

Colouring for wellbeing: Evidence and applications

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Synonyms: Mindfulness colouring, visual art, doodling, drawing, painting-by-numbers.

Definition: Colouring is the use of colour (through various art materials, including coloured pencils, felt-tip pens, pastels, watercolours, etc.), to fill the blank spaces in a pre-designed line drawing or design.

Colouring has been increasingly used by adults as a tool to reduce stress and anxiety and to increase mindful attention in recent years. Its popularity has been reflected in the production and sales of colouring books, downloadable colouring pages and colouring apps (Vanry, 2019), as well as the use of colouring to reduce anxiety in applied settings, such as cancer wards, patient waiting rooms, care homes, University libraries and primary schools (e.g., Blackburn & Chamley, 2016; Rigby & Taubert, 2016). While evidence for the role of the visual arts in general has burgeoned, suggesting multiple health and wellbeing benefits (Fancourt & Finn, 2019), colouring research is relatively nascent, and studies have increased exponentially in the last three years. Unlike other forms of visual art (e.g., free-form painting or drawing) colouring is highly structured, and as such, might serve specific purposes, for example, being an entry activity to art making for people who feel overwhelmed by a blank sheet of paper, or enabling absorption in a creative task when there is a no desire for complex and creative decision-making processes. This chapter will review the evidence base for colouring as a wellbeing intervention, focusing primarily on experimental studies, which have, thus far, examined its impact on anxiety reduction and mindful attention. Consideration will be given to the strengths and limitations of this evidence base and potential mechanisms to explain any wellbeing effects. The chapter will then move on to the application of colouring in practice (e.g., in hospital settings) before considering future directions.

Colouring for anxiety reduction

Anxiety is a normal and adaptive experience that orients us to potentially threatening situations. However, at high or chronic levels, anxiety (with its rumination, worry, hyperarousal and fear) can reduce quality of life, lead to burnout, and is a determinant of poor physical and mental health (Cohen, Edmondson, & Kronish, 2015; Pereira-Lima & Loureiro, 2015). Anxiety is highly prevalent in the general population, and lifetime prevalence of anxiety disorders has been estimated to be 11% (Remes, 2016), the treatment of which has a large economic burden (Konnopka & König, 2020). Alongside other activities (e.g., physical exercise and breathing exercises; Jorm et al., 2004), colouring has been suggested as a self-help tool to help reduce and manage symptoms of anxiety in everyday life, being accessible, easy to engage with, and inexpensive.

Colouring books for adults consist of intricate designs. The repetitive and aesthetic act of completing these is thought to be calming. Although a plethora of colouring templates are available, a common design is the mandala, a concentric, symmetrical, geometric pattern. Most of the research on colouring has asked participants to colour mandalas, probably due to their historical use as an object for concentrative meditation in spiritual traditions (Bühnemann, 2017) and because the creation of mandalas is recommended as a useful tool in art psychotherapy (Henderson, Rosen & Mascaro,

2007). Experimental studies on the immediate affective impact of colouring mandalas have often followed a similar protocol. In these studies participants have usually been undergraduate students who have been randomly allocated to condition, where they either colour (typically for 20 to 30 minutes) or do a comparative task (for example, free-style drawing or a non-art-based control activity, such as reading). Participants' state anxiety is measured before and after taking part in these activities (state refers to how people feel, think, or behave in a particular moment, whereas trait refers to how people typically feel, think, or behave). Several, but not all, studies have asked people to complete activities following a stress induction to examine whether colouring repairs mood (e.g., Curry & Kasser, 2005).

The first study of this kind (Curry & Kasser, 2005) reported that colouring a mandala significantly reduced self-reported anxiety, to levels lower than baseline (when participants arrived to take part in the study). Colouring also appeared to 'repair' anxiety, which increased after a stress induction (writing for four minutes about a fearful event in one's life) and decreased after colouring. A comparative activity, free-form drawing, failed to reduce anxiety following the stress-induction. Curry and Kasser suggested that the lack of direction about what to draw in the free-drawing condition may have been cognitively demanding and anxiety-inducing for some people. Subsequent studies have replicated this original finding, similarly, reporting that colouring mandalas can reduce self-reported anxiety, both with and without a prior stress-induction exercise (e.g., Carsley & Heath, 2018; Cross & Brown, 2019; Duong, Stargell & Mauk, 2018; Drake, Searight & Olson-Pupek, 2014; van der Vennet & Serice, 2012).

