organized by Passage Valence Condition (Unambiguous Negative Valence, Unambiguous Positive Valence, Ambiguous Valence), Sample Group (Clinical, Control) and Age Group (Young, Older)

Passage Valence	Future Valence	Clinical Younger (n = 30) M±SD	Clinical Older (n = 37) M±SD	Control Younger (n = 25) M±SD	Control Older (n = 33) M±SD
Unambiguous Negative	Negative	2.4±0.5	2.3±0.4	2.4±0.4	1.9±0.4
	Positive	2.4±0.4	2.6±0.4	2.6±0.3	2.7±0.3
	Neutral	2.8±0.5	2.9±0.5	2.9±0.4	2.8±0.4
Unambiguous Positive	Negative	2.1±0.4	2.0±0.4	2.1±0.3	1.8±0.4
	Positive	2.9±0.4	3.0±0.3	3.0±0.3	3.0±0.4
	Neutral	2.8±0.5	3.0±0.5	2.9±0.4	2.8±0.5
Ambiguous	Negative	2.3±0.4	2.2±0.3	2.3±0.3	1.9±0.4
	Positive	2.7±0.3	2.8±0.4	2.8±0.2	2.9±0.3
	Neutral	2.8±0.5	2.9±0.4	2.8±0.6	2.8±0.5

There was a significant interaction between Future Valence and Sample Group, F (1, 121) = 11.75, p = .001, η_p^2 = .088, which showed that participants in the clinical group showed greater negative expectancy (i.e., rated negative future events more likely to occur; M = 2.2, SD = 0.4), than participants in the control group (M = 2.0, SD = 0.4), F (1, 121) = 6.40, p = 0.13, η_p^2 = .05. However, the clinical (M = 2.7, SD = 0.4) and control (M = 2.8, SD = 0.4) groups did not differ in their ratings of positive future events, F (1, 121) = 3.22, p = 0.75, η_p^2 = .03. There was also a significant interaction between Future Valence and Age Group, F (1, 121) = 23.34, p < .001, η_p^2 = .162, which showed that younger adults showed greater negative expectancy (M = 2.2, SD = 0.3) than older adults (M = 2.0, SD = 0.4), F (1, 121) = 13.45, p < .001, η_p^2 = .10. Further, older adults showed greater positive expectancy (M = 2.8, SD = 0.3) than younger adults (*M* = 2.7, *SD* = 0.3), F (1, 121) = 5.79, p = .018, η_p^2 = .05. Notably, the interaction between Future Valence, Sample Group and Age Group was not significant, F (1, 121) = 1.97, p = .163, η_p^2 = .02, indicating that psychopathology and age had independent effects on the expectancy bias.

A significant interaction between Future Valence and Passage Valence confirmed that participants were engaged with the passages, F (1, 121) = 82.66, p < .001, η_p^2 = .41, such that negative future events were rated as more likely to occur following negative passages (*M* = 2.3, *SD* = 0.5) than positive passages (*M* = 2.0, *SD* = 0.4), F (1, 121) = 33.28, p < .001, η_p^2 = .22. Additionally, positive future events were rated as more likely to occur following positive passages (*M* = 3.0, *SD* = 0.3) than negative passages (*M* = 2.6, *SD* = 0.4), F (1, 121) = 452.73, p < .001, η_p^2 = .80. This indicates that the valence of current information was used to inform expectations of the future (i.e., extrapolation).

A significant interaction between Future Valence, Passage Valence and Age Group also emerged, indicating that this pattern of extrapolation differed between age groups, F (1, 121) = 4.72, p = .032, η_p^2 = .038. Follow-up pairwise comparisons showed that younger adults (*M* = 2.43, *SD* = .47) rated negative future events significantly more likely to occur following negative passages than older adults (*M* = 2.14, *SD* = .43), F (1, 123) = 12.98, p < .001, η_p^2 = 1.00. However, older adults rated positive future events (*M* = 2.71, *SD* = .37), as significantly more likely to occur following negative passages than younger adults (*M* = 2.49, *SD* = .40), F (1, 123) = 9.47, p = .003, η_p^2 = .072. Younger adults also rated negative future events (*M* = 2.07, *SD* = .35) as significantly more likely to occur following positive passages than older adults (*M* = 1.92, *SD* = .41), F (1, 123) = 4.66, p = .033, η_p^2 = .037, while there were no significant differences between younger (*M* = 2.92, *SD* = .36), and older adults (*M* = 2.97, *SD* =.33), on rating positive future events following positive passages, F (1, 123) = .641, p = .425, η_p^2 = .005.

Expectancy Bias in Ambiguous passages

A repeated measures analysis of variance (ANOVA) with two between-subjects factors of Sample Group (Control, Clinical), and Age Group (Younger, Older), and one within-subjects factor of Future Valence Condition (negative, positive) was conducted on the Ambiguous (mix of positive and negative) passages only. Similar to the analysis of Unambiguous passages, a significant main effect of Future Valence was evident, F (1, 121) = 253.88, $p < .001$, $\eta_p^2 = .677$, indicating that participants rated positive future events (M = 2.8, SD = 0.3) as more likely to occur than negative future events (M = 2.2, SD = 0.4). There was also a significant main effect of Age Group, F (1, 121) = 4.38, p = .039, $\eta_p^2 = .035$. The main effect of Sample Group was not significant, F (1, 121) = .364, p = .548, $\eta_p^2 = .003$.

There was also a significant interaction between Future Valence and Sample Group, F (1, 121) = 10.91, p = .001, $\eta_p^2 = .083$, which showed that participants in the clinical group (M = 2.3, SD = 0.4) demonstrated greater negative expectancy (i.e., rated negative future events more likely to occur), than participants in the control group (M = 2.1, SD = 0.4), F (1, 121) = 5.61, p = .019, $\eta_p^2 = .04$. The groups did not differ significantly in their ratings of positive future events, F (1, 121) = 2.98, p = .087, $\eta_p^2 = .02$. This is consistent with the pattern of results in Unambiguous passages. There was also a significant interaction between Future Valence and Age Group, F (1, 121) = 30.24, $p < .001$, $\eta_p^2 = .20$, which showed that younger adults demonstrated greater negative expectancy (M = 2.2, SD = 0.3) than older adults (M = 2.0, SD = 0.4), F (1, 121) = 22.43, $p < .001$, $\eta_p^2 = .16$. This is consistent with the finding in Unambiguous passages. However, older adults did not show significantly greater positive expectancy (M = 2.8, SD = 0.3) than younger adults (M = 2.7, SD = 0.3), F (1, 121) = 3.82, p = .053, $\eta_p^2 = .03$, as they had in Unambiguous passages, although a strong trend was evident.

Additionally, an interaction between Future Valence, Sample Group and Age Group was significant, F (1, 121) = 4.13, p = .044, η_p^2 = .033, which was not observed in Unambiguous passages. To understand this three-way interaction the data were split by age group and follow up analyses revealed a significant two-way interaction of Future Valence and Sample Group in the older adults, F (1, 68) = 14.32, p < .001, η_p^2 = .174) but not the younger adults, F (1, 53) = .865, p = .356 , η_p^2 = .016. To understand this interaction we calculated the difference between positive and negative expectancies in the control relative to the clinical group in the younger (.456 - .357 = .099) and older adults (1.044 - .627 = .417). This indicated that the relative decrease in positive expectancy was greater for the older than the younger adults. However, older adults in the clinical group showed significantly greater positive expectancy than younger adults in the clinical group, F (1, 66) = 6.69, p = .012, and the older adults in the control group showed significantly greater positive expectancy than the younger adults in the control group, F (1, 57) = 25.54, p < .001. This suggests that anxiety does not lead to greater negative expectancies in older adults in the clinical group. Rather the greater positive expectancy demonstrated by older adults in the control group accounts for a larger relative difference in positive expectancy between older adults in the control and clinical group.

Discussion

The current study investigated whether clinical levels of emotional dysfunction and age have independent or moderating effects on negative expectancy bias. Furthermore, the Expectancy Task allowed us to determine the underlying mechanisms that were driving these expectancy bias effects. It was hypothesised that compared to younger adults, older adults would have a heightened expectancy for positive events occurring in the future which would be driven by an extrapolation bias. We also predicted that compared to community controls, both younger and older clinical adults would exhibit a pervasive negative expectancy bias.

Consistent with predictions, the results indicated that participants with emotional dysfunction are characterised by a greater pervasive tendency to expect negative outcomes across a range of scenarios than control participants. The bias is pervasive because it occurs in both unambiguous and ambiguous scenarios and therefore is independent of the valence of current events. This result is consistent with evidence of negative threat expectancy bias in high trait anxious individuals (e.g., MacLeod et al., 1997; Miranda & Mennin, 2007; Steinman et al., 2013) and extends this finding to a clinical population with comorbid anxiety and depression. Our data suggest that this might occur because individuals with emotional dysfunction extrapolate less from the current situation to the future and may be more strongly influenced by pre-existing biases.

Also consistent with predictions, the results indicated an age-linked expectancy bias. Younger adults were found to have a greater negative expectancy bias than older adults and this was the case for both unambiguous and ambiguous passages. Thus, similar to anxious and depressed individuals, younger adults have a pervasive tendency to expect negative outcomes in the future. In contrast, older adults were found to have a greater positive expectancy than younger adults, but this was more clearly the case for unambiguous passages than for ambiguous passages. Specifically, it indicates that when existing events are clearly positive, older adults are able to learn from that information and use it to make positive predictions about likely future events. However, there was only a strong trend for older adults to have a greater positive expectancy than younger adults for ambiguous passages (containing both positively and negatively valanced information), suggesting that although older adults do not ignore negative information, they tend to extrapolate positive information more so than younger adults even amongst negative information. Therefore, unlike younger adults, older adults do not appear to disqualify positive information; however they are not pervasively positive and are influenced by negatively valanced information.

Interestingly, there were also age-linked differences in extrapolation with older adults being less influenced by the negative valence of previous information when forming expectations of the future compared to younger adults. This difference in processing between age groups is consistent with Steinman et al. (2013) who also found that extrapolation from negative events decreases with age, suggesting that older adults may be less sensitive to negative information. Also consistent with Steinman et al., we found that older adults extrapolated more positive events from negative information but the age groups did not differ on extrapolating positive events from positive information.

The anxiety-linked expectancy bias did not differ by age group for unambiguous passages, suggesting that both younger and older clinical adults have negative expectancies about the future. However, the age groups differed on anxiety-linked expectancy for ambiguous passages, pointing to an interpretation bias driving the age group difference in negative expectancies. Examination of the mean differences in the negative expectancy index (positive minus negative expectancy ratings) showed that the greater anxiety-linked bias in older adults was accounted for by a significantly greater positive expectancy in older adult than younger adults. Therefore, even though older adults in the clinical group did not display a significantly greater negative expectancy bias, the relative difference between positive and negative expectancy bias was greater for older adults in the clinical group than older adults in the control group. Anxiety and depression appear to be having a more detrimental effect on older adults only because it decreased their positive expectancy to a greater extent. However it is important to note that older adults in the clinical group still had a significantly higher positive expectancy than younger adults in the clinical group.

This finding could highlight a ‘positive buffer’ for older adults which may serve as a protective factor. Combined with the pervasive negative expectancy bias observed in younger adults this buffer may explain the increase in wellbeing that is observed across the lifespan. It is likely that older adults do make negative interpretations when information is ambiguous (as we have demonstrated here), however having a much higher positive expectancy at baseline may reduce the likelihood of the negative expectancy from becoming pervasive, and leading to subsequent depression and anxiety. However, the cross sectional nature of this research does not allow us to make causal interpretations. Future studies would benefit from tracking changes in expectancy bias longitudinally to determine the causal effect that a pervasive negative expectancy may have on the development of depression and anxiety. Further, as emotion regulation has been highlighted as an important predictor of depression and anxiety (Aldao, Nolen-Hoeksema, & Schweizer, 2010; Wirtz, Hofmann, Riper, & Berking, 2013) and evidence suggests that younger and older adults employ different emotion regulation strategies (Urry & Gross, 2010), it would be useful for future research to investigate the extent to which expectancy bias predicts emotion regulation processes, and how this interplay predicts psychopathology.

Several limitations of the current study should be noted. First, while these results suggest that the expectancy bias previously reported for high trait anxious individuals is also found in individuals with comorbid depression and anxiety, we are unsure how the mechanisms underlying this bias will differ between disorders. Future studies should assess the mechanisms underlying expectancy bias separately in anxiety and depression. However, given the marked comorbidity between these disorders in both younger and older adults, the current study has ecological validity and contributes to our understanding of the mechanisms underlying expectancy bias in comorbid populations. A second limitation is that we cannot say with confidence that the control group were non-clinical. Although participants in the control group exhibited a maximum of mild symptoms of depression and anxiety, it would have been advantageous to conduct clinical interviews with the control group participants, as well as with the clinical participants, to ensure symptomatology was not at clinical levels. Third, the younger control group consisted of primarily female, undergraduate students and the older adult control group were very healthy, highly educated adults from a relatively affluent geographic area. These control groups may not be representative of the normal adult community population, limiting generalizability of the present findings to the greater population. Future studies should aim to use more representative control groups from the wider community. However, given the difficulty in recruiting older adults for such research tasks, this study provides important insights into the possible age differences in expectancy bias. It is also a limitation of this study that we were unable to conduct inter-rater reliability on the ADIS diagnoses due to some assessments been conducted over the phone. Finally, it is unclear the extent to which the role of memory is implicated in these findings. It is likely that presenting block of 16 passages, before being asked to make expectancy ratings based on the information contained in those 16 passages, places a significant demand on memory, especially for the older adults. Future investigations using this task should aim to replicate these effects by varying the number of passages presented in each block or including a measure of memory to determine the influence that memory has on expectancy bias results. Alternatively, rather than presenting blocks of scenarios, future event ratings might be obtained immediately following each scenario as has been done in previous studies of interpretation biases (e.g., Berna et al., 2011). We also conducted a post hoc power analyses using GPower (Faul, Erdfelder & Buchner, 2007) on the age group by sample by future valence interaction for ambiguous scenarios as this was the interaction of interest to determine interpretation bias. With a sample size of 125 and the desired power of .80, the post hoc analysis revealed that we had enough power to detect an effect size of .074, a medium sized effect according to eta squared size conventions (see Murphy & Myors, 2004). The observed effect size of the interaction of interest was 0.033, a small sized effect. Therefore this analysis was somewhat underpowered and the present results need to be considered with caution.

In summary, the results from the current study are consistent with Steinman et al. (2013) showing independent effects of anxiety and age on expectancy biases. We replicated a negative expectancy bias associated with anxiety in a comorbid depressed and anxious sample, as well as a positive expectancy bias associated with increasing age. However, rather than looking at a global expectancy index (positive minus negative expectancy), the breakdown of results looking at unambiguous and ambiguous passages separately adds important information. Specifically, it suggests that when information is unambiguous, anxiety and depression are associated with a pervasive negative expectancy bias regardless of the valence of current information. This effect is not moderated by age. However, age does moderate the negative expectancy bias when information is ambiguous. Older adults in the control group displayed a significantly greater positive expectancy compared to younger adults in the control group when comparing expectancy ratings following ambiguous passages. Specifically, anxiety had a greater detrimental influence on positive expectancy for older adults than younger adults. The current data suggest that this occurs as a result of the 'healthy' control older adults having such an especially high positive expectancy, which makes the difference in expectancy bias between clinical and control older adults larger than the comparison between clinical and control younger adults.

The results suggest that the high positive expectancy bias exhibited by older adults may serve as a protective buffer so that healthy older adults make more positive predictions about the future than younger adults. Theoretically, it is important to distinguish between biases that are pervasive and interpretive in nature. It appears that this may differ across the lifespan. Younger adults have a tendency to expect threat-related events in the future regardless of the information they are given about the event. Therefore this pervasive expectancy of threat, or overestimation of the probability of something bad happening, should be highlighted in treatment. In contrast, for older adults, negative expectancy occurs only when information is ambiguous, thus the biases in interpretation of ambiguous information should be highlighted in therapy. The current study contributes to our knowledge about anxiety-linked expectations across the adult lifespan in a clinical population.

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Appendix

Example of a Scenario Event Set:

Title: Going to the Doctor

Orienting Sentence: You go to the doctor’s rooms

Negative: You find out you need a biopsy done

Negative: The doctor prescribes you medication that can have bad side effects

Negative: The doctor warns you all your family is at risk of diabetes

Positive: The doctor says your heart sounds very healthy

Positive: The doctor informs you that you are at a healthy weight

Positive: The doctor says she is happy with your exercise regime

Neutral: A bird flies past the window

Neutral: The telephone rings

Neutral: You notice a car drive by outside

Sample scenarios of different valence types based on above Scenario Event Set:

1. Unambiguous Positive

Title: Going to the Doctor

Orienting Sentence: You go to the doctor’s rooms

Positive: The doctor informs you that you are at a healthy weight

Positive: The doctor says she is happy with your exercise regime

Neutral: A bird flies past the window

Neutral: You notice a car drive by outside

2. Unambiguous Negative

Title: Going to the Doctor

Orienting Sentence: You go to the doctor’s rooms

Negative: You find out you need a biopsy done

Negative: The doctor prescribes you medication that can have bad side effects

Neutral: A bird flies past the window

Neutral: You notice a car drive by outside

3. Ambiguous

Title: Going to the Doctor

Orienting Sentence: You go to the doctor’s rooms

Negative: You find out you need a biopsy done

Negative: The doctor prescribes you medication that can have bad side effects

Positive: The doctor informs you that you are at a healthy weight

Positive: The doctor says she is happy with your exercise regime

Example of an Expectancy Rating Trial:

Title: Going to the Doctor

Orienting Sentence: You go to the doctor’s rooms

How likely is it that…

Negative: The doctor warns you all your family is at risk of diabetes

Positive: The doctor says your heart sounds very healthy

Neutral: The telephone rings

Paper 3

Bias in Interpretation of Ambiguous Social and Physical Threat: Age Differences in Community and Clinical Samples

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This paper has been submitted for publication.

