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Can Psychedelic Drugs Attenuate Age-Related Changes in Cognition and Affect?

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Abstract

Older adulthood can be characterized by various cognitive and affective changes. In general, older adults show declines in creativity and executive functioning. They also score lower in openness to experience, empathy, and many suffer from a paucity of meaningful experiences. Further, depression, pessimism, and suicide can be major concerns for this population. Although currently there are few interventions that can effectively address these changes, recent findings from psychedelic science suggest myriad parallels between the effects of these drugs and the cognitive/affective shifts seen in older adulthood. Studies have shown that psychedelics are associated with enhanced creativity and executive functioning. They can also lead to increases in openness and empathy, and induce personally meaningful experiences. Lastly, psychedelics' efficacy for treating mood disorders and their role in palliative care are rapidly growing areas of scientific research. In this article, we analyze findings from contemporary psychedelic studies and integrate them with research on cognitive/affective changes in older adulthood to assess whether these drugs have potential to be incorporated into older adult research. We also assess the intuitive follow-up questions of potential mechanisms of action and safety concerns. Findings indicate that psychedelics have effects on a number of cognitive/affective processes that are altered in older adulthood, and are relatively safe when used with professional preparation and supervision. Increased neuroplasticity, neurogenesis, connectedness, and mystical experiences have been argued to underlie cognitive/affective changes. However, further research is needed to overcome current experimental limitations such as generalizability, unstandardized dosages, inadequate controls, and self-selection/experimenter biases.

Keywords: psychedelics, cognition, affect, aging, well-being

Can Psychedelic Drugs Attenuate Age-Related Changes in Cognition and Affect?

A number of cognitive and affective changes have been documented in older adulthood, which is typically conceptualized as beginning in one's 60s (Salthouse, 2009). These changes can include declines in creativity and generating novel ideas (Price & Tinker, 2014), impaired executive functioning (Baudouin, Isingrini, & Vanneste, 2019), decreased openness to experience (Donnellan & Lucas, 2008), and decreased empathy (Gruhn, Rebucal, Diehl, & Labouvie-Vief, 2008). Further, although depression scores generally drop after early adulthood, late-life depression is one of the most common causes of emotional suffering in older adults (Blazer, 2003; Wang & Blazer, 2015), and the elderly have higher rates of suicide than younger adults (De Leo & Meneghel, 2001; Kumar, Anish, & George, 2015). These changes in negative affect may be due in part to a lack of meaningful experiences: Baum (1988) found that when elderly persons were asked to recount their most meaningful life experiences, none of the 50 participants reported an event after the age of 40. Lastly, the number of neurons in the brain decreases in older age as neurons that die off are not replaced as efficiently (Galvan & Jin, 2007). Because neurogenesis is thought to play a major role in age-related cognitive and affective deficits, interventions which stimulate neurogenesis may build-up a cognitive reserve which could help reduce the intellectual and emotional burdens in late-life (Xu, Yu, Tan, & Tan, 2015).

This is not to say that aging is inherently negative as many older adults experience high life satisfaction and emotional stability (Charles & Carstensen, 2010; Scheibe & Carstensen, 2010). Yet, risk factors for cognitive and affective decline can have a cumulative effect across individuals' lifespans ultimately leading to impairment (Camacho, Strawbridge, Cohen, & Kaplan, 1993; Zeki Al Hazzouri et al., 2014). Addressing these risk factors can stave off

cognitive decline (Mossello et al., 2008), and identifying holistic treatments which target multiple risk factors could facilitate healthy aging (Cesari, Vellas, & Gambassi, 2013). Thus, while older adults show changes in cognition and affect at the group-level, many variables can exert compensatory effects on individual trajectories (Smith, 2016).