More recent research has sought to consolidate these findings by refining the methodology, for example, by including non-art-based control groups and by not relying solely on self-report measures, which might be sensitive to demand characteristics (where behavior, subconsciously or consciously, conforms to participants' perceived expectations of an experiment). Firstly, several studies have reported significant improvements in physiological and performance measures of anxiety after colouring: heart rate variability (Sandmire et al., 2016); heart rate and respiratory sinus arrhythmia (Turturro & Drake, 2020); pulse rate (Lee, 2018); and implicit fear (Holt et al., 2019). Further, Kaimal et al. (2018) reported increased blood flow activity in the medial prefrontal cortex while colouring, compared with rest periods, an area that is associated with inhibitory control of the stress response (sympathetic nervous system, SNS) (Crozier et al., 2011). These outcomes help to refute arguments that reporting biases, including expectation effects, may explain reports of reduced anxiety after colouring (where participants might suspect that they are expected to feel more relaxed after colouring and respond accordingly), and suggest that colouring reduces the activity of the SNS, a physiological stress response. Secondly, colouring a mandala has been found to be more effective at reducing self-reported anxiety than passive and active control activities: socializing in groups (Powell, Alcorn & Lindsay, 2017); reading (Holt, Furbert & Sweetingham, 2019); and solving logic puzzles (Flett et al., 2017); helping to isolate the anxiety-reduction effect to colouring. Further studies with non-art-based controls are required, since several studies (e.g. Drake et al., 2014; Duong et al., 2018; Kaimal et al., 2018; Turturro & Drake, 2020) have found that *all* art-based activities included in their research (e.g. colouring, doodling and drawing) have significantly reduced anxiety, making it difficult to rule out the role of contextual effects in these studies, such as experimenter effects, time away from study, or socializing in a relaxing space (for those studies where art activities are done in groups [e.g., Sandmire et al., 2016]).

While the use of colouring as an anxiety reduction technique is promising, questions remain. For example, it is not clear whether colouring is a useful intervention for people with very high levels of anxiety, or for chronic stress (rather than acute stressors). It is not known how long any wellbeing

effects of colouring might last for, or how often one may need to colour for (e.g., weekly frequency) to maintain any longer-term benefits. Flett et al. (2017) explored the longer-term impact of colouring, asking participants to colour once a day for one week. Evaluations of depression, anxiety and stress significantly decreased after that week (but not in a control group, who completed logic puzzles). This suggests that the immediate anxiety reduction benefits of colouring can result in a longer-term improvement in anxiety symptoms. However, further work exploring the impact of colouring on lived experience would be useful (e.g., considering sleep quality, salutogenic variables (wellbeing, happiness, etc.) and its impact over longer periods or time).

An additional unanswered question relates to whether the type of colouring design matters. Since research has mostly focused on mandala designs, it is not clear whether it is the colouring activity itself or the focus on a mandala pattern that is therapeutic. It has been suggested that focusing on the mandala, with its concentric design, is 'centering' and has an 'inherently calming' structure (Lee, 2018). A few studies have explored the impact of different designs on anxiety reduction, comparing colouring a mandala with colouring a geometric grid-design or a nature scene (Curry & Kasser, 2005; Drake, Searight & Olson-Pupek, 2014; Lee, 2018; Powell et al., 2017; van der Vennet & Serice, 2012). These have obtained mixed results, some finding mandalas to be more effective and others not (possibly due to small sample sizes). Given the wide variety of colouring books available, further research on what designs might reliably decrease anxiety would be useful (considering the role of people's preferences for certain types of design). For example, for older adults, many colouring books focus on images that promote reminiscence about times gone by, but these non-neutral designs may be calming for some, but not others, depending on personal memories, or might have different wellbeing impacts than anxiety reduction (e.g., fostering nostalgia) (Routledge et al., 2013).