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Mrs. Dusanka Tadic was responsible for the design of this study, collection and entry of data, analysis and write-up of this paper. Dr. Wuthrich and Professor Rapee provided research supervision and were involved in reviewing the manuscript.

Abstract

Negative interpretation biases have been associated with clinical depression and anxiety. However, ageing is associated with a positivity effect, in which older adults have a preference for positive emotional stimuli compared to younger adults. Relatively few studies have compared interpretation biases in younger and older adults and even fewer studies have made this comparison in clinical samples. This study conducted a signal detection analysis to assess differences in interpretation biases to ambiguous sentences in clinical and community younger (Clinical: n = 30; age range = 18-28 years; *M* = 21.6 years; females = 17; Control: n = 25; age range = 17-25 years; *M* = 18.8 years; females = 22) and older (Clinical: n = 37; age range = 60-78 years; *M* = 66.9; females = 20; Control: n = 33; age range = 60-80 years; *M* = 66.5; females = 22) adults. Participants completed an Interpretation Bias task, in which they were presented with ambiguous sentences related to social and physical threat. Both younger and older adults with depression and anxiety displayed a negative interpretation bias. Further, older adults in general showed a positive interpretation bias that was explained by a tendency to interpret information in a more positive way. In contrast, younger adults in general showed a negative interpretation bias which was explained by a response bias, suggesting that younger adults tend to endorse threatening interpretation of ambiguous sentences regardless of the information presented.

Introduction

Biased information processing has been identified as a vulnerability factor for the development of anxiety and depression . In particular, a negative interpretation bias, defined as the tendency to assign more negative meaning to ambiguous situations, has been associated with clinical anxiety and depression (Mathews & MacLeod, 2005). However it is unclear whether there are age differences in interpretation bias, and also whether the mechanisms that drive potential age differences in interpretation biases are the same. This gap in the research is important to address as there is evidence of a positivity effect with advanced age in other types of information processing such as attention and memory, whereby older adults show a bias toward attending to and remembering positive stimuli (Carstensen & Mikels, 2005). However, it is unclear whether this positivity effect extends to biases in interpretation of ambiguous information.

Furthermore comorbidity of psychological disorders is very common, especially between anxiety and depression. Approximately 50% of people with major depressive disorder also meet criteria for a comorbid anxiety disorder, in both younger and older adult populations (Beekman et al., 2000; Brown, Campbell, Lehman, Grisham, & Mancill, 2001). People with comorbid presentations often experience more severe symptomatology and have poorer treatment response than those with either condition alone (Almeida et al., 2012; Lenze et al., 2000). However, little is known about the cognitive factors that are features of comorbid presentations. Thus there is a need to extend research to better understand the nature of interpretation biases in both community and clinical populations. It is especially important to investigate these biases in older adults with comorbid depression and anxiety as comorbidity is associated with more serious consequences such as decline in cognition (DeLuca et al., 2005) and even suicide risk (Allgulander & Lavori, 1993).

Evidence suggests that while non-anxious individuals tend to favour positive or benign inferences about ambiguity, anxious individuals favour threatening inferences (Hirsch & Mathews, 2000; MacLeod & Cohen, 1993; Mathews & Mackintosh, 2000). A seminal study by Eysenck, Mogg, May, Richards and Mathews (1991) presented participants with ambiguous sentences and asked them to rate how pleasant or unpleasant they would feel. Using this classic interpretation bias task, the authors showed that relative to non-anxious individuals, individuals with Generalized Anxiety Disorder remembered ambiguous sentences in terms of their more threatening meanings. Signal detection analysis indicated that the results reflected differences in sensitivity to threatening information, implying real differences in interpretation bias, rather than just a response bias reflecting a tendency to endorse threatening items in general.

Recently, a paradigm was developed to assess expectancy bias. In this paradigm participants are presented with positive, negative and neutral information and asked to predict the valance of future events. Expectancy bias is defined as the tendency to expect that future events will be negative. Thus although this task investigates predictions individuals make about the future, it also enables the assessment of interpretation bias by isolating the predictions individuals make following ambiguous information. This task was recently used to investigate the influence of anxiety and age on negative future expectancies. Results showed that anxiety and age had independent and opposite influences on future expectancies (Steinman, Smyth, Bucks, MacLeod, & Teachman, 2013). Anxious individuals had a reduced expectancy for positive future events, whereas older adults had a heightened expectancy of positive events occurring in the future, even when the preceding information was negative or ambiguous, suggesting that older adults are perhaps less sensitive to negative information or maintain more positive interpretations in the presence of negative information (Steinman et al., 2013). We recently replicated these findings in a clinical sample of adults with comorbid depression and anxiety and a non-clinical sample, supporting a negative expectancy bias associated with anxiety and a positive expectancy bias associated with older age (Tadic, Cabeleira, MacLeod, Wuthrich & Rapee, 2013).

Both of these studies suggest a pervasive bias whereby clinical individuals have heightened expectations that negative events will happen in the future compared to non-clinical individuals, and that older adults have heightened expectations that positive events will happen in the future compared to younger adults. Both younger and older clinical adults tend to make negative predictions for the future independent of the valence of the information they are presented (e.g., they might receive positive information about the current situation, but still predict negative or threatening events occurring in the future). However, only our study found evidence that the negative future expectancies displayed by clinical older adults may be driven by biases in interpretation. This suggests that older adults with depression and anxiety make more negative interpretations of ambiguous information than non-clinical older adults, whereas this was not the case for younger adults. To date, no other studies have compared interpretation biases in younger and older adults and therefore we cannot be sure how robust this finding is. More research investigating age differences in interpretation bias in both clinical and non-clinical populations is required.

Evidence regarding negative interpretation of emotional ambiguity in depression is not as robust as it is for anxiety. Studies using explicit measures of interpretation biases which rely on participant self-report have found that depressed individuals exhibit similar interpretation biases to anxious individuals. For example compared to low dysphoric individuals, high dysphoric individuals have been shown to resolve ambiguous scenarios in a more negative way (Berna, Lang, Goodwin, & Holmes, 2011), to recall a greater number of negative sentences and words, to identify negative facial expressions in faces that combined both positive and negative emotions (Beevers, Wells, Ellis, & Fischer, 2009), and negatively interpret ambiguous homophones (Mogg, Bradbury, & Bradley, 2006; Wenzlaff & Eisenberg, 2001). However, these explicit measures may be affected by self-report biases (MacLeod & Cohen, 1993) whereby anxious or depressed individuals may simply endorse any negative items due to their negative affective state.

Interestingly, studies of interpretation bias which rely on measures such as response latencies have generally failed to confirm an interpretation bias in clinically depressed individuals (Lawson & MacLeod, 1999; Mogg et al., 2006). One possible explanation is that these studies used ambiguous scenarios that were not self-referential in nature. Individuals with depression show stronger negative interpretation biases when presented with material that is self-referential (Wisco & Nolen-Hoeksema, 2010), so it is likely that depressed or dysphoric individuals will demonstrate a negative interpretation bias only when primed to think about themselves. Furthermore it has been suggested that the use of reaction time tests in depressed participants may obscure differences in interpretation biases between depressed and non-depressed samples due to the general psychomotor slowing that can occur in depression (Lawson, MacLeod, & Hammond, 2002).

A recent study examined a negative interpretation bias in dysphoric individuals using priming and self-referent ambiguous stimuli (Hindash & Amir, 2012) with a modified word sentence association paradigm (Beard & Amir, 2009). Participants were primed with an unambiguous word that was either negative (e.g., clumsy) or neutral (e.g. walk), followed by a self-referential ambiguous sentence (e.g., “You carry a tray of food at the party). The task assessed both self-report (participants rated how related each word was to the sentence) and response latencies (speed of endorsement). Compared to healthy controls, individuals with dysphoria endorsed more negative interpretations and were significantly faster to endorse the association between negative words and ambiguous sentences. The authors suggested that ambiguity does in fact prime negative interpretations in dysphoric individuals as long as it is self-referenced. However, it is not clear whether these results can be generalized to a clinically depressed population.

In the current study we compared interpretation biases in younger and older clinical samples suffering comorbid anxiety and depression to a community sample, to determine whether the previous findings that have been demonstrated independently in anxious and dysphoric samples are also a feature of participants with comorbid anxiety and depression. We examined interpretation biases using an adaptation of the paradigm used by Eysenck et al. (1991), which assesses interpretation biases of ambiguous sentences relating to social and physical threat. The sentences were worded in a self-referential way to encourage participants to put themselves in the situations. Negative, positive and neutral ratings were collected using participant self-reports, so we could compare both the presence of negative interpretation biases as well as possible positive interpretation biases. However, in addition to the self-report ratings, the task also included a recognition memory component allowing a signal detection analysis of the recognition items, thus enabling us to determine whether any group differences are due to real interpretation differences (i.e. tendency to interpret ambiguous information in a threatening compared to a benign or positive way) or simply due to response bias (i.e. the tendency to endorse all items as threatening, regardless if the items are related to the ambiguous information or not). This paradigm therefore allows the examination of self-report biases that may be inherent in depression and anxiety.

We predicted that both younger and older clinical adults would more negatively interpret ambiguous scenarios compared to the community control group, as indexed by the sensitivity analysis on self-report ratings following ambiguous stimuli. Further, in line with previous findings, we predicted that older adults overall would exhibit a significantly smaller bias towards negative interpretations, and significantly greater bias towards neutral or positive interpretations relative to younger adults.

Method

Participants

There were four groups of participants (N = 125). Younger community participants were first year psychology students at Macquarie University in Sydney (n = 25, age range = 17-25 years; *M* = 18.8 years; *SD* = 2.0, 22 females). Older community participants were members of the local community who were recruited via newspaper advertisements (n = 33, age range = 60-80 years; *M* = 66.5; *SD* = 5.4, 22 females). These participants formed the control group. Younger clinical participants were recruited from the university counseling service and advertisements on the internet as well as flyers around campus (n = 30, age range = 18-28 years; *M* = 21.6 years; *SD* = 3, 17 females). Older clinical participants were recruited from a group treatment program for comorbid depression and anxiety in older adults at Macquarie University (n = 37 older adults, age range = 60-78 years; *M* = 66.9; *SD* = 4.3, 20 females). All clinical participants met criteria for both a unipolar mood and an anxiety disorder according to the Diagnostic and Statistical Manual of Mental Disorders 4th edition (DSM-IV; American Psychiatric Association, 2000) with the exception of 8 younger adults who only met criteria for one primary disorder. Summary of diagnoses is reported in Table 1. Control participants who reported clinically significant levels of depression and anxiety on the self-report measures were excluded (see method). University students received course credit and all other participants received AUD$30 for participation.

Table 1.

ADIS-IV Diagnoses for Younger and Older Clinical Groups

	Younger	Older
Principal Diagnoses		
GAD	36.7	18.9
SPEC	0	5.4
SOC	20.0	5.4
OCD	0	2.7
MDD	16.7	45.9
DYS	13.3	8.1
ADNOS	13.3	5.4
MDNOS	0	8.1
Secondary		
GAD	20.0	43.2
SPEC	0	13.5
SOC	6.7	16.2
MDD	30.0	8.1
DYS	6.7	2.7
PD	0	5.7
ADNOS	0	2.7
MDNOS	10.0	8.1
ADIS primary	$M = 5.74$ ($SD = 1.29$)	$M = 5.97$ ($SD = 0.87$)
ADIS secondary	$M = 5.35$ ($SD = 1.23$)	$M = 5.14$ ($SD = 0.98$)

Note. GAD = Generalized Anxiety Disorder, SPEC = Specific Phobia, SOC = Social Phobia, OCD = Obsessive Compulsive Disorder, MDD = Major Depressive Disorder, DYS = Dysthymic Disorder, ADNOS = Anxiety Disorder Not Otherwise Specified, MDNOS = Major Depressive Disorder Not Otherwise Specified, PD = Panic Disorder, ADIS = Anxiety Disorders Interview Schedule.

Measures

Diagnostic Interview

The Anxiety Disorders Interview Schedule-IV (ADIS; Brown, Di Nardo, & Barlow, 1994) is a semi-structured diagnostic interview that was used to confirm clinical diagnoses in the clinical samples. Older adults completed the interviews face-to-face at the university center clinic as part of their assessment for the group program for depression and anxiety. The younger adults completed the interviews over the telephone. The interviews were conducted by graduate students in clinical psychology who were formally trained on the ADIS-IV and received regular supervision. Only participants who met full diagnostic criteria were invited to participate in the clinical sample of the research.

Cognitive Assessment

The Mini Mental Status Examination (MMSE; Folstein, Folstein & McHugh, 1975) was used to screen for cognitive decline in older adults. A score of 26/30 or lower is indicative of mild cognitive impairment. All participants scored in the normal range (Range = 27-30; M = 29.2; SD = .86).

Symptom Measures

Depression Anxiety and Stress Scale (DASS; Lovibond & Lovibond, 1995) is a 42-item scale that measures self-reported anxiety, depression and stress symptoms during the last week (*1 = does not apply to me at all, to 4 = applies to me very much, or most of the time*). Higher scores indicate more severe symptomatology. The scale has demonstrated good reliability and validity in both non-clinical and clinical samples (Brown, Korotitsch, Chorpita, & Barlow, 1997; Lovibond & Lovibond, 1995). However the DASS has not been well validated in older samples and so only the younger adults completed it. Only the depression and anxiety subscales were examined in this study, and both subscales were found to have adequate internal consistency (Cronbach's α = .95 and α = .88, respectively).

Geriatric Anxiety Inventory (GAI; Pachana et al., 2007) is a 20-item scale that measures self-reported anxiety during the last week (*agree/disagree*). A larger number of endorsements indicate more severe symptomatology. The scale was developed on older adults (aged 66-94) and has demonstrated adequate reliability and validity in non-clinical and clinical older adult samples (Pachana et al., 2007). The older adults in our study completed this scale, which was found to have strong internal consistency (Cronbach's α = .94).

Geriatric Depression Scale (GDS; Yesavage et al., 1983) is a 20-item scale that measures self-reported depression during the last week (*yes/no*). A higher score indicates more severe symptomatology during the last week. The scale was developed on older adults and has demonstrated adequate reliability and validity in non-clinical and clinical older adult samples (Dunn & Sacco, 1989; Parmelee, Lawton, & Katz, 1989). The older adults in our study completed this scale, which was found to have strong internal consistency (Cronbach's α = .95).

<u>Interpretation Bias Task</u>

Participants completed an interpretation bias task adapted from Eysenck et al. (1991) that involved two parts (see Appendix for examples). In part one, participants read 50 sentences describing a simple scenario. The first two sentences were practice trials. Of the remaining 48 sentences, 32 were ambiguous sentences that could be interpreted in either a threatening or a non-threatening way. Half of the ambiguous sentences were constructed to be potentially related to physical health themes (e.g., *"You are climbing a steep flight of stairs in a hurry when you feel your heart pounding"*) and half were potentially related to social themes (e.g., *"While talking to your best friend about one of your concerns, you notice that they are looking away"*). Participants also read 16 sentences that were unambiguously nonthreatening (e.g., *"You are rushing for the bus when you notice a colorful advert on the side of the bus"*). The sentences were presented in a fixed random order for each participant on a 21 inch computer screen. Each sentence remained on the screen for 15 seconds and participants were instructed to imagine themselves in the situation. This instruction, along with the sentences being written in the second person (e.g. "you") was used to encourage selfreferencing. Following the presentation of each sentence participants were asked to rate on a 5 point scale the degree of pleasantness they felt about the preceding situation (*1= definitely unpleasant, 3= neutral and 5= definitely pleasant*). These sentences formed the target stimuli and were used in the second part of the experiment.

In part two, participants completed a recognition memory test, where they were provided with four alternative versions of each sentence from part one and asked to rate on a 4-point Likert scale how similar in meaning each was to the original sentence (*1= very similar in meaning, 2= fairly similar in meaning, 3= fairly different in meaning and 4= very different in meaning*). Subjects were encouraged to rate each version of the sentence independently from the others, and were allowed to use any combination of ratings. The four alternatives were structurally similar to the original and began with the same few context-setting words. For the ambiguous sentences, two of the versions corresponded in meaning to the possible threatening event and non-threatening event (i.e. they were threat-and non-threat probes), whereas the other two versions described a threatening and a non-threatening event, both of which were different to the one described in the original sentence (i.e. they were threat- and non-threat distractors). In this way the recognition memory test provided separate measures of recognition memory sensitivity and response bias.

Procedure

Data were collected as part of a larger study by the authors (Tadic, Wuthrich, Rapee, Kangas, & Taylor, 2013b)[4]. This study was approved by the University Human Research Ethics Committee. Signed informed consent was obtained at the beginning of the experimental session. Younger adults completed the DASS at home and brought it to the

[4] For a complete list of tasks, measures and randomisation order please contact the corresponding author.

experimental session. Older adults completed the GAI and GDS at the experimental session, followed by the MMSE. All participants then completed the Interpretation Bias Task.

Results

Descriptive statistics

Younger and older adults in both the control and clinical groups differed on most demographic variables, such as education and income, however the age groups did not significantly differ on sex (See Table 2).