Psychedelic drugs such as lysergic acid diethylamide-25 (LSD), psilocybin, and ayahuasca have been shown to induce alterations in cognition and affect that run counter to the changes seen in older adulthood. Research into psychedelic drugs blossomed in the mid-20th century but was put to a halt in the late 1960s as the War on Drugs emerged (Aday, Bloesch, & Davoli, 2019). However, the last 10–15 years has seen a renaissance of psychedelic research, and their public stigma seems to be waning as evidenced by recent positive pieces in mainstream media outlets (e.g., the *New York Times* Carroll, 2017; *Wall Street Journal* Pollan, 2018; *Business Insider* Brodwin, 2018) and successful decriminalization efforts in parts of the US (Aday, Davoli, & Bloesch, in-press). There are many parallels between the findings from these new studies and psychological changes in older adulthood. First, psychedelics have been shown to increase divergent (Kuypers et al., 2016) and convergent creativity (Uthaug et al., 2018). They can also lead to long-lasting increases in the personality trait of openness (MacLean, Johnson, & Griffiths, 2011) as well as increasing empathy (Pokorny et al., 2017). Psychedelic-assisted psychotherapy has been shown to have promising effects on depression (Griffiths et al., 2016; Ross et al., 2016). Relatedly, psychedelic use is associated with decreased psychological distress and suicidality (Hendricks et al., 2015). Psychedelics may also address the lack of meaningful experiences in older adulthood: In one study, two-thirds of participants reported their psychedelic session as being one of the top five most meaningful experiences of their life (Griffiths et al., 2006). Their role in palliative care is also a rapidly growing area of study

(Shelton & Hendricks, 2016). Lastly, there is emerging evidence in animal models that psychedelics can stimulate neurogenesis (Catlow, Jalloh, & Sanchez-Ramos, 2016; Lima da Cruz, Moulin, Petiz, & Leao, 2018; Morales-Garcia et al., 2017) and neuroplasticity (Ly et al., 2018), which may be key mechanisms facilitating improvements. Altogether, the reviewed literature suggests many parallels between cognitive/affective changes in older adulthood and the effects of psychedelic drugs. In this paper, we analyze recent findings in psychedelic research and synthesize them with studies on cognitive and affective changes in late-life to determine whether these substances have potential to be incorporated into older adult research.

Cognitive Parallels

Relative to younger individuals, older adults suffer deficits in cognition in areas such as memory and attention (Mok, Myers, Wallis, & Nobre, 2016). Older age can also be associated with declines in creativity and executive functioning, and these changes in cognition may impair one's quality of life (Baudouin et al., 2019). There is growing evidence that psychedelic drug use is associated with improved creativity and executive functioning, suggesting that these drugs may have potential cognitive benefits for older adults.

Anecdotal reports about psychedelics' potential for improving creativity date back to the first era of psychedelic research during the mid-20th century and were espoused by diverse figures—from Aldous Huxley to Francis Crick to the Beatles (Goodden, 2017; Sessa, 2008). Researchers soon picked up on the connection between psychedelics and creativity as demonstrated by myriad articles published during this period (e.g., Harman, McKim, Mogar, Fadiman, & Stolaroff, 1966; McGlothlin, Cohen, & McGlothlin, 1967; Zegans, Pollard, & Brown, 1967; see Sessa, 2008, for a review). Today, researchers are revisiting psychedelic drugs' potential for improving creativity. Kuypers and colleagues (2016) found that while under the

influence of ayahuasca, participants had increased divergent, but decreased convergent, creativity compared to their pre-ayahuasca session. These results contrast with another study which found improved convergent creativity after ayahuasca ingestion that lasted at least four weeks (Uthaug et al., 2018). In another study looking at non-acute effects, participants who partook in an ayahuasca retreat demonstrated enhanced creative expression relative to a control group similar in sex and age (Frecska, Móré, Vargha, & Luna, 2012). Finally, Prochazkova et al. (2018) found that when on "microdoses" of psychedelics (i.e., ~1/10th of a standard dose), participants had improved divergent and convergent creativity; however, the results must be interpreted with caution as participants were self-selected and not blind to conditions. It is also important to keep in mind that many of the aforementioned studies lacked adequate control groups given that it is difficult to blind participants between a consciousness-altering drug and placebo (Hendy, 2018). Additionally, it is unclear if these effects generalize to older adulthood because no studies to date have directly assessed psychedelics' effects on creativity in this population. The inconclusive results in the literature thus far can most likely be attributed to differences in timing (i.e., acute vs. non-acute effects) and dosage. However, the wealth of anecdotal reports and promising findings from preliminary empirical research suggest a relationship between psychedelic use and creativity. Thus, although more research is needed, psychedelic drugs may have the potential to compensate for declines in creativity in older age and stimulate new ideas or styles of thinking (Uthaug et al., 2018).