Theoretical work has begun to focus on possible mechanisms to explain the potential anxiety reduction benefits of colouring, drawing on mechanisms used to explain the benefits of expressive writing and drawing (Drake, Hastedt, & James, 2016; Sloan & Marx, 2004). Since colouring differs from these art-based interventions in that it does not facilitate the free expression of emotions and ideas, and is therefore less likely to be cathartic or facilitate the creation of a new narrative in relation to stressful events, theories have focused on attentional mechanisms: distraction; flow; and mindfulness. In distraction as mechanism, colouring is proposed to engage attention, distracting people from worries and rumination, leading to the temporary 'suspension of inner dialogue', which consequently reduces stress and anxiety (Forkash & Drake 2017). A related attentional mechanism is the flow state, where colouring is thought to promote an engaged, autotelic, enjoyable and meaningful state of immersion, characterized by a loss of sense of self and time. The flow state does not simply reduce anxiety, but is characterized by enjoyment, motivation and engagement, and repeated experiences of flow are thought to be important for wellbeing (Bryce & Haworth, 2002). The flow hypothesis is supported by findings that positive affect is increased after colouring (as well as negative affect being decreased), as are scores on flow questionnaires (Drake et al., 2014; Forkash & Drake 2017; Holt et al., 2019). For both of these attentional states (distraction and flow), the repeated use of colouring, when feeling anxious, could be used as an emotional regulation tool in everyday life. Fredrickson's (2004) broaden and build model of emotion, where positive affective states broaden attentional capacity and increase creativity and problem resolution can be applied here. The model would predict that these affective and attentional state benefits of colouring could also improve wellbeing by improving one's capacity to solve problems in everyday life. Indeed, two studies have found that colouring has improved subsequent creativity: originality scores on figural divergent thinking tasks (which measure one's ability to produce numerous original responses to a stimulus in a short timeframe); and perceptions of one's own problem-solving ability (Holt et al., 2019; Kaimal et al., 2018), supporting this hypothesis. Longitudinal research exploring whether

experiences of distraction and/or flow, when colouring, predict emotional regulation and improved wellbeing in everyday life would help to deepen understanding of this potential process.

Attentional approaches are supported by findings suggesting that an optimal amount of structure is required for an anxiety reduction effect to occur, perhaps facilitating an optimal level of cortical arousal and attentional focus (Eastwood et al., 2012). Art activities with a lack of structure (e.g., free-style drawing) have not reliably reduced anxiety or promoted flow, in comparison with colouring (Forkash & Drake 2017). Conversely, too much structure (e.g., copying predetermined colors) has been found to be ineffective at reducing anxiety (Eaton & Tieber, 2017). Future work could profitably draw on flow theory to help understand these findings (Nakamura & Csikszentmihalyi, 2014.). Here it is proposed that in order to enter an absorbed attentional state, some autonomy and choice is required, alongside a balance between perceived challenges and skills. If a task too challenging (is too advanced for one's skill set) it is likely to lead to feelings of stress or anxiety. If a task is not challenging enough, conversely, it is likely to lead to boredom or frustration. According to this approach different people will require different levels of challenge, or complexity, in an art activity, in order for the flow state and anxiety reduction to occur. People will also require an increase in challenges over time, as their skills develop, in order to maintain a state of flow. Further research could explore these parameters.

An additional attentional mechanism that could arise from colouring is that of mindfulness. Colouring has been proposed to induce a state of concentrative meditation that not only quiets the 'chaotic mind', but promotes mindful attention, which may help people to be more mindfully aware in everyday life (Curry & Kasser, 2005). Here, the wellbeing benefit comes not from engaging with the material in a way that facilitates flow, but from using the colouring template as a tool to train, focus and concentrate attention. It is to this topic that we will now turn, since colouring is often referred to as 'mindfulness colouring' in colouring books and applications. Consequently, recent research has explored whether colouring really does improve mindfulness.

Colouring for improving mindful attention

Mandalas have long been objects for meditation in spiritual traditions (Bühnemann, 2017), hence it has been argued that the act of colouring mandalas, and focusing on abstract designs when colouring in general, might act as a form of concentrative meditation, promoting mindfulness. Mindfulness has been defined as "a process of openly attending, with awareness, to one's present moment experience" (Creswell, 2017, p. 493). Mindfulness consists of two elements: attention being focused on current experience, rather than one's mind unintentionally wandering; and an acceptance of, openness to, and detachment from this experience – having a non-judgmental attitude towards one's experience. Initial training of attention to remain focused on current experience can be effortful, but mindfulness meditation interventions have been associated with numerous physical and mental health benefits, including anxiety reduction (Creswell, 2017; Mantzios & Giannou, 2018). While the mechanisms behind these benefits of mindfulness meditation are not fully understood, both mindfully attending to lived experience and having a receptive and accepting attitude towards these experiences appear to be important for emotional regulation (Lindsay & Creswell, 2017).