Table 2

Demographic Information for Younger and Older, Clinical and Control Groups

Variable	Clinical Younger (N = 30)	Clinical Older (N = 37)	Control Younger (N = 25)	Control Older (N = 33)	F/X^2	p
	N (%)	*N (%)*	*N (%)*	*N (%)*		
Sex					8.69	.033
Female	17 (56.7)$_c$	20 (54.1)	22 (88.0)$_c$	22 (66.7)		
Male	13 (43.3)$_c$	17 (45.9)	3 (12.0)$_c$	11 (33.3)		
Education					39.63	<.001
High school or below	18 (60.0)$_c$	13 (35.1)	23 (92)$_{bc}$	5 (15.2)$_b$		
Certificate or diploma	3 (10.0)	12 (32.4)	0 (0)$_b$	10 (31.2)$_b$		
Bachelor or Postgraduate	9 (30.0)$_c$	12 (32.4)	2 (8.0)$_{bc}$	17 (53.1)$_b$		
Income					59.22	<.001
Less than $500 per week	29 (96.7)$_a$	23 (62.2)$_{ad}$	25 (100)$_b$	5 (16.7)$_{bd}$		
More than $500 per week	1 (3.3)$_a$	14 (37.8)$_{ad}$	0 (0)$_b$	25 (83.3)$_{bd}$		
Marital status					121.34	<.001
Never married	29 (96.7)$_a$	4 (10.8)$_a$	24 (96.0)$_b$	1 (3.0)$_b$		
Married or defacto	1 (3.3)$_a$	11 (29.7)$_{ad}$	1 (4.0)$_b$	22 (66.7)$_{bd}$		
Separated or divorced	0 (0)$_a$	16 (43.2)$_{ad}$	0 (0)	3 (9.1)$_d$		
Widowed	0 (0)$_a$	6 (16.2)$_a$	0 (0)$_b$	7 (21.2)$_b$		
Ethnicity					23.27	<.001
Australian	16 (53.3)$_a$	35 (94.6)$_a$	18 (72.0)$_b$	31 (93.9)$_b$		
Other	14 (46.7)$_a$	2 (5.4)$_a$	7 (28.0)$_b$	2 (6.1)$_b$		
Medication					19.43	<.001
Yes	7 (24.1)$_a$	24 (64.9)$_a$	7 (28.0)$_b$	24 (64.9)$_b$		
No	22 (75.9)$_a$	13 (35.1)$_a$	18 (72.0)$_b$	13 (35.1)$_b$		

Note. F = Fisher's exact test for for analyses that have cell sizes less than 10
Distributions in each row that share subscripts were found to be significantly different
$_a$ = significant difference between younger and older clinical participants
$_b$ = significant difference between younger and older community participants
$_c$ = significant difference between younger clinical and younger community participants
$_d$ = significant difference between older clinical and older community participants

Depression scores from the DASS-depression subscale and the GDS, and anxiety scores from the DASS-anxiety subscale and the GAI were converted to z-scores to allow comparison between younger and older adults. Z scores were computed separately within each age group using means and standard deviations from the distribution obtained for each age group (descriptive statistics in Table 3). Group comparisons showed that participants in the clinical group were significantly more depressed, F (1,121) = 126.0, p <.001, and significantly more anxious than those in the control group, F (1, 121) = 183.07, p < .001. Follow up comparisons showed that both younger and older adults in the clinical group were significantly more depressed (M = .59, SD = .91 and M = .65, SD = .81, respectively) than those in the control group, (M = -.84, SD = .32 and M = -.76, SD = .53, respectively), and significantly more anxious, (M = .59, SD = .96 and M = .80, SD = .67, respectively), than those in the control group (M = -.77, SD = .42 and M = -.93, SD = .21, respectively), all p's <.001. There were no significant differences between younger and older adults on depression in either the clinical, F (1,121) = .098, p = .755, or control group, F (1,121) = .170, p = .681. There were also no significant differences between younger and older adults on anxiety in either the clinical, F (1,121) = 1.84, p = .177, or control group, F (1,121) = .968, p = .327.

Table 3

Depression and Anxiety Scores by Sample Group (Clinical, Control) and Age Group (Younger, Older)

	Clinical		Control	
Variable	Younger (*N* = 30)	Older (*N* = 37)	Younger (*N* = 25)	Older (*N* = 33)
Depression				
Range	4-40	8-22	0-12	8-17
Mean (SD)	19.8 (9.4)	15.0 (2.9)	4.9 (3.4)	10.0 (1.9)
Anxiety				
Range	1-30	2-19	0-9	0-7
Mean (SD)	15.2 (7.4)	11.2 (4.1)	4.7 (3.2)	0.6 (1.3)

Note. For younger adults the Depression scores are obtained using the DASS-depression subscale, and the anxiety scores are obtained using the DASS-Anxiety subscale. For older adults the depression sores are obtained using the Geriatric Depression Scale and the anxiety scores are obtained using the Geriatric Anxiety Inventory.

Interpretation of Ambiguous Sentences

A mixed method Analysis of Variance was conducted on the mean pleasantness ratings from part one, with Age Group (young, older) and Sample (clinical, control) as between-subjects variables and Sentence Content (neutral, social threat, physical threat) as within-subject variables. The mean pleasantness ratings of the sentences are given in Table 4.

Table 4

Descriptive Statistics for Pleasantness Ratings of the Original Target Sentences

	Younger		Older	
	Community	Clinical	Community	Clinical
	M (SD)	*M (SD)*	*M (SD)*	*M (SD)*
Neutral Unambiguous	3.53 (0.30)	3.30 (0.40)	3.70 (0.27)	3.65 (0.38)
Social threat Ambiguous	2.67 (0.31)	2.59 (0.26)	3.04 (0.30)	2.64 (0.34)
Physical threat Ambiguous	2.30 (0.37)	2.39 (0.33)	2.43 (0.29)	2.27 (0.27)

Note. Sentences were rated from 1 (definitely unpleasant) to 5 (definitely pleasant).

There was a significant main effect of sample, F (1, 121) = 11.21, p = .001, η^2= .09, which showed that clinical participants rated the sentences as more unpleasant than control participants. There was also a significant main effect of age group, F (1, 121) = 15.49, p < .001, η^2 = .11 which showed that younger participants rated the sentences as more unpleasant than older participants. The interaction between age group and sample was not significant, p = .095, η^2 = *.02*. There was also a significant main effect of sentence type, F (2, 242) = 586.28, p < .001, η^2 = .83. Follow up analysis revealed that the physical threat sentences were rated as more unpleasant than the neutral unambiguous sentences, t (124) = -29.36, p <.001, and the social threat sentences were rated as more unpleasant than the neutral unambiguous sentences, t (124) = -21.36, p <.001. Further, physical threat sentences were rated as more unpleasant than social threat sentences, t (124) = 11.84, p <.001.

There were also significant interactions between sentence content and age group, F (2, 242) = 7.31, p < .001, η^2 = .06, and sentence content and sample, F (2, 242) = 3.92, p = .021, η^2 = .03, as well as a significant interaction between sentence content, age group and sample, F (2, 242) = 6.89, p = .001, η^2 = .05. Follow-up analyses were conducted to break down the three-way interaction. Analyses of the control sample showed that younger adults rated social threat sentences as significantly more negative than older adults, F (1, 57) = 21.85, p < .001, but there were no age differences for physical threat sentences, F (1, 57) = 2.36, p = .130. Further, younger adults rated unambiguous non-threat sentences as significantly more negative than older adults, F (1, 57) = 5.47, p = .023. Analyses of the clinical sample showed that there were no age differences on ratings of social threat sentences, F (1, 66) = .55, p = .461 or physical threat sentences, F (1, 66) = 2.90, p = .094; however, clinical younger adults rated unambiguous non-threat sentences as significantly more negative than clinical older adults, F (1, 66) = 12.91, p = .001.

Sensitivity and Bias

Signal-detection analyses were carried out on the 4-point recognition memory ratings obtained in part two of the task. ROC analysis (McNicol, 1972) was used to compare the subjects' ability to distinguish between probes and distracters (*sensitivity*) in the threat and non-threat conditions in three different domains - neutral, physical and social. There was also interest in comparing *bias* (the tendency to give ratings towards one end or the other of the four-point scale) over the different conditions. For each subject, 16 ratings were available for each combination of valence (Non-threat Distractor (ND) versus Non-threat Probe (NP), and Threat Distractor (TD) versus Threat Probe (TP)) and domain (neutral, physical and social). If a subject gave a rating towards the 'very similar in meaning' end of the scale for a probe item, this was a 'hit', while if they gave a similar rating for a distractor item, this was a 'false alarm'.

Sensitivity was measured by P(A), the area under the ROC curve formed by plotting the cumulated hit and false alarm rates in a unit square with 'probe' trials (either NP or TP) treated as the 'signal' condition and 'distractor' trials (ND or TD) as the 'noise' condition. This process is described by McNicol (1972, Pp. 11-116). The advantage of using a rating scale and the procedure described by McNicol is that the measure of sensitivity is more accurate than that which could be obtained from a single pair of hit and false alarm rates. In addition, P(A) is a non-parametric measure and does not rest on any assumptions about the underlying distributions. For each subject P(A) values were calculated for each combination of threat (TP versus TD and NP versus ND) and domain, giving six values in all. A P(A) of .50 is obtained if a subject is responding at chance (i.e., showing no evidence of distinguishing between probe and Distractor questions). Values higher than .50 are evidence of discrimination.

A measure of response bias, *B*, was obtained using the method described by McNicol (1972, Pp. 123-127. Like P(A), this measure is non-parametric. A higher value indicates a greater tendency to give ratings towards the *very similar in meaning* end of the scale.

Sensitivity

A mixed method Analysis of Variance was conducted on the sensitivity data, i.e. *p* (*A'*), with Age group (young, older) and Sample (clinical, control) as between-subjects variables and Sentence Valence (neutral, threat) and Sentence Type (physical, social) as within-subject variables. Results showed a significant main effect of sentence valence, indicating that overall participants had higher sensitivity to non-threat sentences than threat sentences, F (1, 121) = 55.93, $p < .001$, $\eta^2 = .32$. There was also a significant main effect of sentence type, which indicated that overall participants were more sensitive to social themed sentences than physical themed sentences, F (1, 121) = 25.73, $p < .001$, $\eta^2 = .18$. The main effects of age group and sample were not significant, F (1, 121) = .844, $p = .360$, $\eta^2 = .01$ and F (1, 121) = .013, $p = .911$, $\eta^2 = .00$, respectively.

The crucial finding theoretically was the significant interaction between age group and sentence valence, F (1, 121) = 11.45, $p = .001$, $\eta^2 = .09$. As depicted in Figure 1, this interaction showed that older adults had significantly greater sensitivity to non-threat sentences than younger adults, F (1, 121) = 4.47, $p = .037$, $\eta^2 = .04$, whereas older and younger adults did not differ in their sensitivity to threat sentences, F (1, 121) = .28, $p = .595$,

η^2 = .002. However, both younger and older adults were more sensitive to non-threat than threat sentences, F (1, 121) = 7.47, p = .007, η^2 = .06 and F (1, 121) = 67.23, p < .001, η^2 = .36, respectively. Two other significant interactions of interest emerged for the p (A') data. A significant interaction between age group and sentence type, F (1, 121) = 5.09, p = .026, η^2 = .04, which indicated that older adults had significantly greater sensitivity to social sentences than physical sentences, F (1, 121) = 30.61, p < .001, η^2 = *.20*. Further, there was a significant sentence valence by sentence type interaction, F (1, 121) = 107.99, p < .001, η^2 = .47, which showed that overall participants had greater sensitivity to non-threat sentences than threat sentences for sentences relating to physical concerns, F (1, 121) = 191.11, p < .001, η^2 = .61, however, participants did not differ in their sensitivity to non-threat and threat sentences for those relating to social concerns, F (1, 121) = .43, p = .513, η^2 = .004.

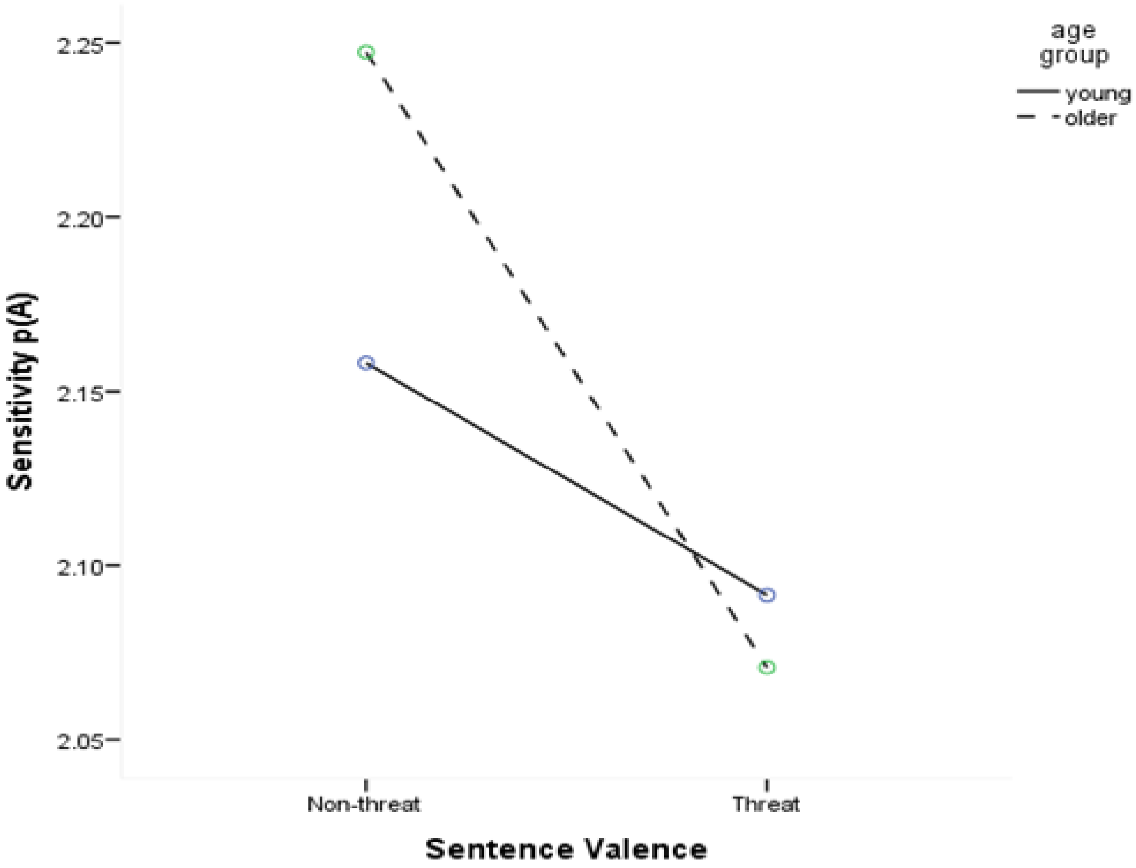

Figure 1. Interaction between age group and sentence valence for sensitivity data.

Response bias

Another mixed method Analysis of Variance was conducted on the response bias data, i.e. *B*, with Age group (young, older) and Sample (Clinical, control) as between-subjects variables and Sentence Valence (neutral, threat) and Sentence Type (physical, social) as within-subject variables. There was a significant main effect of sentence valence, F (1, 107) = 277, $p < .001$, $\eta^2 = .72$, which indicated that participants were more likely to endorse non-threatening than threatening sentences. There was a significant main effect of age group, F (1, 107) = 13.51, $p = .001$, $\eta^2 = .11$, as well as a significant interaction between age group and sentence valence, F (1, 107) = 17.03, $p < .001$, $\eta^2 = .14$. The interaction indicated that there was no significant difference between younger and older adults' response biases to non-threat sentences, F (1, 107) = .272, p = .603, η^2 = .003, however, younger adults displayed a significantly greater response bias toward endorsing threat related sentences than older adults, F (1, 107) = 26.61, p < .001, η^2 = .22, see Figure 2.

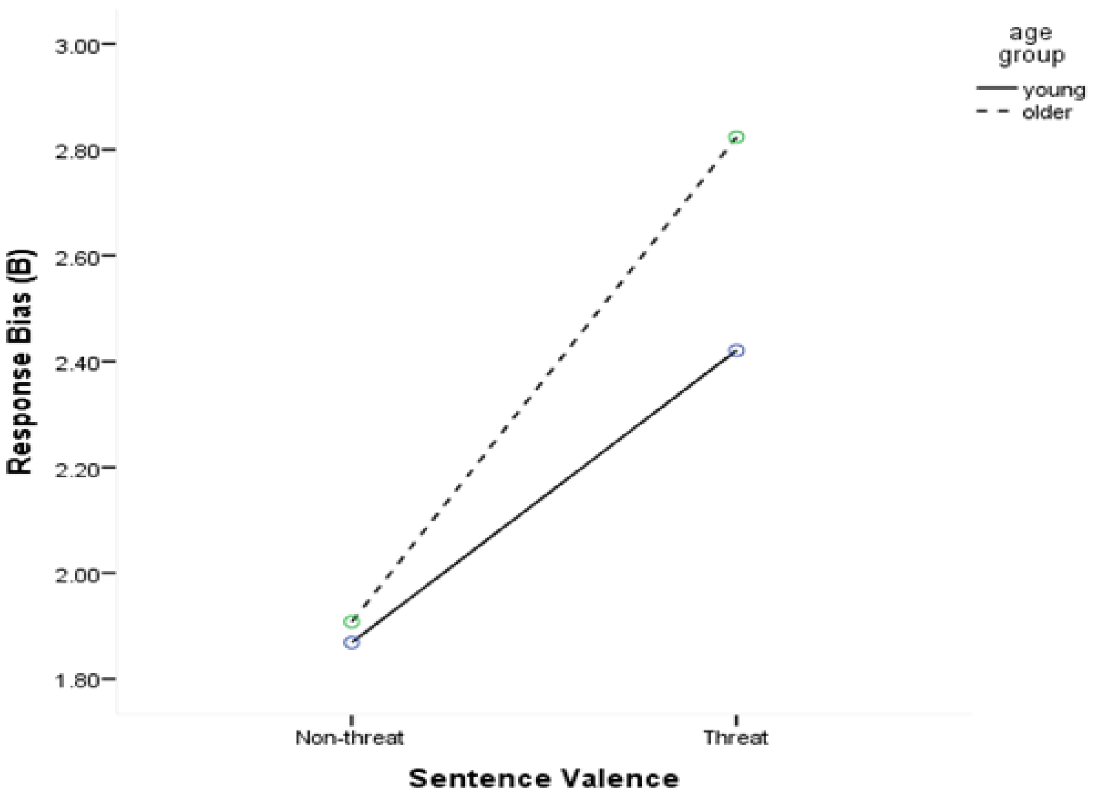

Figure 2. Interaction between age group and sentence valence for response bias data.