Psychedelics may also have effects on age-related cognitive changes in areas such as executive functioning. In a study examining regular ayahuasca users with controls who were similar in sex, age, education, and income, Buoso and colleagues (2012) found that the users performed better on the Stroop task, the Wisconsin Card Sorting Test (WCST), the Letter-

Number Sequencing task, and the Frontal Systems Behavior Scale. These findings suggest that psychedelic use is associated with increased working memory and set-shifting, which are two key components of executive functioning. Consistent with these results, another study found greater working memory performance in psychedelic drug users and a trend towards improved scores on the WCST relative to a control group that was matched for sex, age, income, and verbal and fluid intelligence quotient (IQ) scores (Buoso et al., 2015). Given the correlational nature of these studies, future experimental research is needed to delineate causation as well as test whether these improvements are maintained as individuals age. However, given that psychedelics stimulate plasticity (Ly et al., 2018) and enhanced plasticity has been shown to improve executive functioning (Selemon, 2013), there is reason to expect that psychedelics have a causal effect on executive function. These results, in tandem with studies on psychedelics and creativity, suggest that psychedelics may be able to attenuate some of the cognitive changes related to older adulthood.

Affective Parallels

A striking parallel between psychedelic drugs and older adulthood regards their connections with affective processing. As previously mentioned, late-life can be associated with a number of affective shifts, including changes in openness to experience (Donnellan & Lucas, 2008), empathy (Gruhn et al., 2008), pessimism (Chang et al., 2013), rates of depression/suicide (De Leo & Meneghel, 2001; Kumar et al., 2015; Wang & Blazer, 2015), and meaningful experiences (Baum, 1988). These affective changes can have considerable implications for overall well-being and quality of life in the elderly (Chang et al., 2013). For instance, treating depression decreases the severity of cognitive decline in the elderly (Mossello et al., 2008) and increased openness to experience is related to successful aging (Gregory, Nettelbeck, & Wilson,

2010). For those wanting to counter affective changes documented in older adulthood, evidence is mounting that psychedelics induce several opposing effects.

One affective change that has been consistently related to psychedelics is increased openness to experience. MacLean, Johnson, and Griffiths (2011) found that participants reported increased openness after a high-dose psilocybin session relative to a control methlyphenidate session, and these changes were maintained for at least one year. Although this study was limited by a selection bias (i.e., recruitment materials advertised that participants would be taking psilocybin), subsequent studies have replicated increased openness after psychedelic use (Buoso, dos Santos, Alcázar-Córcoles, & Hallack, 2018; Erritzoe et al., 2018; Lebedev et al., 2016). Studies in this area could also be tainted by experimenter bias: Given the stigma historically associated with these drugs, potentially only researchers with deep intrinsic interest in psychedelics would be willing to risk their professional credibility and resources by entering the field. This could bias the type of questions researchers study with the drugs (i.e., there could be a lack of studies on negative outcomes related to psychedelics). Lastly, it is possible that participants showed increased openness because they were on an illicit drug rather than because of psilocybin per se. That is, perhaps after having an enjoyable experience with something highly stigmatized, individuals may wonder what other stigmatized/disconcerting activities they should also be open to. Changes in openness may nevertheless have exponential downstream effects on other cognitive and affective outcomes, such as creativity (Silvia, Nusbaum, Berg, Martin, & O'Connor, 2009). Further, psychedelic use has been shown to increase emotional empathy (Pokorny et al., 2017), which may also be related to changes in openness. Speculatively, it seems that increased openness to experience could also increase the number of meaningful experiences

in older adulthood. In any case, the changes in openness induced by psychedelics seem to run counter to the changes seen in late-life.