Several studies have examined the impact of colouring mandalas, not only on anxiety, but also on self-reported mindful attention. Three of these studies have reported significant increases in state mindfulness after colouring (Carsley & Heath, 2018; Cross & Brown, 2019; Holt et al., 2019), but not

after taking part in a control activity: reading (Holt et al., 2019); and breathing exercises (focusing on one's breath) (Cross & Brown, 2019). Further, Holt et al. reported that following colouring, but not reading, performance was improved on a test of sustained attention, performance on which has also been improved after mindfulness meditation (Norris et al., 2018). However, two studies (Campenni & Hartman, 2020; Mantzios & Giannou, 2018) did not find that colouring increased state mindfulness. However, in these studies, state mindfulness was operationally defined in different ways, either as maintaining focused attention (e.g., Carsley & Heath, 2018) or as an awareness of, and acceptance of, broader experience in the moment (e.g., bodily sensations, emotions coming and going, etc.). It was for mindfulness defined as the latter for which colouring had no significant impact (Campenni & Hartman, 2020; Mantzios & Giannou, 2018). Mantzios and Giannou (2018) compared colouring with and without guided instructions on how to colour mindfully, noting that mindfulness exercises usually involve guidance. In one condition a researcher continuously narrated verbal instructions that advised people to relax, to concentrate on the colouring and to return to the colouring without judgement if one's attention wandered. Neither colouring activity significantly improved mindful attention. Participants only coloured for ten minutes in this research (rather than 20 minutes), which may have impacted on its efficacy. Campenni and Hartman (2020) found that colouring a mandala did not improve mindfulness overall, but did improve 'body mindfulness', which included awareness of one's posture, movements and sensations. Taken at face value, these findings suggest that at best colouring might promote sustained and focused attention, but not necessarily 'mindful attention' defined as 'present moment awareness'. It may be that colouring promotes the flow state more than mindfulness, at least in a single sitting. While flow and mindfulness both require focused attention, the flow state is characterized by 'losing oneself' in an experience, being fully absorbed by an activity (forgetting about body, self, environment and time), whereas mindfulness involves one's 'self' being fully present in an experience, with awareness of the components of one's experience (Sheldon et al., 2015). Thus far, the research findings suggest that colouring can be an engaging activity, rather than a mindful one, although this is not to say that colouring could not be used as a tool to develop mindfulness, with the right instruction and practice. An alternative explanation is that colouring promotes distraction through 'grounding' in sensory experience, through repetitive motor movements, observing sensorially pleasing colours and patterns, and visual and motor engagement with these (Malchiodi, 2019), perhaps similar to the soothing repetitive motor movements reported in knitting (Lampitt, 2018).

Further research has examined colouring in relation to dispositional mindfulness (one's *general* ability to stay focused on tasks and not be preoccupied in daily life, as well as accepting one's thoughts and feelings, rather than trying to suppress them). Flett et al. (2017) measured dispositional mindfulness before and after colouring every day for a week. Reports of mindfulness increased across the week in both a colouring group and a control group (who completed logic puzzles), but anxiety was only reduced in the colouring group. Flett et al. therefore suggested that colouring is not unique in improving mindful attention, and that mindfulness cannot explain the anxiety reduction benefits of colouring. More research exploring methods to help people develop mindfulness through colouring, following Mantzios and Giannou (2018), would be useful, exploring using different ways to deliver guidance (e.g., audio recordings or written instructions at the outset) and examining the impact of such practice longitudinally. Mindfulness is a skill that develops with practice. That Cross and Brown (2019) found significant improvements in state mindfulness (focused attention) after colouring, but not after focusing on one's breath, a traditional mindfulness meditation activity, might be due to a lack of expertise and the level of difficulty involved in each task. Qualitative research by Dresler and Perera (2019) explored the experiences of people who regularly used colouring, which supported this argument. Colouring was described as a calming,

enjoyable activity that provided a safe place to retreat from emotions and stressful thoughts, promoting “peacefulness and stillness”, “being in the now” and “just blocking everything else out” (p. 866), while meditation was described by some as frustrating and being too challenging to quiet inner speech. Hence, colouring might be an accessible entry activity that helps to focus one’s attention in the moment, but the development of dispositional mindfulness *might* require more attentional effort and practice.