Note. Smaller values signify a bias toward responding *yes* and endorsing the item.

The main effect of sentence type was not significant, F (1, 107) = .00, p = .984, however there was a significant interaction between sentence type and sentence valence, F (1, 107) = 22.90, p < .001, η^2 = .18, which indicated that participants were more likely to endorse non-threat than threat sentences for sentences relating to physical concerns, F (1, 107) = 13.48, p < .001, η^2 = .11, and were more likely to endorse threat than non-threat for sentences relating to social concerns, F (1, 107) = 13.37, p < .001, η^2 = .11. However, overall, non-threat sentences were endorsed significantly more than threat sentences for both social and physical sentences, F (1, 107) = 117.65, p < .001, η^2 = .52, and F (1, 107) = 283.29, p < .001, η^2 = .73, respectively. The effect size was much greater for overall endorsement for non-threat sentences than the effect size for the differences between social and physical sentences. Of note, neither the main effect of sample, F (1, 107) = .030, p = .863, nor the interaction between sample and sentence valence was significant, F (1, 107) = 2.10, p = .150.

Discussion

We predicted that both younger and older clinical adults would exhibit a bias towards a negative interpretation of ambiguous scenarios compared to the control group. Analysis of the self-report pleasantness ratings following each sentence showed that clinical participants rated both ambiguous and unambiguous sentences as more unpleasant than control participants. However, contrary to predictions, the sensitivity analysis showed that there was no difference between the clinical and control groups on sensitivity to threat and non-threat sentences. Both clinical and control participants were more sensitive to non-threat than threat sentences. This result is inconsistent with that of Eysenck et al. (1991) who showed that control participants were more sensitive to non-threat than threat, whereas anxious participants showed no difference in sensitivity between threat and non-threat sentences. Of note, this finding could not be attributed to a response bias in either group as there were no differences in response bias to threat and non-threat sentences between the clinical and control groups.

This unexpected finding could be due to a number of factors. First, we cannot be sure that our control group was non-clinical. Although no control participants reported severe levels of depression and anxiety symptomatology, within any community sample some clinical cases may be expected. Future studies would benefit from conducting a full diagnostic interview with the control group participants, as was done with the clinical participants in this study, to ensure accurate diagnosis of non-clinical status. Second, we used a comorbid sample of depressed and anxious participants, in contrast to a purely anxious group used by Eysenck et al. (1991). The sentences were originally constructed to be relevant to anxious participants and thus were related to social or physical threat situations, themes that are more common to anxiety disorders, whereas individuals with depression tend to be more concerned about issues of self-worth and interpersonal relationships (Beck & Clark, 1988). Future studies should include ambiguous sentences related to these themes to get a better representation of potential situations relevant to both depression and anxiety. However, all participants in the current study also met diagnosis for an anxiety disorder. It is therefore most likely that the relatively small sample size was unable to pick up on the differences in sensitivity to threat versus non-threat between clinical and control participants.

We also predicted that older adults would exhibit a significantly lower bias towards negative interpretations, and significantly greater bias towards neutral or positive interpretations relative to younger adults. This hypothesis was supported. Analysis of the self-report pleasantness ratings showed that younger adults were likely to rate ambiguous and unambiguous sentences more negatively than older adults, suggesting a negative interpretation bias for the younger adults, or alternatively a positive interpretation bias in older adults. Interestingly, younger adults were found to rate ambiguous sentences more negatively than older adults in both the clinical and control groups. The sensitivity analysis confirmed that older adults were more sensitive to non-threat interpretations than younger adults, and that this was not driven by a response bias. However, although there were no significant age differences in sensitivity to threat, younger adults displayed a significantly greater response bias toward endorsing threat related sentences than older adults. Although the effect size ($\eta^2 = .22$) was much smaller compared to the overall tendency for participants to endorse non-threatening over threatening interpretations ($\eta^2 = .72$), the significant interaction suggests that younger adults tend to have a bias towards responding in a negative manner, regardless of the valence of information that was presented. This provides evidence for the negativity bias in younger adults, however it suggests that this bias is driven by more controlled processes associated with responding, rather than implicit interpretation processes. The finding of greater sensitivity to non-threat in older adults, which is not driven by a response bias, in contrast suggests that the positivity effect in older adults is due to implicit positive interpretation processes.

These findings have clinical relevance. Younger adults may be biased in how they process or store potentially threatening experiences in memory, thus when faced with ambiguous information they tend to endorse a threatening interpretation which may lead them to overgeneralise the potential of future threat. This interpretation is consistent with the findings demonstrated by Steinman et al. (2012) and Tadic et al. (2013a), which showed that younger adults exhibited a pervasive negative expectancy bias for future events. These and the current study indicate that the negativity bias in younger adults may be due to a pervasive tendency to expect threatening event in the future, and is not driven by automatic interpretation biases.

The reason why younger adults exhibit this pervasive negative bias is unclear. One possible explanation comes from the literature on the positivity effect in aging, which states that motivational influences may account for greater positivity in older adults (Carstensen & Mikels, 2005). Specifically, it is suggested that with the realisation that length of life remaining is reducing, older adults prioritise emotional goals. In contrast, younger adults prioritise information goals as they are motivated to learn and progress (Carstensen, Isaacowitz, & Charles, 1999). Therefore it is possible that younger adults' motivation for achievement results in a greater fear of failure (that is relevant in both physical and social domains) as this is more relevant at their stage of life. This fear may leave them on high alert for threat, which may result in greater perception of threat as has been evidenced across a number of cognitive domains, including memory, attention and interpretation. An alternative, but related possibility is that both evolutionarily and socially, younger adults are more likely to be engaged with competitive situations, making a bias toward negative information more adaptive for them.

An important finding in this study is that there was no interaction between age group and clinical status on pleasantness ratings, indicating that both younger and older adults with emotional difficulties exhibit a bias towards a negative interpretation of ambiguous sentences. Therefore, although older age is associated with positive interpretation biases, older adults who become depressed and anxious display a similar negative interpretation tendency to anxious and depressed younger adults. This is consistent with previous findings which have shown that emotional difficulties have a negative impact on older adults' perceptions of threat. For example, high-anxious older adults have shown a greater attentional bias to negative words (Lee & Knight, 2009), and have more negative expectancies about the future compared to non-anxious (Steinman et al., 2013) and non-depressed or anxious older adults (Tadic et al., 2013a). These findings suggest that despite an age-related positivity effect, there is evidence that cognitive processes are moderated by psychopathology.

In general the current study showed that participants were more sensitive to social threat and tended to have a response bias toward endorsing threatening interpretations of ambiguous sentences related to social threat situations. The fact that younger adults are more sensitive to social threat fits with motivational theory as social interactions are especially important for achievement of knowledge and progression in social and work domains (Carstensen et al., 1999). However, greater sensitivity to social threat than physical threat in older adults is contrary to previous research which suggests that due to reductions in health associated with age, physical health concerns are more salient for older adults (Teachman & Gordon, 2009). It is possible that the nature of the current task did not provoke enough anxiety about physical concerns as has been demonstrated by more behavioural tasks such as straw breathing (Teachman & Gordon, 2009). This is especially likely as we had a relatively physically and emotionally healthy sample of older adults, a result of the recruitment method which specifically sought healthy and happy older adults from the community.

This study has a number of limitations which must be considered. First, the representativeness of the young adult community sample is limited by the use of predominantly female, undergraduate university students. Future studies should aim to recruit a more representative sample of younger adults to determine whether a negative interpretation response bias is a feature of all younger adults, not just university students. Furthermore, it would be beneficial to assess a broader age sample to assess interpretation biases across the lifespan. This would provide insight into the trajectory of change of interpretation biases with increasing age. Second, we cannot be sure of the influence that cohort effects have on these findings. Our community older adult group were high functioning, well-educated and self-selected to take part in the research. The positive interpretation bias effects could partly be explained by generational and cohort differences in the experiences that shaped the coping mechanisms of the older adults in this study, and might not be purely due to chronological age differences, although previous research indicates that the positivity bias in older adulthood is well established (Carstensen & Mikels, 2005; Mather & Carstensen, 2005; Scheibe & Carstensen, 2010). More longitudinal studies are needed to determine how interpretation biases are influenced by age. A post hoc power analysis was conducted using the software package GPower (Faul, Erdfelder & Buchner, 2007) on the age group by sentence valence interaction for the response bias data. With a sample size of 125 and the desired power of .80, the post hoc analysis revealed that we had enough power to detect an effect size of .066, a medium sized effect according to eta squared size conventions (see Murphy & Myors, 2004). The observed effect size of the interaction of interest was 0.14, a large sized effect. Therefore the current analysis had enough power to detect an effect of this size. It is also a limitation that inter-rater reliability data for the ADIS clinical diagnoses was not possible due to some assessments being conducted over the phone.

Despite these limitations, this study provides a unique opportunity to evaluate age differences in negative interpretation biases in a clinical sample. The findings suggest that clinical levels of psychopathology are associated with interpretation biases for both younger and older adults. Further, older age is associated with a positive interpretation bias that was explained by true age differences in interpretation, and could not be explained by response bias, suggesting that older adults automatically perceive information in a more positive way. However, the greater negative interpretation exhibited by younger adults was explained by a general response bias, suggesting that younger adults tend to endorse more threatening interpretations regardless of the information presented.

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Appendix

Example Sentences from Part 1:

1. *Unambiguously Nonthreatening*

- You are rushing for the bus when you notice a colorful advert on the side of the bus
- While you are on the way to an appointment you look at the display in a shop window
- You reach out to turn on the kettle but decide to have a glass of fruit juice instead
- As you step off the bus you throw your ticket in the wastebin provided

2. *Ambiguous Physical Threat*

- Watching a sad film in a crowded cinema you feel your breath catch in your throat
- At the cancer screening clinic you see a nurse coming towards you holding the x-ray negatives in her hand
- You are climbing a steep flight of stairs in a hurry when you feel your heart pounding

3. *Ambiguous Social Threat*

- Some of your friends have been talking together and you realise they don't want you to overhear them
- Your boss calls you to their office to discuss the quality of your recent work
- Out shopping one day you see a neighbour across the road, but when you call to them they walk straight past
- While talking to your best friend about one of your concerns, you notice that they are looking away

Example Sentence Sets from Part 2:

1. *Ambiguous Physical Threat*

Threat Probe: You are climbing a steep flight of stairs in a hurry when you feel as though you are about to have a heart attack.

Threat Distractor: You are climbing a steep flight of stairs in a hurry when you trip and fall downstairs.

Non-threat Probe: You are climbing a steep flight of stairs in a hurry and you feel your heart beating strongly and healthily.

Non-threat Distractor: You are climbing a steep flight of stairs in a hurry and feel full of life and energy.

2. *Ambiguous Social Threat*

Threat Probe: While talking to your best friend about one of your concerns, you notice they are tired of listening to you.

Threat Distractor: While talking to your best friend about one of your concerns, they start to argue with you.

Non-threat Probe: While talking to your best friend about one of your concerns, something distracts them.

Non-threat Distractor: While talking to your best friend about one of your concerns, you are interrupted by a knock on the door.

Paper 4

Age Differences in Daily Hassles, Uplifts and Coping Strategies

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This paper has been prepared for publication.

Author contribution:

Mrs. Dusanka Tadic was responsible for the design of this study, collection and entry of data, analysis and write-up of this paper. Dr. Wuthrich, Professor Rapee and Dr. Kangas provided research and statistical supervision and were involved in reviewing the manuscript.

Abstract

Compared with younger adults, older adults have consistently demonstrated lower prevalence of anxiety and mood disorders, however the reasons for this are not clear. One possibility is that older adults experience fewer daily stressors, or cope better with stress than younger adults. The objective of this study was to investigate age differences in the frequency and severity of daily hassles and uplifts, as well as coping mechanisms in community and clinical samples of younger (Community: n = 33; age range = 17-25 years, *M* = 18.8 years, 30 females; Clinical: n = 30; age range = 18-28, *M* = 21.6 years, 17 females) and older (Community: n = 34; age range = 60-80 years, *M* = 66.3, 22 females; Clinical: n = 37; age range = 60-78, *M* = 67.03, 20 females; Younger: age range = 18-28, *M* = 21.6 years, 17 females) adults. Participants completed self-report measures of depression, anxiety, coping, and their experience of daily hassles and uplifts over the last 30 days. As predicted, younger adults reported significantly greater severity of hassles than older adults. Clinical participants also reported greater frequency and severity of daily hassles compared to community participants. Also as predicted, younger adults were found to endorse an avoidant coping style significantly more than older adults. Clinical participants also endorsed an avoidant coping style significantly more than community participants. Age was not found to moderate the relationship between hassles and psychopathology, nor was age found to moderate the relationship between avoidant coping and psychopathology. Implications for theoretical models of coping and psychopathology across the lifespan are discussed.

Introduction

Extensive evidence points to age-related reductions in negative affect and increases in positive affect in older adulthood (e.g., Carstensen et al., 2011; Charles & Carstensen, 2007; Charles, Reynolds, & Gatz, 2001). Likewise, psychological distress and affective disorders are found to be the lowest among older adults (Jorm et al., 2005; Kessler et al., 2005). Although it is not clear why these patterns emerge, a large body of research now demonstrates a positivity bias in older adults in which older adults are more likely to prioritize positive emotions and experiences (see review by Charles & Carstensen, 2007). For example, compared to younger adults, older adults pay attention to and remember emotionally positive information more than they do negative or neutral information. These motivational changes with age may motivate older adults to limit their exposure to stressful situations. In addition, age-related changes in social roles, such as retirement, may result in fewer daily stressors and facilitate ease of structuring the environment in a way that enhances enjoyment and reduces stress (Ginn & Fast, 2006; Rosenkoetter, Gams, & Engdahl, 2001). Alternatively, older adults may simply be better at coping with stressful experiences given lifelong practice (Amirkhan & Auyeung, 2007). Therefore, frequency of stressors and coping styles may help explain age differences in affective wellbeing.

Research shows that hassles, minor events or stressors associated with daily living and social roles are better predictors of psychological and physical health than major life events (Kanner, Coyne, Shaefer, & Lazarus, 1981). There is considerable evidence that greater frequency of daily hassles is associated with poorer health outcomes (DeLongis, Coyne, Dakof, Folkman, & Lazarus, 1982), increases in negative affect (Zautra, Affleck, Tennen, Reich, & Davis, 2005), and greater psychological distress (Almeida, 2005; Charles, Piazza, Mogle, Sliwinski, & Almeida, 2013; Grzywacz, Almeida, Neupert, & Ettner, 2004; Lu, 1991). Long-term exposure to frequent daily hassles has also been shown to predict symptom-based diagnosis of affective disorder ten years after they were first measured (Charles et al., 2013). Chronicity of daily hassles therefore appears to have a negative impact on psychological wellbeing.

There has also been interest in uplifts, positive daily experiences, and the extent to which they may contribute to stress resilience. Uplifts result in the experience of positive emotions, which have been shown to broaden an individual's attentional focus and behavioural repertoire, consequently promoting creativity and flexibility in thinking and problem solving (Fredrickson & Branigan, 2005). Thus greater frequency of positive events amid negative events may facilitate continued adaptive coping efforts, interrupt rumination cycles, and restore resources depleted by the stress (Folkman & Moskowitz, 2000a, 2000b; Lazarus, Kanner, & Folkman, 1980). Empirical studies have shown that contentment and joy speed recovery from the cardiovascular after-effects of negative emotions (Fredrickson & Levenson, 1998). Also, individuals who report higher levels of positive emotion show greater emotional distance following stressful negative events (Keltner & Bonanno, 1997). Therefore, an increase in creative and flexible thinking, an increased ability to distance oneself from negative emotions and faster physiological recovery from negative emotions are all adaptive functions of positive emotions which may prevent prolonged negative affect occurring. Thus in emotionally healthy individuals, uplifts may serve as emotional buffers against the effect of negative daily experiences, over time enhancing people's emotional and physical wellbeing. However, no studies have assessed whether uplifts improve mood in currently depressed and anxious individuals.

Older adults are often found to report fewer daily hassles than younger adults (Aldwin, Sutton, Chiara, & Spiro, 1996; Stawski, Sliwinski, Almeida, & Smyth, 2008). Frequency of hassles was also found to be a predictor of depression, psychosomatic symptoms and negative wellbeing in a community sample of older adults aged between 65 and 75 years (Holahan &

Holahan, 1987). In contrast, some studies have shown that older adults report greater frequency of positive daily events, or uplifts, and appraise these positive events as more pleasurable than younger adults (Almeida & Horn, 2004; Whitehead & Bergeman, 2013). One study assessed positive and negative social exchanges in a sample of community-dwelling older adults (aged 60-89) showing that positive social exchanges experienced during the course of the day not only contributed to more positive mood but also appeared to offset the adverse effects of negative social exchanges. In contrast, a greater number of daily negative social events were associated with more severe symptoms of loneliness and depression (Rook, 2001). Another study showed that the occurrence of daily positive emotions mediated the reactivity to and recovery from daily stress in a sample of recently bereaved women (aged 57-83 years) (Ong, Bergeman, Bisconti, & Wallace, 2006). The experience of positive events amid negative events may therefore contribute to stress resilience in older adults. However few studies have compared younger and older adults on the experience of daily hassles and uplifts, and no studies have included clinical samples. It is therefore unclear whether there are age differences in the frequency and severity of daily hassles, and whether age moderates the effect of hassles on severity of symptom distress. It is also unclear whether there are age differences in the extent to which the experience of uplifts may provide a buffer against stress. A better understanding of the relationship between age, hassles and uplifts is needed as it may help explain age differences in affective wellbeing.