Perhaps the most rapidly growing area of psychedelic research is in their treatment for affective disorders like depression (Griffiths et al., 2016; Carhart-Harris et al., 2016; Ross et al., 2016; Uthaug et al., 2018). Indeed, in the United States, the FDA recently designated psilocybin to "breakthrough therapy" status for treatment-resistant depression (Bauer, 2019), which should expedite future research in this area. Given the wide variety of negative outcomes associated with depression, this research could have important implications for older adults. In one stark example, Griffiths and colleagues (2016) found that following psilocybin-assisted psychotherapy, 80% of their depressed patients showed a reduction in symptoms that were maintained for at least six months after their sessions. Ross et al. (2016) concurrently found similar findings (i.e., 60–80% of patients had a reduction in symptoms 6.5 months after their sessions) in a rigorous double-blind, placebo-controlled, and crossover trial of cancer patients experiencing end-of-life distress. The findings from the Griffiths and Ross experiments are particularly pertinent to older adults given the average age in each of their studies was 56 years old. Further, while older adults are generally more pessimistic (Chang et al., 2013), psychedelic therapy has been shown to reduce pessimism and these changes are related to therapeutic outcomes with depression (Lyons & Carhart-Harris, 2018). Heightened emotion regulation has also been linked with healthy aging (Suri & Gross, 2012) and is increased in male psychedelic users compared to male non-users (Thiessen, Walsh, Bird, & Lafrance, 2018). Lastly, correlational research shows a negative relationship between psychedelic use and psychological distress and suicidal behaviors (Hendricks et al., 2015). Altogether, there is growing evidence

that these drugs induce changes in emotional processing that oppose many changes seen in late-life.

Another affective connection between psychedelics and older adults regards meaningful experiences. As previously mentioned, the elderly report a paucity of meaningful events in later life (Baum, 1988). Intuitively, a lack of meaningful experiences may be a contributing factor in pessimism, late-life depression, and increased rates of suicide in the elderly (Heisel & Flett, 2008). Indeed, low meaning in life has been linked with increased suicide ideation (Heisel & Flett, 2008), and interventions aimed at increasing meaning improve wellbeing in the elderly (Breitbart et al., 2015). Recent findings from psychedelic science suggest that psychedelic drugs may be able to treat this lack of meaningful experiences. In what is perhaps the seminal psychedelic study of the 21st century so far, Griffiths et al. (2006) found in their double-blind experiment that two-thirds of their participants rated their psilocybin session as being one of the top five most meaningful experiences in their life—comparable to events like the birth of a child or death of a parent. Further, 38% said it was one of their top five most spiritually significant experiences, and 79% of participants in this study rated that the experience improved their sense of well-being or life satisfaction "moderately" or "very much." The results illustrate that psychedelic drugs can induce experiences that are incredibly meaningful, even spiritual; this could have monumental implications for older adults suffering from a lack of meaningful experiences.

Relatedly, psychedelics' effects on end-of-life distress and palliative care is another area of current study (Kelmendi, Corlett, Ranganathan, D'Souza, & Krystal, 2016; Shelton & Hendricks, 2016). Although this line of research was predated by similar studies in the first era of psychedelic research (e.g., Cohen, 1965; Fisher, 1970; Grof, Goodman, Richards, & Kurland,

1973), improved experimental methodology has greatly advanced our understanding of the role psychedelics can play at the end-of-life. The first study in this area during the current era of psychedelic research was a double-blind, placebo-controlled pilot study which showed modest improvements in measures of well-being (Grob, Danforth, & Chopra, 2011). Though limited by a small sample and relatively low dosage of psilocybin, the study was important in reestablishing proof-of-concept and safety protocols. More rigorous studies followed in 2016 as both Griffiths et al. and Ross et al. found robust decreases in measures of end-of-life distress. Finally, another study found that, in a dose-dependent manner, psilocybin treatment led to increases in life satisfaction, positive attitudes about life, and spirituality (Griffiths et al., 2011)—which can be critical factors in healthy aging that buffer against emotional distress (Grob, Bossis, & Griffiths, 2013).