Colouring in applied settings

Thus far most research on colouring as a wellbeing intervention has focused on undergraduate students and how colouring can help to reduce immediate anxiety. However, in recent years colouring has been tested in further contexts, for example, to examine whether it can reduce the test anxiety of school children or the anxiety of patients in hospital waiting rooms. Further, there is limited, but growing research on the benefits of colouring to improve the wellbeing of specific groups of people, such as those diagnosed with post-traumatic stress disorder and older adults. This section will briefly review the research conducted in applied settings and will consider future and broader uses of colouring interventions.

Although there are anecdotal reports of colouring being used as wellbeing activities on hospital wards (e.g., Rigby & Taubert, 2016), there is little research on the benefits of colouring in medical settings. However, three recent studies have examined its efficacy with patients, their relatives, and nurses. Robinson et al. (2018) examined whether colouring reduced the anxiety of parents in a paediatric surgery waiting room. Parent anxiety is high in this context and interventions to reduce parental anxiety have been recommended since it has been reported to predict post-operative outcomes for the child (e.g., pain) (Fortier, Del, Martin & Kain, 2010). Each day block randomization allocated parents to a typical 30-minute wait condition or colouring condition (choosing a preferred colouring design). Parents who coloured while waiting had significantly lower levels of self-reported anxiety after waiting than those who did not, although the impact of this on children’s postoperative wellbeing was not assessed. Similarly, Rajendran et al. (2020) examined whether colouring could reduce anxiety in emergency department waiting rooms, in which anxiety can be high due to long waiting times and overcrowding. Participants were screened if they were ‘flagged’ as being anxious by medical staff (it is not clear how this flagging worked) and were invited to participate in the study if they were subsequently found to have moderate to high scores on the Hospital Anxiety and Depression Scale (HADS). Participants were randomly allocated to either a ‘colouring pack condition’ consisting of various designs and 36 coloured pencils or a ‘placebo pack’ consisting of plain paper and a pen, with instructions to ‘draw or write freely’ (there were no instructions for the colouring pack). Participants were left with the packs for two hours, after which they completed the HADS again. Only those in the colouring group had significantly lower levels of anxiety at the end of this time frame. Further research has suggested that hospital staff might benefit from colouring too. Due to high levels of anxiety reported amongst nurses, especially those on medical-surgical or intensive care units, Maguire et al. (2020) examined the efficacy of colouring mandalas to reduce anxiety amongst medical-surgery nursing staff, who either coloured in their break or carried out their usual activities in their break. Again, those who coloured mandalas had significantly lower levels of anxiety at the end of their break than those who did not. Collectively, these studies suggest that colouring is a low-cost and low-risk activity that could be profitably used in hospital waiting areas and staff rooms to reduce anxiety. However, there may be self-selection processes at work in this research, and not all people in these settings might benefit from colouring. For example, half of invited participants in Rajendran et al. (2020)’s emergency department waiting room declined to participate

in the study, offering various explanations for not wishing to colour, such as considering it to be an activity for children or being in too much discomfort.

Since schools can be places of high pressure and stress for both staff and students, several studies have examined the role of colouring to reduce anxiety in educational settings. Anxiety surrounding tests and exams can be problematic for some children and adolescents, with ramifications on performance and wellbeing. Consequently, research has examined whether colouring prior to a test or exam can help by reducing this anxiety. Indeed, colouring has been found to reduce pre-test anxiety and increase state mindfulness of primary school children, secondary school children and undergraduate students (Carsley & Heath, 2018; 2019a; 2019b), and to reduce post-exam test anxiety of occupational therapy students (Burton & Baxter, 2019). Colouring has also been reported to reduce anxiety about mathematics courses amongst business undergraduate students (Salazar, 2019). However, whether any reduction of test anxiety by colouring impacts test performance is not known. Further, due to high stress levels and turnover of schoolteachers, the efficacy of colouring to reduce teacher anxiety has been tested (Czerwinski et al., 2020). Employing a wait-list control group design, teachers coloured for a period of five days, after watching an instruction video about how to colour mindfully. Teachers randomly assigned to the treatment group showed significantly reduced symptoms of stress, anxiety, depression and burn out, in addition to higher levels of dispositional mindfulness (Czerwinski et al., 2020). Although these studies lacked non-art-based control groups or active control groups and have relied on self-report measures in group settings, which might be sensitive to social desirability biases, these findings support the use of colouring in educational settings to reduce anxiety. However, again, research could help foster understanding of how to optimize such effects (e.g., frequency of colouring) and determine how or whether to support colouring as an activity with instructions.