Coping is defined as the changing thoughts and acts the individual uses to manage the external and/or internal demands of a specific person-environment transaction that is appraised as stressful (Lazarus & Folkman, 1984). Evidence suggests that the coping strategies people use play an important role in stress-management and have an effect on overall wellbeing (Lazarus & Folkman, 1984; Penley, Tomaka, & Wiebe, 2002; Taylor & Stanton, 2007). For example, strategies that are directly aimed at managing or modifying the problem, often referred to as *approach coping* strategies, are shown to lead to adaptive long term outcomes (Billings, Folkman, Acree, & Moskowitz, 2000; Suls & Fletcher, 1985) because they address the cause of the stress directly. For example, a person may engage in problem-solving (i.e. problem-focused coping) or try and manage the emotions associated with the stressful situation in some way, such as seeking support from loved ones (i.e. emotion-focused coping) (Folkman & Moskowitz, 2000a, 2000b; Roth & Cohen, 1986; Skinner, Edge, Altman, & Sherwood, 2003). In contrast, efforts to disengage from or avoid the stressor, often referred to as *escape-* or *avoidant-focused coping*, are found to be maladaptive as they lead to greater stress-generation and are a risk factor for developing affective disorders such as depression (Fledderus, Bohlmeijer, & Pieterse, 2010; Holahan, Moos, Holahan, Brennan, & Schutte, 2005).

To date, the research findings on age differences in coping are mixed. While some studies have reported that older adults use fewer maladaptive strategies such as avoidant-coping and more adaptive coping such as problem-focused coping (Amirkhan & Auyeung, 2007; Blanchard-Fields, Sulsky, & Robinson-Whelen, 1991), other studies have revealed the opposite pattern (Aldwin, 1991), or no change in coping strategies with age (McCrae, 1982; Whitty, 2003). A recent 20-year longitudinal study found moderate declines in the use of both approach and avoidance coping in a community sample of older adults (Brennan, Holland, Schutte, & Moos, 2012). It is unclear whether this finding is a result of older adults being better at emotion regulation or having less stress in their environments as both explanations would result in less need to engage in coping. Additionally, this general pattern of decline was not uniform across all coping strategies. For example, support seeking did not decline with age, and the use of acceptance increased with age (Brennan et al., 2012), suggesting that there may be age-differences on specific coping strategies.

Not surprisingly, older adults who report greater emotional distress such as depressive symptoms showed an increase in overall coping efforts (Brennan et al., 2012). We would expect that individuals who experience greater stress need to engage in more efforts to reduce the impact of that stress. However, little research has assessed the use of specific coping strategies in clinical older adults. Coping is a clinically relevant construct to investigate because the coping strategies one uses to handle stress are likely related to the severity of distress one experiences (Segal, Hook, & Coolidge, 2001). For example there is some evidence that compared to non-anxious older adults, anxious older adults rely more on avoidant coping strategies such as mental and behavioural disengagement (Coolidge, Segal, Hook, & Stewart, 2000) and that coping strategies may be related to the onset of anxiety disorders in the elderly (Vink, Aartsen, & Schoevers, 2008).

Although older adults are consistently found to experience high subjective wellbeing and a lower prevalence of affective disorders compared to younger adults, it is unclear whether age-related differences in the experience of daily hassles, uplifts and coping can account for this finding as there are no studies examining the relationship between these variables in younger and older clinical samples. Therefore the present study aimed to examine age differences in daily hassles, daily uplifts, and coping, and the extent to which these were related to anxiety and depression in younger and older adults. It was hypothesised that 1. Older adults would report fewer hassles and more uplifts than younger adults 2. Older adults would report using more adaptive coping strategies and 3. Age would moderate the relationship between hassles, uplifts and coping. Specifically, the relationship between hassles and severity of depression and anxiety was predicted to be smaller for older adults and the relationship between maladaptive coping and severity of depression and anxiety was predicted to be smaller for older adults. Furthermore, uplifts were predicted to attenuate the relationship between hassles, coping and severity of depression and anxiety more so for older than younger adults.

Method

Participants

The community sample consisted of 33 younger adults (age range = 17-25 years, *M* = 18.8 years, *SD* = 1.9, female = 30) recruited from a first year psychology course, and 34 older adults (age range = 60-80 years, *M* = 66.3, *SD* = 5.5, female = 22) recruited from the local community. The clinical sample consisted of 30 younger adults (age range = 18-28, *M* = 21.8 years, *SD* = 3, female = 15) recruited from a university counseling service and the local community based in north-west Sydney, and 37 older adults (age range = 60-78, *M* = 66.9, *SD* = 4.3, female = 20), recruited from a university treatment trial for older adults with anxiety and depression (Wuthrich, Rapee, Kangas, & Perini, 2014). Clinical status was determined by structured diagnostic interview (see below). Only older adults without cognitive decline were included (see below). The younger adults in the community sample received course credit for participation. All other participants received AUD$30 reimbursement for their time.

Measures

<u>Cognitive Assessment</u>

The *Mini Mental Status Examination (MMSE; Folstein, Folstein & McHugh, 1975)* was used to screen all older adults for cognitive decline. The maximum score on this scale is 30 with scores of 26 and below indicative of mild cognitive impairment. All participants scored in the normal range (Range = 27-30, *M* = 29.2, *SD* = .86).

Diagnostic Clinical Interview

The *Anxiety Disorders Interview Schedule-IV (ADIS-IV; Di Nardo, Brown, & Barlow, 1994)* is a semi-structured diagnostic tool that shows good inter-rater reliability for both younger (Di Nardo et al., 1994) and older adults (Wuthrich & Rapee, 2013), which was used to assess clinical participants for anxiety and depression. The older adults completed the ADIS-IV face-to-face at the university clinic as part of their assessment for the treatment trial. The younger clinical participants completed the ADIS-IV over the phone. Each diagnosis is scored by the clinician on a 0-8 severity rating scale where ratings of 4 and above are considered of clinical severity and meet diagnostic status. All clinical participants met criteria for an anxiety and mood disorder, determined by a minimum clinical severity rating of 4 out of 8. Eight young adult clinical participants only met diagnosis for either a mood or anxiety disorder. Summary of diagnoses is reported in Table 1. The interview was administered by graduate students in clinical psychology formally trained on the ADIS-IV who received regular supervision. The ADIS was only administered to clinical participants.

Table 1

ADIS-IV Diagnoses for Younger and Older Clinical Groups

	Younger	Older
Principal Diagnoses (%)		
GAD	36.7	18.9
SPEC	0.0	5.4
SOC	20.0	5.4
OCD	0.0	2.7
MDD	16.7	45.9
DYS	13.3	8.1
ADNOS	13.3	5.4
MDNOS	0.0	8.1
Secondary Diagnoses (%)		
GAD	20.0	43.2
SPEC		13.5
SOC	6.7	16.2
MDD	30.0	8.1
DYS	6.7	2.7
PD	0.0	5.4
ADNOS	0.0	2.7
MDNOS	10.0	8.1
ADIS primary severity	*M* = 5.74 (*SD* = 1.29)	*M* = 5.97 (*SD* = 0.87)
ADIS secondary severity	*M* = 5.35 (*SD* = 1.23)	*M* = 5.14 (*SD* = 0.98)

Note. GAD = Generalized Anxiety Disorder, SPEC = Specific Phobia, SOC = Social Phobia, OCD = Obsessive Compulsive Disorder, MDD = Major Depressive Disorder, DYS = Dysthymic Disorder, ADNOS = Anxiety Disorder Not Otherwise Specified, MDNOS = Major Depressive Disorder Not Otherwise Specified, PD = Panic Disorder, ADIS = Anxiety Disorders Interview Schedule.

Self-Report Measures

Demographic information including sex, marital status, education, ethnicity and medication use was obtained as summarized in Table 2.

Depression Anxiety and Stress Scale (DASS-42; Lovibond & Lovibond, 1995) is a 42-item scale that measures the presence of anxiety, depression and stress symptoms over the past 7 days. It was administered to the younger adult samples (clinical and community) only. The DASS-42 is scored on a 4-point scale, (*1 = does not apply to me at all,* to *4 = applies to me very much, or most of the time*). Higher scores indicate more severe symptomatology. The

DASS-42 has demonstrated good psychometric properties in both clinical and non-clinical adult samples (Brown, Korotitsch, Chorpita, & Barlow, 1997; Lovibond & Lovibond, 1995). Adequate internal consistency was demonstrated in our younger adult sample for anxiety (Cronbach's α = .88), and depression (Cronbach's α = .95). Raw scores were converted to z-scores for comparison with the older sample.

Geriatric Anxiety Inventory (GAI; Pachana et al., 2007) is a 20-item scale (*agree/disagree*) which assesses the severity of symptoms over the past 7 days, and was administered to the older adult samples (clinical and community) only. A larger number of endorsements indicate more severe anxiety symptoms. This scale was developed on older adults samples (age range 66-94) and has been shown to have adequate reliability and validity in clinical and non-clinical samples (Pachana et al., 2007). Strong internal consistency was demonstrated in our older adults sample (Cronbach's α = .94). Raw scores were converted to z-scores for comparison with the young sample.

Geriatric Depression Scale (GDS; Yesavage et al., 1983) is a 30-item scale (*yes/no*) measuring the severity of symptoms over the past 7 days and was administered to the older adult samples only. Higher scores indicate more severe depression. The GDS has demonstrated adequate psychometric properties in clinical and non-clinical older adult samples (Dunn & Sacco, 1989; Parmelee, Lawton, & Katz, 1989). Strong internal consistency was demonstrated in our older adults sample (α = .95). Raw scores were converted to z-scores for comparison with the young sample.

Combined Hassles and Uplifts Scale (CHUS; Lazarus & Folkman, 1989) consists of 53 items reflecting common day-to-day person-environment transactions (e.g. time spent with family, work load, the weather). The respondent indicates whether the given transaction has been a hassle, uplift or both in the last month on a 4 point scale (0 = *none or not applicable*, 1 = *somewhat*, 2 = *quite a bit* and 3 = *a great deal*). A frequency score was obtained for both hassles and uplifts by summing the number of items that were endorsed as a hassle and uplift respectively. A severity score was obtained for both hassles and uplifts by averaging the ratings pertaining to each subscale, giving an average severity per experienced stressor. We found adequate internal consistency for each of the subscales in our sample; Hassles (Cronbach's α = .92), Uplifts (α = .93).

Coping Orientations to Problems Experienced Scale- Brief (COPE-B; Carver, 1997), is a 28-item scale which measures 14 conceptually different coping reactions. Each coping subscale is made up of 2 items and participants rate the extent to which they use each of the coping strategies when faced with a stressful situation (*1 = I haven't been doing this at all* to, *4 = I've been doing this a lot*). We found adequate internal consistency for most of the subscales in our sample; active coping (α = .72), planning (α = .82), positive reframing (α = .74), humour (α = .84), religion (α = .87), using instrumental support (α = .87), using emotional support (α = .78), self-distraction (α = .69), denial (α = .62), substance use (α = .94), behavioral disengagement (α = .65), and self-blame (α = .85). However, two of the subscales had unacceptable internal consistency; acceptance (α = .57) and venting (α = .23), and therefore were dropped from further analyses.

Procedure

The study protocol was approved by the Macquarie University Human Research Ethics Committee. The measures were included in a questionnaire battery that was completed as part of a larger study previously conducted by the authors (Tadic, Wuthrich, Rapee, Kangas, & Taylor, 2013). Participants completed all of the measures at the beginning of the experimental session. Participants first completed the symptom measures, followed by the CHUS, and then the COPE-B.

Results

Younger and older adults in the community group differed on sex, education, income, marital status, ethnicity and medication use. Younger and older adults in the clinical group differed on income, marital status, ethnicity and medication (see Table 2). Total scores on the DASS depression and anxiety subscales, the GAI and GDS were converted to z-scores to conduct between group analyses on symptom severity (see Table 3). Z scores were computed separately within each age group using means and standard deviations from the distribution obtained for each age group. This was necessary as younger and older adults completed different measures of symptom severity. Each person's depression and anxiety z-score was then added together to create a composite score reflecting 'general distress'. The variable general distress was used in all further analyses. An Analysis of Variance on the composite score showed a significant main effect of sample, F (1, 130) = 160.02, $p < .001$, $\eta^2 = .56$, such that participants in the clinical sample were significantly more distressed (M = 1.33, SD = 1.30) than participants in the community sample (M = -1.36, SD = 1.11). There was no significant main effect of age group, F (1, 130) = .511, $p = .476$, $\eta^2 = .004$, showing that younger (M = 0.007, SD = 1.78) and older (M = -.03, SD = 1.85) adults did not significantly differ on distress. The sample by age group interaction was marginally significant, F (1, 130) = 3.97, $p = .049$, $\eta^2 = .03$, indicating a trend for younger adults in the community sample to be more distressed (M = -1.08, SD = 1.32) than older adults in the community sample (M = -1.64, SD = .78).

Table 2

Demographic Information for Younger and Older, Community and Clinical Groups

	Clinical		Community			
Variable	Younger (*N* = 30)	Older (*N* = 37)	Younger (*N* = 33)	Older (*N* = 34)	F/X^2	*p*
	N (%)	*N (%)*	*N (%)*	*N (%)*		
Sex					12.73	.005
Female	17 (56.7)$_c$	20 (54.1)	30 (90.9)$_{bc}$	22 (64.7)$_b$		
Male	13 (43.3)$_c$	17 (45.9)	3 (9.1)$_c$	12 (35.3)		
Education					48.46	<.001
High school or below	18 (60)$_c$	13 (35.1)	31 (93.9)$_{bc}$	5 (15.2)$_b$		
Certificate or diploma	3 (10)	12 (32.4)	0 (0)$_b$	11 (33.3)$_b$		
Bachelor or Postgraduate	9 (30)$_c$	12 (32.4)	2 (6.1)$_{cb}$	17 (51.5)$_b$		
Income					66.53	<.001
Less than $500 per week	29 (96.7)$_a$	23 (62.2)$_{ad}$	33 (100)$_b$	5 (16.1)$_{bd}$		
More than $500 per week	1 (3.3)$_a$	14 (37.8)$_{ad}$	0 (0)$_b$	26 (83.9)$_{bd}$		
Marital status					71.95	<.001
Never married	29 (96.7)$_a$	4 (10.8)$_a$	32 (97)$_b$	1 (2.9)$_b$		
Married or defacto	1 (7.8)$_a$	11 (29.7)$_{ad}$	1 (3)$_b$	22 (64.7)$_{bd}$		
Separated or divorced	0 (0)$_a$	16 (43.2)$_{ad}$	0 (0)$_b$	4 (11.8)$_{bd}$		
Widowed	0 (0)$_a$	6 (16.2)$_a$	0 (0)$_b$	7 (20.6)$_b$		
Ethnicity					23.83	<.001
Australian	16 (53.3)$_a$	35 (94.6)$_a$	23 (69.7)$_b$	32 (94.1)$_b$		
Other	14 (46.7)$_a$	2 (5.4)$_a$	10 (30.3)$_b$	2 (5.9)$_b$		
Medication					21.97	<.001
Yes	7 (24.1)$_a$	24 (64.9)$_a$	8 (24.2)$_b$	22 (64.7)$_b$		
No	22 (75.9)$_a$	13 (35.1)$_a$	25 (75.8)$_b$	12 (35.3)$_b$		

Note. *F* = Fisher's exact test for for analyses that have cell sizes less than 10
Distributions in each row that share subscripts were found to be significantly different
$_a$ = significant difference between younger and older clinical participants
$_b$ = significant difference between younger and older community participants
$_c$ = significant difference between younger clinical and younger community participants
$_d$ = significant difference between older clinical and older community participants

Table 3.

Descriptive Statistics for DASS, GAI, GDS and the converted z scores for younger and older community and clinical groups

	Community				Clinical			
	Young		Older		Young		Older	
	Mean (SD)	Range	Mean (SD)	Range	Mean (SD)	Range	Mean (SD)	Range
DEPRESSION	8.06 (7.83)	0-32	10.03 (1.85)	8-17	19.80 (9.43)	4-40	14.95 (2.83)	8-22
Z-score	-.54 (.75)	-1.31- 1.76	-.75 (.53)	-1.33-1.23	.59 (.91)	-.93- 2.53	.65 (.81)	-1.33-2.65
ANXIETY	6.48 (5.29)	0-25	.85 (2.20)	0-11	15.20 (7.40)	1-30	11.19 (4.11)	2-19
Z-score	-.54 (.69)	-1.38-1.87	-.88 (.36)	-1.02-.77	.59 (.91)	-.9.-2.53	.80 (.81)	-1.33-2.65

Note. Younger adults completed the Depression and Anxiety subscales of the Depression Anxiety and Stress Scales. Older adults completed the Geriatric Anxiety Inventory and Geriatric Depression Scale.

Age differences in hassles, uplifts and coping strategies

Multivariate Analysis of Variance (MANOVA) was used to examine differences in daily hassles and uplifts, with frequency of hassles and uplifts and severity over the last month entered as levels of the dependent variable, and age group (younger, older) and sample (clinical, community) entered as fixed factors. Sex, education, income, marital status, ethnicity and medication use were entered as covariates. Analyses revealed a significant main effect of age group, F (4, 116) = 3.36, p = .012; Wilks' Lambda = .90; partial η^2 = .10, and sample, F (4, 116) = 13.29, p < .001; Wilks' Lambda = .69; partial η^2 = .31. There was no significant interaction between age group and sample, F (4, 126) = .771, p = .546; Wilks' Lambda = .97; partial η^2 = .03. Descriptive statistics for each group are presented in Table 4.

Table 4

Means and Standard Deviations and Maximum scores for the Combined Uplifts and Hassles Scale and COPE-B (14 subscales nested under 3 factors)

	Community				Clinical			
	Young		Older		Young		Older	
Scale	*M (SD)*	*Range*	*M (SD)*	*Range*	*M (SD)*	*Range*	*M (SD)*	*Range*
Frequency of Hassles	24.39 (6.88)	10- 35	15.57	0- 43	29.00 (8.84)	13- 44	29.43	9- 53
Frequency of Uplifts	31.24 (6.33)	18- 45	33.57	0- 52	28.41 (9.61)	9- 45	33.70 (9.09)	11- 50
Severity of Hassles	0.70 (0.25)	.25- 1.21	0.36 (0.26)	0- 0.89	1.00 (0.37)	.32- 1.74	0.89 (0.39)	.26- 1.85
Severity of Uplifts	1.19 (0.34)	.60- 1.98	1.30 (0.59)	0- 2.43	0.98 (0.40)	.28- 1.74	1.18 (0.44)	.32- 2.00
COPE-B factors								
Problem coping	5.22 (1.34)	2.67- 8.00	5.76 (1.58)	2-8	5.09 (1.41)	2.33- 8.00	5.12 (1.15)	3.00- 7.33
Active Coping	5.21 (1.64)	3-8	5.87 (1.74)	2-8	5.24 (1.64)	2-8	5.43 (1.59)	2-8
Planning	5.45 (1.62)	2-8	5.97 (2.09)	2-8	5.48 (1.57)	3-8	5.49 (1.77)	2-8
Positive Reframing	5.00 (1.44)	2-8	5.43 (1.83)	2-8	4.55 (1.98)	2-8	4.43 (1.32)	2-8
Humour	3.97 (1.57)	2-8	3.50 (1.89)	1-8	4.24 (2.25)	2-8	3.43 (1.56)	2-8
Avoidant coping	3.81 (0.98)	2.25- 6.50	3.03 (1.00)	2.00- 5.75	4.77 (0.80)	3.50- 7.50	4.34 (0.88)	2.50- 6.25
Self-Distraction	5.30 (1.67)	2-8	3.70 (1.66)	2-8	6.24 (1.36)	3-8	5.19 (1.75)	2-8
Denial	2.58 (1.25)	2-8	2.57 (1.17)	2-6	3.31 (1.37)	2-7	3.00 (1.53)	2-8
Behavioral Disengagement	2.97 (1.38)	2-8	2.27 (1.14)	1-8	4.07 (1.77)	2-8	3.76 (1.16)	2-6
Self-Blame	4.39 (1.64)	2-8	3.57 (1.89)	2-8	5.45 (1.80)	2-8	5.41 (1.76)	2-8
Emotion coping	5.00 (1.69)	2-8	4.03 (1.44)	2-7	5.41 (1.84)	2-8	4.41 (1.49)	2.00- 7.50
Using Emotional Support	4.88 (1.65)	2-8	4.07 (1.57)	2-8	5.38 (1.92)	2-8	4.27 (1.47)	2-7
Using Instrumental support	5.12 (1.92)	2-8	4.00 (1.72)	2-7	5.45 (2.05)	2-8	4.57 (1.71)	2-8
Religion	3.73 (2.18)	2-8	3.63 (2.34)	2-8	3.34 (1.97)	2-8	4.16 (1.98)	2-8
Substance Use	2.58 (1.23)	2-8	2.20 (0.61)	2-4	3.97 (2.41)	2-8	2.97 (1.68)	1-8

Follow up univariate analyses indicated that younger adults reported significantly greater severity of hassles than older adults, (M = 0.84, SD = 0.35 and M = 0.66, SD = 0.43, respectively), F (1, 119) = 5.25, p =.024, partial η^2 = .04. There was no significant difference in frequency of hassles between younger and older adults during the previous month, (M = 26.55, SD = 8.13 and M = 23.22, SD = 13.07, respectively), F (1, 119) = 1.80, p =.182, partial η^2 = .02. Furthermore, there was no significant difference between younger and older adults on frequency of uplifts, (M = 29.92, SD = 8.09 and M = 33.64, SD = 10.44, respectively), F (1, 119) = 2.58, p = .111, partial η^2 = .02, or severity of uplifts in the last month, (M = 1.09, SD = 0.38 and M = 1.23, SD = 0.52, respectively), F (1, 119) = 1.92, p = .167, partial η^2 = .02.

Comparing the clinical sample to the community sample collapsed across age, we found the clinical sample reported significantly greater frequency of hassles in the previous month compared to individuals in the community group, (M = 29.24, SD = 10.12 and M =20.19, SD = 10.13, respectively), F (1, 119) = 23.64, p <.001, partial η^2 = .17, and the clinical sample also reported significantly greater severity of those hassles, (M = 0.94 , SD = 0.39 and M = 0.54, SD = 0.30, respectively), F (1, 119) = 42.27, p <.001, partial η^2 = .26. There were no significant differences between individuals in the clinical and community group on the frequency of uplifts, (M = 31.38, SD = 9.62 and M = 32.35, SD = 9.49, respectively), F (1, 119) = .15, p = .704, partial η^2 = .001, or severity of uplifts, (M = 1.09, SD = 0.43 and M = 1.24, SD = 0.48, respectively), F (1, 119) = 2.07, p = .153, partial η^2 = .02.

In order to examine differences in the coping strategies for the age sample groups, a factor analysis of the COPE-B was initially conducted based on 12 of 14 subscales of the COPE-B using principal component analysis with Direct Oblimin (non-orthogonal) rotation. The two subscales with unacceptable internal consistencies were not included (acceptance and venting). The analysis yielded four factors with eigenvalues greater than one. The four factors explained a total of 62.62% of the variance. Three of the factors were easily interpretable. The subscales active coping, positive reframing, planning and humour all loaded onto one factor which was referred to as ‘problem coping’ due to its conceptual similarity with descriptions of problem-focused coping in the literature (e.g., Baker & Berenbaum, 2007). This factor explained 9.03% of the variance and had a factor loading of 5.74. Self-distraction, denial, behavioral disengagement, and self-blame loaded onto the second factor which was referred to as ‘avoidant coping’ as it was conceptually comparable with descriptions of avoidant coping (e.g., Penley et al., 2002). This factor explained 16.76% of the variance and had a factor loading of 6.19. The two subscales indexing the use of emotional and instrumental support loaded onto the third factor. Although instrumental and emotional support are often regarded as distinct coping mechanisms, evidence suggests that people seek instrumental support largely because of the emotional meaning associated with it, especially in close interpersonal relationships (i.e. interactions involving family and friends) (Semmer et al., 2008). The items in the COPE-B refer to ‘seeking help and advice from other people’ without specifying whether they are professionals or family and friends. Given that using emotional and instrumental support both loaded highly on the same factor (1.51 and 1.73), it is likely that participants in the current sample were engaging in instrumental support in a way which facilitated emotional meaning for them. Therefore this third factor was labeled ‘emotion coping’, explained 25.14% of the variance and had a factor loading of 7.60. The fourth factor comprised the substance use and religion subscales and explained 11.69% of the variance and had a factor loading of 5.86. On the basis that these 2 subscales did not seem conceptually related, these subscales were considered as separate factors in the analyses. This concurs with Carver’s (1997) findings in which he found that substance use and religion formed distinct factors (Carver, 1997). Means and standard deviations for the individual COPE-B subscales and the factors are presented in Table 4.

A MANOVA was conducted on the five factors of the COPE-B as levels of the dependent variable of coping (Problem Coping, Avoidant Coping, Emotion Coping, Substance Use, and Religion). Age (younger, older) and sample (clinical, community) groups were entered as fixed factors. Again, sex, education, income, marital status, ethnicity and medication use were entered as a covariates to control for the effects these demographic differences between younger and older adults could have on coping outcomes. The analysis revealed a significant effect of age group and sample on the dependent variables of coping, F (5, 116) = 2.88 p = .017; Wilks' Lambda = .89; partial η^2 = .11, and F (5, 116) = 14.26, p < .001; Wilks' Lambda = .62; partial η^2 = .38, respectively. There was no significant interaction between age group and sample, F (5, 116) = .27, p = .274; Wilks' Lambda = .95; partial η^2 = .05. Follow-up pairwise comparisons were conducted to assess age and sample differences. Results showed that compared to older adults, younger adults reported using significantly more emotion coping, F (1, 120) = 4.77, p = .031, η^2 = .04, compared to older adults, but the age groups did not significantly differ on the use of problem coping, F (1, 120) = 0.53, p = .818, η^2 = 0, avoidant coping, F (1, 120) = 3.36, p = .059, η^2 = .03, substance use, F (1, 120) = 1.23, p = .269, η^2 = .01 or religion, F (1, 120) = 2.49, p = .117, η^2 = .02.

When comparing the community and clinical groups, the clinical group reported using significantly more avoidant coping, F (1, 120) = 46.00, p < .001, η^2 = .28, and significantly more substance use than the community group, F (1, 120) = 11.80, p = .001, η^2 = .09. There were no differences between the clinical and community groups on emotion coping, F (1, 120) = 2.21, p = .140, η^2 = .02, problem coping, F (1, 120) = .1.98, p = .162, η^2 = .02 or religion, F (1, 120) = 0.00, p = .978, η^2 = 0.

Age as potential moderator between general distress and hassles, uplifts and coping strategies.

A preliminary series of bivariate correlations was conducted to assess the relationship between age and severity and frequency of hassles and uplifts, and coping. Age was found to have small negative correlations with frequency of daily hassles (r = -.177, p = .041), severity of daily hassles (r = -.244, p = .004), avoidant coping (r = -.243, p = .005), and emotion coping (r = -.265, p = .002). A series of bivariate correlations were also conducted to assess the relationship between general distress and severity and frequency of hassles and uplifts, and coping. General distress had moderate significant correlations with frequency of daily hassles (r = .371, p < .001), severity of daily hassles (r = .500, p < .001), and avoidant coping (r = .662, p < .001), as well as a small, significant positive correlation with substance use (r = .233, p < .001). Results are summarized in Table 5.

Table 5

Bivariate Correlations Between, Daily Hassles, Daily Uplifts, Coping Strategies, and Age and General Distress

	Age	General Distress
Frequency of Daily Hassles	-1.77*	.371***
Severity of Daily Hassles	-.244**	.500***
Frequency of Daily Uplifts	.157	-.037
Severity of Daily Uplifts	.121	-.133
COPE-B Avoidant Coping	-.243**	.662***
COPE-B Problem Coping	.121	-.157
COPE-B Emotion Coping	-.265**	-.006
COPE-B Humour	-.163	.151
COPE-B Religion	.098	-.022
COPE-B Substance use	-.156	.233**

Note. *p<.05, **p<.01, ***p<.001, General Distress = Depression and Anxiety Composite Score.

A hierarchical multiple regression analysis was employed to predict general distress and to determine if age moderated the effect of hassles and coping on general distress. Frequency and severity of hassles and avoidant coping were included in the model since they were significantly correlated with both age and general distress. Severity and frequency of uplifts were dropped from further analyses as they did not correlate with age or general distress. Problem coping, emotion coping, substance use, humour and religion were also excluded from further analyses as they correlated with either age or general distress, but not both.

Sex, education, income, marital status, ethnicity and medication use were entered into the regression in the first step as independent variables. Together these variables were a significant predictor of general distress, F (6, 122) = 2.82, p = .013, Adjusted R^2 = .08. Age group, frequency of daily hassles, severity of daily hassles, and avoidant coping were entered as predictors in the second step. The model adding each of the independent predictors was significant, F (4, 118) = 17.95, p = < .001, Adjusted R^2 = .57. Finally, the interaction between age group and frequency of daily hassles, age group and severity of daily hassles and age group and avoidant coping were entered into the regression. However, when the interactions between each of the independent predictors and age group were entered into the regression, they did not account for a significant change in variance, F (3, 115) = 14.14, p = .321, R^2 = .60 (see Table 6). The full model including all predictors and independent variables was significant, F (13, 115) = 14.14, p <.001, Adjusted R^2 = .57. All variables were centered prior to inclusion in the model.

Table 6

Regression Summary Table for Predictors of General Distress

Model	Predictor	B	SE(B)	β	t	p
1	Constant	1.256	.567		2.22	.029
	Sex	-.526	.338	-.139	-1.559	.122
	Education	.175	.201	.086	.872	.385
	Marital Status	.222	.174	.123	1.274	.205
	Income	-1.216	.371	-.316	-3.276	.001**
	Ethnicity	.011	.391	.003	.029	.977
	Medication Use	-.011	.328	-.003	-.035	.972
2	Constant	-.565	.490		-1.155	.251
	Sex	-.675	.238	-.179	-2.832	.005**
	Education	.050	.140	.024	.354	.724
	Marital Status	.059	.120	.033	.493	.623
	Income	-.547	.287	.023	.359	.720
	Ethnicity	.103	.286	.023	.359	.720
	Medication Use	-.090	.233	-.025	-.386	.701
	Age Group	1.012	.277	.284	3.658	<.001***
	Frequency hassles	-.065	.022	-.401	-2.890	.005**
	Severity hassles	2.818	.643	.633	4.385	<.001***
	COPE-B avoidant coping	.223	.027	.548	8.196	<.001***
3	Constant	-.598	.490		.-1.221	.225
	Sex	-.648	.245	-.171	-2.640	.009**
	Education	.090	.144	.044	.623	.534
	Marital Status	.023	.123	.013	.191	.849
	Income	-.568	.297	-.148	-1.914	.058
	Ethnicity	.114	.286	.026	.399	.691
	Medication Use	-.077	.233	-.021	-.331	.741
	Age Group	1.022	.288	.287	3.556	.001**
	Frequency hassles	-.082	.035	-.509	-2.342	.021*
	Severity hassles	2.742	.869	.616	3.154	.002**
	COPE-B avoidant coping	.271	.041	.664	6.646	<.001***
	Frequency hassles*Age	.022	.047	.118	.475	.636
	Severity hassles*Age	.254	1.328	.044	.191	.849
	COPE-B avoidant coping*Age	-.087	.055	-.160	-.582	.116

Note. **p*<.05, ***p*<.01, ****p*<.001
Separate regression analyses were conducted for simple models investigating whether age moderates the relationship between hassles and general distress, and avoidant coping and general distress. Neither of the simple models produced significant interactions with age. Thus, limited power is not an alternative explanation for the non-significant results. Neither the full model reported here, nor the simple models, produced different results when removing sex, education, marital status, income, ethnicity and medication use as covariates.

Discussion

The aim of this study was to assess age differences in reports of daily hassles, uplifts, and coping strategies, and the extent to which these were related to symptoms of depression and anxiety. It was hypothesised that older adults would report fewer hassles and more uplifts than younger adults. Additionally older adults were hypothesised to employ more adaptive coping strategies. Results showed that younger adults reported greater severity of hassles in the past month and a more avoidant coping style than older adults, as predicted. Previous findings suggest that greater frequency and severity of hassles, and avoidant coping are associated with negative emotional outcomes (e.g., Grzywacz et al., 2004 and Fledderus et al., 2010), thus the current findings are consistent with findings of lower subjective wellbeing in younger adults compared to community dwelling older adults. However, contrary to predictions, we did not find any age differences in the frequency and severity of uplifts. Also as predicted, clinical participants reported greater frequency and severity of hassles and more avoidant coping compared to community samples, regardless of age group.

We also predicted that age would moderate the relationship between hassles, uplifts and coping. Specifically, the relationship between hassles and severity of depression and anxiety was predicted to be smaller for older adults and the relationship between maladaptive coping and severity of depression and anxiety was predicted to be smaller for older adults. However, results showed that age did not moderate the relationship between clinical distress, hassles and coping, indicating that the pattern of greater hassles and avoidant coping is associated with more severe distress for both younger and older adults alike. Uplifts were predicted to attenuate the relationship between hassles, coping and severity of depression and anxiety more so for older than younger adults. However results did not support this hypothesis as frequency and severity of uplifts was not significantly associated with distress severity.

One explanation for the greater severity of hassles reported by younger compared to older adults is that due to the nature of changing environmental demands, whereby late adulthood is often associated with less daily social and work pressures, older adults may have more time and flexibility to structure their environment in a way that enhances enjoyment and reduces stress. However, we found that older adults reported lower severity of hassles and not a lower frequency of hassles, compared to younger adults. Therefore, the current findings suggest that either the hassles experienced by older adults are truly less severe, or more likely that older adults interpret hassles as less severe. This interpretation fits with existing research demonstrating that older adults are better at reappraising situations in a more positive or benign way (Haga, Kraft, & Corby, 2007; John & Gross, 2004). Future research may consider including independent raters (e.g., partner or close friend) to rate the frequency and severity of hassles in the individual's daily life to gain better insight into whether hassles are truly less severe in older adulthood, or are simply interpreted this way. Future research should also investigate more directly the link between automatic emotion regulation processes, habitual coping styles and hassles.

As expected, clinical participants reported greater frequency and severity of hassles than community participants, but there were no differences between the samples on reported uplifts. Hence, higher levels of hassles may contribute to psychological disorders, or alternatively a greater level of negative affect in individuals who experience clinical levels of psychological distress may lead these individuals to perceive more hassles in their environment, and to also perceive those hassles more negatively. Interestingly, although older age was associated with lower severity of hassles, age did not moderate the relationship between hassles and severity of general distress. These results indicate that age and hassles exert independent influences on emotional distress. Therefore it appears that although older age may be a protective factor against the severity of hassles experienced in daily life, both younger and older adults who are depressed and anxious report similar levels of negative and positive experiences (i.e., hassles and uplifts).

Interestingly, we did not find any significant differences between younger and older or clinical and community participants in the experience of daily uplifts and there was no evidence that uplifts buffered the effect of hassles on general distress. It is possible that due to the restrospective nature of recording daily events, negatively charged experiences such as hassles were more easily remembered than positive daily eperiences. Experience sampling methods in which individuals are reminded to provide systematic self-reports at random occasions during the waking hours of a normal week would be a more accurate way of assessing the frequency of positive experiences that does not rely on memory (Csikszentmihalyi & Larson, 1987). Alternatively, it is possible that negative experiences account more for general distress than the non-experience of positive experiences, and the small sample size in the current study may have prevented the detection of small effects. More research is required to understand age differences in the experience of uplifts amidst daily hasssles.