There is very limited research on the use of colouring as a wellbeing intervention with specific mental health diagnoses, although this is not the case for art interventions and art psychotherapies more generally (Fancourt & Finn, 2019). Rodak, Alloway and Rizzo (2018) extended the research on colouring for anxiety reduction to veterans experiencing post-traumatic stress disorder (PTSD). Given that high levels of anxiety and stress can also impair cognitive functioning, Rodak et al. examined the impact of a colouring intervention on stress, anxiety and working memory. A repeated measures design was used where 24 veterans were screened for PTSD and, on different days, either coloured a mandala or took part in free-form drawing. Participants identified as experiencing PTSD had significant decreases in both stress and anxiety after the art activities, and an improvement on working memory tests (while remaining participants only showed a significant decrease in anxiety). For participants with PTSD anxiety was only significantly reduced in the colouring condition, and working memory only significantly improved in the free-drawing condition, suggesting that different art activities may serve different functions. Free drawing may promote more cognitive associations and the exploration of memories and ideas, while colouring might limit such cognitive wanderings (since choices are limited to those of colour, rather than searching for ideas about what to draw) and induce a calm focused state. Although, since this study had very small sample sizes, these differences may in part be due to a lack of statistical power. There is no further research on colouring with specific clinical groups. However, colouring has been recommended as a useful tool for art psychotherapists to embed within their practice (Kaimal et al., 2017). For example, it may be an accessible entry activity for those not confident with art making and be used to help clients regulate emotions, particularly after the expression of difficult or traumatic memories (Forkash & Drake, 2017) and help clients to refocus attention on the present (Holt, et al., 2019).

There is also a role for colouring as a wellbeing intervention for community groups. For example, colouring is advocated as a wellbeing activity for older adults (both generally, and for those diagnosed with dementia) (e.g., Alzheimer's Society, 2018) and colouring books and activity packs specific to this population abound (e.g., Active Minds, 2018). However, there is very little research to examine the efficacy of colouring for older adults, or other community groups in which colouring may be practiced (e.g., intergenerational playgroups or online colouring communities). Koo, Chen and Yeh (2020) examined the use of colouring to improve the wellbeing of community-dwelling older adults (aged 55 to 75 years). Participants who coloured a mandala for twenty minutes reported significantly greater reductions in anxiety than those in a control group (reading), supporting the anxiety reduction outcomes with university students (e.g., Curry & Kasser, 2005). However, it would be useful to explore whether there are also cognitive benefits of engaging in colouring for older adults, and whether colouring groups can help reduce feelings of social isolation. Further research on best practice with colouring for older adults would be helpful, such as the impact of reminiscence colouring templates on wellbeing, and the best materials to use if people have tremors, limited vision, or cognitive impairments. Research on the benefits of community colouring groups would also be informative, which may have benefits beyond anxiety reduction, such as pride in sharing completed work with others, reduced loneliness, and facilitating social ease, since moments of 'awkward silence' may be absorbed by mutual attention on the colouring activity. It could also be considered, for example, how colouring might be a shared activity for parents and children or foster interaction in intergenerational groups.

A final note on colouring and community interventions, which again, is observed in practice, but which has not been researched, is the potential wellbeing benefits of colouring as a form of craftivism (activism focused on socially conscious crafting, where art objects may be left in the world for people to find, spreading messages with positive and gentle intent). In recent months (March to June, 2020), in the context of the coronavirus pandemic, there has been a trend for colouring templates to be used to share messages of positivity (e.g. of hope for the future or support for keyworkers), which have been displayed in people's windows (BBC, 2020; I support the NHS, 2020). As such, colouring has been used not just to reduce anxiety or increase mindfulness, but to promote community wellbeing, resilience, and connection.

Conclusion

In recent years the evidence base for colouring as a wellbeing intervention has been steadily accumulating, and it supports the utility of colouring mandalas as a tool to reduce anxiety and improve attentional focus. Further research, with non-art-based control groups, is required to rule out contextual effects, and to identify the parameters by which this anxiety reducing effect might be best facilitated. In addition, better understanding of the mechanism behind any effect is required, which may be due to the structure of colouring designs enabling absorption and distraction from everyday worries. Longitudinal research on how repeated colouring may improve wellbeing and emotional regulation, would help improve understanding of such processes. Research has begun to examine how colouring could be used to reduce anxiety in applied settings, such as schools and hospital waiting rooms, with encouraging results, and further research on applications of colouring in community settings is warranted.

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