When we compared groups on coping, younger adults reported using more avoidant coping strategies than older adults. Specifically it appeared that younger adults relied heavily on self-distraction. They also reported utilizing more emotion coping, both emotional and instrumental support, than older adults. These results suggest that when faced with stress, younger adults are more likely to try and avoid dealing with the stress, and/or seek support from other people to help them cope. Interestingly, there were no significant age differences on problem coping indicating that although older adults are less likely to avoid dealing with stress, they are no more likely to engage in problem solving than younger adults, which is seen as an adaptive coping strategy. Consistent with findings by Brennan et al., (2012), the lower severity of hassles reported by older adults in our sample may have stimulated less need to engage in as many coping attempts.

As predicted, clinical participants also used more avoidant coping than community participants, including more self-distraction, denial, self-blame and behavioural disengagement, as well as more substance use than community participants, consistent with previous findings linking maladaptive coping styles with greater symptom severity (Thompson et al., 2010). Individuals with depression and anxiety disturbances are often self-critical for feeling the way they do, and frequently engage in avoidance behaviour which maintains their low mood (Barlow, 2002; Trew, 2011). The current findings are consistent with this and suggest that current models of depression which focus on behavioural activation and pleasant event scheduling are effective methods to reduce low mood through their increase in positive experiences (Cuijpers, van Straten, & Warmerdam, 2007). Again, there was no interaction between age group and sample and age did not moderate the relationship between avoidant coping and distress, suggesting that clinical older adults engage in as much avoidant coping as younger adults, and that avoidant coping leads to similar levels of distress in both age groups. Future research using a longitudinal design is required to determine whether adaptive coping exhibited by older adults mediates the severity of psychological distress as this may help explain the greater level of wellbeing reported by community older adults.

Several limitations of the present study should be noted. First, a cross-sectional design was utilized. Participants were asked to reflect on a 30-day period in their lives and age differences in daily hassles and coping were assessed in the context of this period. However, stress is not a static phenomenon. Therefore it cannot be determined on the basis of the current data how representative this 30 day period was of the participants' general lives. Replication of these results using longitudinal designs for example with repeated diary assessment would give a more accurate assessment of the experience of hassles and uplifts in younger and older adults' everyday lives. Second, generational cohort effects might also have influenced results. It is possible that the age differences in coping with daily stress observed are due to generational differences in socialisation rather than any differences due to development. Further, a relatively young and well-educated older adult sample was recruited which may not be representative of the normal older population in terms of the frequency and severity of daily hassles experienced. Similarly, the younger adult sample comprised university students (primarily female) and hence results from this sample may not generalize to younger adults in the community. Future research should utilize a more representative sample from the wider community. Statistically, several of the COPE-B subscales (self-distraction, denial and behavioural disengagement) had questionable reliability. Although an alpha level of .6 or greater is common practice, some researchers argue that less than .7 is unacceptable. The low reliability is likely a result of the small number of items making up each subscale. The present results need to be interpreted with caution; however the original COPE-B subscales had similar reliability scores to the ones we obtained (Carver, 1997) which were considered acceptable. The factor analysis of the COPE-B may also be underpowered. A ratio of 10 participants per variable studied is often considered adequate (Everitt, 1975). The factor analysis conducted on the COPE-B involved 14 subscales; however we did not have the recommended 140 participants. However Preacher and MacCallum (2002) report that simply looking at sample size is not useful, and that other factors such as communality of variables and number of factors to number of variables ratio need to be considered. Additionally, age has a bimodal distribution, as we looked at age groups at opposite ends of the lifespan, violating the assumption of linearity required for correlation and regression. However, dummy coding was used to investigate whether age at each end of the lifespan influenced the relationship between hassles, coping and general distress whose relationships are all linear.

The robustness of the regression procedure does not void the interpretation of these analyses. A post hoc power analysis was conducted using the software package GPower (Faul, Erdfelder & Buchner, 2007) on the regression analysis. The effect of interest was the interaction between age and frequency of hassles, age and severity of hassles and age and avoidant coping. When these interactions were entered into the model they accounted for 60% of the variance (R^2 = .60). The effect size of this particular interaction was 1.5 (i.e., a large effect, according to Cohen's *f* size conventions). The post hoc analysis revealed that power was at 1.0, thus suggesting that we had adequate power (>.80 is considered acceptable) to detect if age moderated the relationships between hassles, avoidant coping and distress. We were also unable to report inter-rater reliability for the ADIS diagnoses, thus we are not sure how reliably participants were categorized as having clinical levels of psychopathology.

A more conceptual limitation was that the current study assessed how individuals generally cope with stress in their lives. However, there is strong evidence of situational effects on individual coping such that the type of stressful episode and its perceived importance influence the type of coping response that is used (Aldwin & Park, 2004; Mattlin, Wethington, & Kessler, 1990; Parkes, 1986). Therefore the current findings of age differences in severity of hassles may not generalize to all types of stress. Future research should investigate age differences in the relationship between coping and specific types of hassles in specific contexts to reveal more information about the nature of successful adaptation to stress, how it unfolds over time across the lifespan, and how it differs by context.

Most coping research to date has focused on individual differences in the use of adaptive versus maladaptive coping strategies and the links these have to physical, social and psychological outcomes. However, it is important to be able to use a range of different coping strategies flexibly because degree of personal control over the problem, and the resources available at any one time may change from situation to situation. Therefore, although there is evidence that prolonged use of avoidant coping strategies may contribute to the development and maintenance of depression and anxiety, a capacity to flexibly adapt to situations and utilize a variety of coping strategies is beneficial (Cheng & Cheung, 2005; Kashdan & Rottenberg, 2010). For example, avoidant coping strategies have been shown to be effective in some situations when used as short-term solutions (Roth & Cohen, 1986). Given reductions in cognitive flexibility with older age (Johnco, Wuthrich, & Rapee, 2013), investigation of age differences in the flexibility of shifting between different styles of coping and its impact on overall wellbeing may demonstrate some interesting differences.

In summary, the current study provides insights into the experience of daily hassles, uplifts and coping strategies used by younger and older adults in the community and clinical populations. Our findings suggest that younger age and clinical levels of psychological distress are associated with more severe daily hassles and greater endorsement of avoidant coping styles. Age did not moderate the relationship between hassles and distress severity, nor did it moderate the relationship between avoidant coping and distress severity, indicating an independent effect of age on depression and anxiety. These findings have implications for theoretical and treatment models of coping across the lifespan.

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General Discussion

There is emerging evidence that emotional wellbeing is maintained well into older adulthood and that the rate of clinical anxiety and depression decrease with age, however it is unclear what factors contribute to this. A number of hypotheses have been proposed. The first is that older adults are better at regulating their emotions than younger adults (Urry & Gross, 2010). To date, self-report data suggests that older adults have more control over their emotions and use more effective emotion regulation strategies. Additionally, older adults are found to give preference to positive over neutral or negative stimuli in attention and memory tasks (Scheibe & Carstensen, 2010), a phenomenon termed the *positivity effect*. However, relatively little is known about the age differences in spontaneous use of emotion regulation strategies across discrete emotions, and whether rate of recovery differs based on strategy used. Another explanation is that perhaps older adults exhibit more positive interpretation biases than younger adults, resulting in less negative interpretations being made of ambiguous stimuli, which are abundant in our environment, consequently leading to less intense emotional reactions and ease of emotion regulation. To date interpretation biases have not been adequately explored in older adults. Finally, it has been proposed that older adults may experience less stress in their day to day lives, and/or have developed more effective long term coping strategies, resulting in less stress and greater wellbeing. However, the manner in which age influences the stress and coping process remains poorly understood. Given the lack of agreement on which factors account for greater wellbeing in older adults, this thesis sought to explore these three hypotheses by examining the relationships between age and emotion regulation (paper 1), interpretation biases (paper 2 and 3) and coping (paper 4). Four studies were used to examine these relationships in both younger and older non-clinical and clinical populations. The inclusion of a clinical sample was essential in understanding whether age moderates the experience of psychopathology in these three domains.

Review of Thesis Papers and Outcomes

Paper 1: Age Differences in Emotion Regulation

The aim of paper 1 was to investigate age differences in the spontaneous use of emotion regulation strategies following sad, anxious and happy emotions. Participants were induced into each emotion using a mood induction procedure with video clips. Each induction was followed by a five minute recovery period during which self-report and galvanic skin response measures were taken every 30 seconds to track rate of recovery from each emotion. At the end of all three inductions participants were asked to rate which, if any, strategies they had used to regulate their sad and anxious affect during the recovery period.

Results from this study showed that younger adults recovered faster from anxiety than older adults, contrary to expectations. Younger adults reported greater use of suppression, distraction and redirecting attention during the recovery period for anxiety compared to older adults, suggesting that these strategies may be effective for younger adults in down regulating anxiety. However, although there were no age differences on the reported use of reappraisal during the recovery period, reappraisal use was found to predict faster recovery from anxiety for clinical older adults compare to clinical younger adults. Also, reappraisal predicted faster recovery from sadness for older adults in the community sample compared to older adults in the clinical sample; a pattern not found in younger adults. This suggests that reappraisal success may increase with age. Finally, older adults were found to maintain the happy emotion for longer than younger adults. Together, the results from this study suggest that the ability to spontaneously use reappraisal to regulate negative emotions, as well as the ability to maintain positive emotions may contribute to the greater wellbeing observed in older adults.

This is the first study to assess rate of emotion recovery following spontaneous emotion regulation. This study demonstrates the importance of considering the specific type of emotion when assessing age differences in emotion regulation ability, as age differences were found between the discrete emotions we investigated. Therefore, although previous research has shown that when directly instructed to use reappraisal, older adults may be more successful at regulating negative affect (Phillips, Henry, Hosie, & Milne, 2008; Shiota & Levenson, 2009), we cannot assume that they will apply this strategy spontaneously, or that it will be as successful for all emotions. These results also confirm the usefulness of assessing multiple domains of the emotional response, including subjective and physiological responding. The physiological data in this study suggest that younger adults showed greater responsiveness to anxiety than sadness, whereas older adults showed greater responsiveness for sadness compared to anxiety, a pattern that was consistent with the self-report responses. Therefore, physiological data is a good supplement to self-report as it can strengthen the conclusions made, and provide a potential check for response biases that can occur with self-report.

Paper 2: Age Differences in Negative Expectancy Bias in Co-morbid Depression and Anxiety

Paper 2 aimed to investigate age differences in negative expectancy bias (i.e. negatively distorted predictions about the future). Participants completed the Expectancy Task (Cabeleira et al., 2010), which was developed to assess the mechanisms underlying negative expectancies associated with anxiety. Previously this task has found that anxious participants have an increased expectancy for negative events, regardless of the emotional valence of the information provided, whereas older adults have an inflated expectancy for positive events, especially following negatively valanced information (Steinman, Smyth, Bucks, MacLeod, & Teachman, 2013). Thus it has been suggested that older adults are less influenced by negative information. We aimed to replicate these findings in a clinical sample of comorbid depression and anxiety as these disorders are so commonly comorbid in both younger and older adults.

Consistent with previous findings, participants with emotional dysfunction showed a greater tendency to expect negative outcomes across a range of physical and social scenarios than community participants. This negative expectancy was found to be driven by a pervasive bias (i.e. it occurred if the previous scenario was either positively or negatively valanced). Also consistent with previous findings, older adults showed a greater tendency to expect positive events compared to younger adults. However, this was only the case for unambiguous scenarios suggesting that older adults extrapolate more positive information about the future when current information is clearly positive. There was a strong trend for older adults to expect positive events following ambiguous scenarios as well, which was not the case for younger adults, suggesting that older adults may be less influenced by negative information in forming expectations about the future compared to younger adults.

A key finding from this study is that age did not moderate the negative expectancy bias for clinical participants following unambiguous scenarios. Thus, when current information is negative, both younger and older adults with depression and anxiety exhibit a greater tendency to expect negative future events. However, age did moderate the negative expectancy bias for clinical participants following ambiguous scenarios. Specifically, when current information contained both positively and negatively valanced information, clinical older adults had a significantly lower positive expectancy of future events compared to community older adults in comparison to the younger adults. Thus it appeared that the tendency to expect positive events to occur was reduced to a greater extent for older adults with clinical psychopathology. However, a closer investigation revealed that overall, clinical older adults still had a significantly greater positive expectancy than clinical younger adults. Older adults in the community overall had a much larger positive expectancy to begin with, thus the relative differences between clinical and community older adults was greater than for clinical and community younger adults. Therefore, the tendency to expect fewer positive events among clinical older adults was not indicative of greater negative expectancy bias. We interpreted this as a potential ‘positive buffer’ for older adults which may be protective against developing a pervasive negative expectancy for future events.

Paper 3: Bias in Interpretation of Ambiguous Social and Physical Threat: Age Differences in a Community and Clinical Sample

Evidence from paper 2 suggests that older adults have a tendency to expect positive future events compared to younger adults. There was a strong trend for this to occur in ambiguous scenarios, indicating that perhaps older adults are less influenced by negative information. Thus the aim of paper 3 was to further assess age differences in interpretation of ambiguous information and to determine if older adults do have a positive interpretation bias. Participants were presented with ambiguous scenarios related to both physical and social threat, were required to imagine themselves in the situation, and rate how pleasant they would feel following the situation. Higher pleasantness ratings indicated a more positive interpretation. The self-report ratings were subject to a signal detection analysis in order to determine whether responses were due to differences in interpretation, or a result of a response bias.

The results from this study showed that older adults had a greater positive interpretation bias compared to younger adults, and that this was explained by a tendency to interpret information in a more positive way. In contrast, younger adults showed a negative interpretation bias compared to older adults, which was explained by a response bias. Therefore, these results provide evidence of a positivity bias in interpretation of ambiguous information with older age, suggesting that older adults are in fact more sensitive to non-threatening interpretations and do not just prefer to report positive information. The greater negative interpretation bias in younger adults however, was explained by a response bias, suggesting that younger adults tend to have a bias towards responding in a negative manner, regardless of the valence of information that was presented.

Surprisingly we did not find greater sensitivity to threat in the clinical group compared to the control group as previously shown (Eysenck, Mogg, May, Richards, & Mathews, 1991). Possible explanations for this are discussed in the paper, including restricted power to detect small effects. However, clinical participants did have smaller pleasantness ratings compared to non-clinical participants, and this was not moderated by age, indicating similar interpretation processes in younger and older adults affected by depression and anxiety. Overall, the results from this study suggest that older age is in fact associated with a positive interpretation bias while younger adults perhaps choose to focus on the negatives. This has implications for how we address interpretations in treatment.

Paper 4: Age Differences in Daily Hassles, Uplifts and Coping Strategies

The aim of paper 4 was to determine if there were age differences in the experience of daily hassles, uplifts and coping strategies. The inclusion of a clinical sample allowed us to assess whether age moderated the relationship between stress and clinical symptom severity. Participants rated the extent to which common everyday tasks (e.g., house chores, paying the bills, spending time with family) has been a hassle, uplift, or both during the last month. They also completed a coping questionnaire asking them to rate the strategies they most commonly use to deal with stress. Results revealed that younger adults reported greater severity of daily hassles and more avoidant coping compared to older adults. It could be suggested that more severe stress and maladaptive coping contributes to age differences in wellbeing, however we could not conclude whether these results reflected actual differences in severity of daily stress, or whether they reflected differences in perception. Given that older adults are motivated to regulate their emotions and appear to have more success in doing so (Scheibe &

Carstensen, 2010; Urry & Gross, 2010), as well as tend to interpret ambiguous and sometimes negative information in more positive ways as we showed in paper 2 and 3, it is possible that older adults have less severe stress because they perceive the stressors in a less threatening way. Additionally, we showed that age did not moderate the relationship between stress and general distress, nor did it moderate the relationship between avoidant coping and general distress. Although we cannot make any conclusions about the direction of this relationship, it appears that whether you are younger or older, when you experience more hassles and engage in more avoidant coping you experience more severe distress. Similarly, individuals who are depressed and anxious engage in more avoidant coping and have more stress, regardless of age.

Implications for Understanding Age-Differences in Wellbeing Implications for Theories of Aging

Overall findings from the four papers presented in this thesis support the finding of a 'positivity effect' in normal aging. In paper 1, we found that community-dwelling older adults maintained the happy emotion for longer than younger adults. Recent evidence has suggested that the stability of positive emotional experiences is associated with greater life satisfaction and less depression and anxiety (Gruber, Kogan, Quoidbach, & Mauss, 2013), therefore it can be suggested that the ability to maintain a positive emotion, as demonstrated in our laboratory study, contributes to wellbeing in older adults. The younger adults in our study were shown to be more successful at recovering from an anxious emotion and they reported greater use of suppression, distraction and redirecting attention during the recovery period, although none of these strategies predicted faster recovery. Research has shown that while distraction and redirecting attention are effective emotion regulation strategies in the short term (Compton, 2000; Nolen-Hoeksema & Morrow, 1993), suppression is not adaptive (Campbell-Sills, Barlow, Brown, & Hofmann, 2006). Older adults on the other hand benefited from the spontaneous use of reappraisal, which predicted faster recovery from anxiety in clinical older adults compared to clinical younger adults, and faster recovery from sadness in community older adults compared to community younger adults. Interestingly, there were no age differences in how much participants engaged in reappraisal during these recovery periods, which may suggest that reappraisal is less effortful for older adults. Additionally, older adults exhibited a tendency to expect positive events to occur in the future, to have a positive interpretation bias and to have less severe hassles and engage in less avoidant coping compared to younger adults.

These findings are all in line with Socio-emotional Selectivity Theory (SST) which states that older adults are more motivated to enhance positive emotional experiences (Carstensen, Isaacowitz, & Charles, 1999). Our findings suggest that older adults do have a more positive information processing bias and do engage in strategies which have been shown to be effective at increasing positive emotion and decreasing negative emotion. It could be interpreted that older adults select and prioritise emotional goals to compensate for the cognitive, biological and social losses that occur (Baltes & Baltes, 1990). Alternatively, learning and practice effects which are possible over time may make older adults more competent at emotion regulation. Either way, older adulthood, like every other stage of life, has its own challenges and transitions that must be adapted to. The present findings support the literature which advocates that emotional development continues and improves well into older age, rather than older age being associated with a profile of emotional dampening and cognitive rigidity. Importantly, these findings have demonstrated superior emotional development in older age across multiple domains, including cognition, emotion regulation and coping. Therefore, when considering why older adults maintain a greater level of wellbeing it is important to acknowledge each of these components.

Implications for Treatment

A key finding from this thesis is that age did not moderate the positivity effects described above. That is, with the exception of more effective reappraisal to regulate anxiety in clinical older participants, the pattern of findings across emotion regulation, cognition and coping were the same for clinical participants, regardless of age. This is an important finding as it demonstrates that the factors that contribute to psychological distress, and potentially cause and maintain psychological disorders have the same impact in both younger and older adults. This has implications for selecting appropriate treatment strategies to help older adults manage depression and anxiety, as it highlights that the current theoretical models of depression and anxiety are developmentally appropriate for older adults.

The treatment literature has only recently started to focus on treatment efficacy in older adults. CBT is currently the gold standard psychological intervention for anxiety and depression in adults (Cuijpers et al., 2013; Hofmann & Smits, 2008; Stewart & Chambless, 2009), and is increasingly supported as an effective treatment for late life anxiety and depression, with similar effect sizes to those seen with younger adults (Ayers, Sorrell, Thorp, & Wetherell, 2007; Cuijpers, van Straten, & Smit, 2006; Goncalves & Byrne, 2012; Gould, Coulson, & Howard, 2012; Thorp et al., 2009). However, there is still some debate whether, and to what extent traditional cognitive therapy methods used with younger adults need to be modified in treatment of older adults with depression and anxiety (Koder, Brodaty, & Anstey, 1998; Laidlaw, 2001). Wilkinson (1997) argued that cognitive components of treatment may be difficult to implement due to declines in abstract thinking abilities with age. Consequently, modifications have been suggested for implementing cognitive treatment with older adults, such as the need to focus on concrete examples (Wilkinson, 1997), frequent repetition and summarising (Chand & Grossberg, 2013), and involving others to help with generalization (Koder et al., 1998). While this argument may stand for older adults with more severe cognitive impairment, recent evidence suggests that the majority of community-dwelling older adults are able to learn to use cognitive restructuring even after a very brief training period (Johnco, Wuthrich, & Rapee, 2013). Our results also suggest that older adults with depression and anxiety can benefit from reappraisal, which is a strategy used in cognitive restructuring that involves changing the meaning of negative appraisals by producing alternative interpretations. The results in paper one showed that clinical older adults recovered faster from anxiety than clinical younger adults when we accounted for their use of reappraisal. This finding lends support for the effectiveness of cognitive components in helping older adults manage negative emotions.

Similarly, results from papers 2 and 3 confirm that older adults with depression and anxiety exhibit a profile of negative cognitive biases including negative expectancies about the future, and negative interpretation of ambiguous information. Given that maladaptive cognition has been implicated in the development and maintenance of mood and anxiety disorders (Mathews & MacLeod, 2005), these results suggest that clinicians should be aware of these biases when working with older adults. Cognitive bias modification procedures have been designed to directly alter selective information processing biases that may underlie psychopathology. A number of studies have suggested that cognitive bias modification may be effective at altering interpretive bias and ameliorating state anxiety and depression in adults by training individuals to preferentially resolve ambiguity in a neutral or positive way (see MacLeod & Mathews, 2012 for reviews). However, no studies have investigated whether this strategy can effectively change interpretation biases in older adults. The findings in this thesis suggest that strategies such as cognitive bias modification training, that have been shown to be effective at reducing anxiety and depression may also have clinical utility in older adults.

Finally, findings from paper 4 suggest that avoidant coping is a strategy that contributes to greater symptom severity in both younger and older adults. Thus, older adults presenting for treatment are likely to exhibit the same pattern of maladaptive coping as younger adults. This is important to acknowledge so that treatment can be targeted appropriately. With the unfortunate reality of ageism that exists in western society (Nelson, 2002), clinicians need to be aware not to succumb to stereotypes and treat older adults seeking treatment differently to younger or middle age adults. Although the content of cognitions may differ across the lifespan based on age-related differences in life circumstances, the results from the current studies imply that the same mechanisms underlie emotional dysfunction in both younger and older adults. This suggests that the evidence based treatments that have been shown to be effective with younger adults should also be implemented with adults in the later stages of life.

Thesis Limitations and Directions for Future Research

The papers presented in this thesis have addressed three key factors that may account for increased wellbeing in older adults. However, due to a small sample size and a cross-sectional design, it was not possible to investigate the interaction between emotion regulation, interpretation biases and coping to determine how these interact to maintain wellbeing and/or contribute to psychological disorders in older adults. Future research should focus on integrating the theories and research techniques used across the emotion regulation, cognitive and coping fields, to get a better understanding of the interplay between these factors and mechanisms underlying them.

Understanding the link between cognition and emotion needs to be further investigated. The papers in the current thesis, as well as past research outlined in the introduction, provide substantive evidence for the positivity effect in aging. However this pattern stands in contrast to the large body of literature which documents age-related declines in other processes that are effortful and resource intensive, such as processing speed, working memory, long term memory and selective and divided attention (Park, 2012). The fact that gains in emotional functioning occur against this backdrop of cognitive decline raises interesting questions about the developmental changes in the interaction between emotional and cognitive processes. However, to date researchers of aging have often studied cognitive and emotional processes in isolation.

In fact, MacLeod and Bucks (2011) have recently outlined a need to develop a better synergy between the emotion regulation and the cognitive-experimental approach to emotional dysfunction. For example, they outline that it is just as likely that the breakdown of emotion regulation mechanisms contributes to emotional dysfunction, as it is that cognitive mechanisms underpinning emotional dysfunction serve to explain individual differences in the ability to regulate normal emotional experience. One direction for future research is to elucidate the mechanisms through which cognitive processes such as interpretation biases influence emotion regulation processes. For example, it could be that interpretive bias favouring negative resolutions of ambiguity predict the intensity of negative emotions and efficacy of emotion regulation attempts (e.g., Rude, Wenzlaff, Gibbs, Vane, & Whitney, 2002), or it could be that poor emotion regulation skills lead to biases in processing of ambiguous emotional stimuli. The cognitive emotion regulation approach also provides a way forward in differentiating automatic versus strategic emotion regulation. Most emotion regulation theorists have investigated effortful, goal-driven emotion regulation attempts. Specifically, in aiming to understand age differences in emotion regulation, participants have often been instructed to use particular regulation strategies, or else asked to indicate which strategy they used spontaneously to regulate negative emotions, as we did in paper 1. Although our study contributed to the gap in knowledge on spontaneous use of emotion regulation strategies and how these affect rate of recovery from negative emotions, this approach still only taps into conscious and strategic emotion regulation attempts. Cognitive-experimental methodologies, such as the dot-probe and eye-tracking (Isaacowitz, Toner, & Neupert, 2009; Lee & Knight, 2009, a thorough review of these methodologies is beyond the scope of this thesis) are better able to investigate the consequences of conscious versus unconscious cognitive emotion regulation processes and are fruitful ways forward in getting a better understanding of age difference in automatic emotion regulation strategies (Mauss, Bunge, & Gross, 2007). They can also elucidate the mechanisms that drive attentional, memory and interpretive biases, rather than simply detecting them. Clearly, more research on the intersection of emotion and cognition is required to understand the developmental changes driving the positivity effect.

The current thesis was limited by lack of power to compare gender differences. Although this was not the main focus of this thesis, research has found some differences between men and women on emotion regulation and coping strategies. For example, women have been found to report significantly higher emotional and avoidance coping styles than men. Women are also more likely than men to report using reappraisal and problem-focused coping (e.g., Blanchard-Fields, Sulsky, & Robinson-Whelen, 1991; Matud, 2004; Nolen-Hoeksema, 2012; Tamres, Janicki, & Helgeson, 2002). Given these differences it would have been beneficial to investigate if the age differences we observed across the four empirical studies were consistent for both women and men. Although we attempted to control for gender effects by including gender as a covariate in the emotion regulation and coping papers (papers 1 and 4), we cannot be sure that the conclusions drawn in this thesis are representative of both men and women.

Furthermore, we assessed a relatively young sample of older adults (age range 60-80, with mean age approximately 65), who were well educated and from a relatively affluent demographic area. The older adult samples were either treatment seeking or self-selected to take part in the research, which indicated that they had adequate resources, such as financial and functional ability to attend the research session. We cannot be sure whether the current findings extend to older adults who suffer from more severe resource limitations, limiting the generalizability of our findings. For example better educated adults have been found to report fewer physical symptoms and less psychological distress following exposure to daily stressors or hassles (Grzywacz, Almeida, Neupert, & Ettner, 2004). It would be important for the current findings to be replicated in a sample that includes older adults from a wider cross-section of society, including those of lower socioeconomic status and with a range of physical and/or social challenges. Similarly, not many studies distinguish between young-old and oldest-old populations, thus empirical evidence on changes that occur in positive and negative affect beyond the age of 80, and how these are influenced by emotion regulation, cognitive processing and coping is sparse. The oldest-old may have a profile of greater health and social difficulties which might cause declines in wellbeing. More research needs to compare age differences across the entire lifespan (young, middle-aged, young-old, and oldest-old) to better understand the developmental trajectories of emotion regulation, cognitive bias and coping mechanisms. With a trend of people living longer, it will be important to understand the emotional needs of the oldest members in our community.

Another limitation of the current thesis is that age differences in emotional functioning were addressed in the laboratory, which may not be representative of how the participants respond to emotional stimuli in the natural environment. Although the lab is advantageous in controlling the content and intensity of emotional stimuli to make clear group comparisons, research has also shown the importance of considering context. For example emotion regulation and coping attempts may be situation specific. Some affect regulation strategies may be more effective if carried out in social situations and some may be less effective if they are carried out alone, for example distraction (Augustine & Hemenover, 2009). Also in some situations it may not be appropriate to down regulate negative affect or up regulate positive affect, such as at a funeral. Research to date has not addressed age differences in affect regulation in specific contexts.

As well as investigating the role of context, our research, like most research in this area, has not adequately addressed individual differences in emotion regulation, cognition and coping. The addition of individual difference measure could lead to valuable conclusions regarding the emotion regulation, cognitive bias and coping processes. For example Mroczek, Spiro, Griffin, and Neupert (2006) reported that older adults higher in neuroticism are more reactive to stressors compared to middle age and younger adults. Because neuroticism is a personality component marked by heightened reactivity to daily stressors (Suls & Martin, 2005) and a more volatile emotional profile in general (e.g., anxiety, impulsiveness, and vulnerability domains; Costa & McCrae, 1988), it may be a potential confound to variables of primary interest in this thesis. Individual differences such as neuroticism, extraversion and emotional intelligence are related to nearly all aspects of affective experience including affect repair (Hemenover, Augustine, Shulman, Tran, & Barlett, 2008) and should thus be addressed in further studies of age differences in emotional wellbeing. Also the personal and social resources that individuals possess at entry to later life have been linked prospectively to their subsequent long-term coping trajectories (Brennan, Holland, Schutte, & Moos, 2012) and should also be considered in future research on trajectories of emotional development across the lifespan.

Finally, while strategies for regulating negative affect are certainly important, strategies that maintain positive affect are also of vital importance. There is a gap in the literature on studies investigating the strategies that people employ to maintain positive affect. Our data suggest that older adults are able to maintain positive affect for longer than younger adults; however we were not able to determine how they did this. It would be beneficial to understand the mechanisms behind prolonged positive affect as recent research has found that variability in positive emotional experiences is associated with poorer psychological health including lower wellbeing and life satisfaction, as well as greater anxiety and depression (Gruber, Kogan, Qoidbach & Mauss, 2012). Furthermore, Labouvie-Vief and colleagues (2003) propose that optimal emotional functioning involves not only optimising positive affect, but the ability to integrate positive and negative emotions. They believe that being able to experience mixed emotions, especially positive and negative contrasts (e.g., a mixture of joy and sadness), allows individuals to have a more complex and distinct sense of their individuality and also allows them to better tolerate negative feelings.

Conclusion

Although a vast amount of research is showing that older adults maintain a higher level of subjective wellbeing than younger adults, it is unclear which factors account for this. By comparing both community and clinical younger and older adults across three domains (i.e. emotion regulation of discrete emotions, interpretation biases and stress and coping), this thesis makes several important contributions to the understanding of emotional development in older adults. Healthy older adults appear to be able to maintain positive emotions, have positive interpretation biases and engage in less maladaptive coping than young adults. However, the pattern of functioning across these domains in the same for individuals with clinical levels of depression and anxiety, regardless of age, indicating that the same mechanisms underlie emotional difficulties in these age groups. This is an important consideration when selecting treatment options. Future research is required to investigate the causal pathways between emotion regulation and cognition in order to understand the mechanisms driving increased wellbeing in older age, as well as the mechanisms that contribute to emotional dysfunction across the lifespan.

Study Order

Please note the data for each of the empirical studies reported in this thesis was collected during one 3 hour experimental session at Macquarie University. Upon arriving to the laboratory young adult participants first completed a series of questionnaires in the following order: Demographics, Emotion Regulation Questionnaire, World Health Organisation Questionnaire- brief, Combined Uplifts and Hassles Scales, Depression, Anxiety and Stress Scale, Patient Health Questionnaire- 4, Kessler 10, Billings and Moos Coping Measure, and Coping Orientations to Problems Experienced Scale- Brief. Older adult participants completed all the questionnaires at home before the experimental session in the following order: Demographics, Emotion Regulation Questionnaire, World Health Organisation Questionnaire- brief, Combined Uplifts and Hassles Scales, Geriatric Anxiety Inventory, Geriatric Depression Scale, Patient Health Questionnaire- 4, Kessler 10, Billings and Moos Coping Measure, and Coping Orientations to Problems Experienced Scale- Brief. The questionnaires took approximately 50 minutes to complete. Older adults completed the Mini Mental Status Examination at the beginning of the experimental session.

All participants then completed the Expectancy Bias Task and The Interpretation Bias Task. These two cognitive tasks were counterbalanced between participants and took approximately 90 minuted to complete. All participants then completed the three mood inductions. The order of the three mood inductions (happy, sad and anxious) were counterbalanced between participants and took approximately one hour to complete. The cognitive tasks were completed before the mood inductions to prevent carry-over of fatigue or boredom which may impact the cognitive tasks which require concentration. The Responses to Emotions Questionnaire was completed by both younger and older adults after all three mood inductions were completed.

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APPENDIX 1

8/19/2014 Macquarie University Mail - Ethics application reference-5201000913- Final approva

MACQUARIE UNIVERSITY

Dusanka Tadic <dusanka.tadic@mq.edu.au>

Ethics application reference-5201000913- Final approva

Ethics Secretariat Thu, Nov 11, 2010 at 11:26 AM
To: Dr Viviana Wuthrich
Cc: Prof Ron Rapee Miss Dusanka Vujkovic

Dear Dr Wuthrich

Re: "An Age Comparison of Emotional Regulation Strategies: Evidence from Electrophysiology" (Ethics Ref: 5201000913)

Thank you for your recent correspondence. Your response has addressed the issues raised by the Human Research Ethics Committee and you may now commence your research.

The following personnel are authorised to conduct this research:

Dr Viviana Wuthrich- Chief Investigator/Supervisor
Miss Dusanka Vujkovic & Prof Ron Rapee- Co-Investigators

Please note the following standard requirements of approval:

1. The approval of this project is conditional upon your continuing compliance with the National Statement on Ethical Conduct in Human Research (2007).

2. Approval will be for a period of five (5) years subject to the provision of annual reports. Your first progress report is due on 15 September 2011.

If you complete the work earlier than you had planned you must submit a Final Report as soon as the work is completed. If the project has been discontinued or not commenced for any reason, you are also required to submit a Final Report for the project.

Progress reports and Final Reports are available at the following website:

http://www.research.mq.edu.au/for/researchers/how_to_obtain_ethics_approval/human_research_ethics/forms

3. If the project has run for more than five (5) years you cannot renew approval for the project. You will need to complete and submit a Final Report and submit a new application for the project. (The five year limit on renewal of approvals allows the Committee to fully re-review research in an environment where legislation, guidelines and requirements are continually changing, for example, new child protection and privacy laws).

4. All amendments to the project must be reviewed and approved by the Committee before implementation. Please complete and submit a Request for Amendment Form available at the following website:

http://www.research.mq.edu.au/for/researchers/how_to_obtain_ethics_approval/human_research_ethics/forms

5. Please notify the Committee immediately in the event of any adverse effects on participants or of any unforeseen events that affect the

https://mail.google.com/mail/u/0/?ui=2&ik=afaec9a2aa&view=pt&q=label%3Ato-keep%20ethics&qs=true&search=query&msg=12c3653a5f574aaf&siml=1... 1/2 continued ethical acceptability of the project.

6. At all times you are responsible for the ethical conduct of your research in accordance with the guidelines established by the University. This information is available at the following websites:

http://www.mq.edu.au/policy/

http://www.research.mq.edu.au/for/researchers/how_to_obtain_ethics_approval/human_research_ethics/policy

If you will be applying for or have applied for internal or external funding for the above project it is your responsibility to provide the Macquarie University's Research Grants Management Assistant with a copy of this email as soon as possible. Internal and External funding agencies will not be informed that you have final approval for your project and funds will not be released until the Research Grants Management Assistant has received a copy of this email.

If you need to provide a hard copy letter of Final Approval to an external organisation as evidence that you have Final Approval, please do not hesitate to contact the Ethics Secretariat at the address below.

Please retain a copy of this email as this is your official notification of final ethics approval.

Yours sincerely
Dr Karolyn White
Director of Research Ethics
Chair, Human Research Ethics Committee