Potential Mechanisms

Given the sheer number of cognitive and affective changes that have been related to psychedelics, they are each likely supported by distinct and overlapping mechanisms. In this section, we touch on the potential mechanisms underlying the previously-mentioned alterations in cognition and affect associated with these substances.

Psychedelic drugs exert their acute effects predominantly through serotonin 5-HT2A receptors (Preller et al., 2017; Vollenweider, Vollenweider-Scherpenhuyzen, Bäbler, Vogel, & Hell, 1998). These receptors are widely distributed in the cortex, explaining the diverse effects of psychedelics, and play a key role in memory and cognition (Zhang & Stackman, 2015). In animal studies, 5-HT2A activation has led to increased cognitive flexibility as well as associative learning (Carhart-Harris, Kaelen, & Nutt, 2014). Therefore, psychedelics may also affect cognitive flexibility, which could explain their effects on creativity, executive functioning (i.e.,

set-shifting), openness, and depression. Indeed, Jungaberle et al. (2018) noted that cognitive flexibility is generally heightened in psychedelic states. Carhart-Harris et al. (2014) proposed an exhaustive model of the effects of psychedelic drugs that begins at the 5-HT2A receptor level and builds into the desynchronization of higher-level networks in the brain (see Carhart-Harris, 2018, 2019, for further discussion of the entropic brain hypothesis).

Another—more speculative—explanation for the cognitive changes related to psychedelics is increased neurogenesis and neuroplasticity (Lima da Cruz et al., 2018). Decreased neurogenesis is thought to be a key factor underlying declines in cognition in older adults as neurons that die off are not replaced as efficiently (Galvan & Jin, 2007; Xu et al., 2015). Additionally, Goh and Park (2009) argued that enhanced neuroplasticity could act as a compensatory response in the aging brain, and they suggested that interventions should be identified that can stimulate plasticity. Psychedelic drugs are intriguing candidates for inducing these critical changes in the brain. Several studies in recent years have shown that administering psychedelic drugs in vitro (Catlow et al., 2013) and in vivo (Catlow et al., 2016; Lima da Cruz et al., 2018; Morales-Garcia et al., 2017) stimulates neurogenesis. Further, a recent paper in *Cell Reports* demonstrated that psychedelics increased neuroplasticity and synaptogenesis (Ly et al., 2018). However, this mechanism remains uncertain until the results are replicated in human samples. Increased neurogenesis and neuroplasticity could explain some of the affective changes that have been related to psychedelics. Atrophy of prefrontal cortex neurons is thought to be a contributing factor to depression (Christoffel, Golden, & Russo, 2011; Ly et al., 2018), and Jacobs et al. (2000) speculated that enhancing neurogenesis could aid in the recovery from depression. Given that relatively few interventions have been identified that can increase neurogenesis and plasticity, psychedelic drugs' potential in this domain is an important area of

future research and this mechanism could contribute to the cognitive and affective changes (Vollenweider & Kometer, 2010).

Some have argued that the increased sense of connectedness resulting from psychedelics underlies much of their therapeutic potential (Carhart-Harris, Erritzoe, Haijen, Kaelen, & Watts, 2018). Individuals often report a profound sense of "oneness", ego dissolution, and a loss of a sense of self while on the drugs (Lebedev et al., 2015). Validating these anecdotal accounts, several recent studies have shown that the default mode network (DMN), which is fundamental in maintaining a sense of self, is deactivated while on psychedelics (Carhart-Harris et al., 2012; Palhano-Fontes et al., 2015; Smigielski, Scheidegger, Kometer, & Vollenweider, 2019). Millière and colleagues (2018) argue that the functional disintegration of the DMN during psychedelic states can drastically alter aspects of consciousness through transient decreases in self-referential thought and access to autobiographical information, leading to alterations in one's sense of self-identity. This shift in perspective may underlie changes in openness and empathy as individuals become less self-centered and more open to new ways of thinking. Indeed, changes in ego dissolution predicted subsequent increases in openness (Lebedev et al., 2016) as well as positive therapeutic outcomes (Griffiths, Richards, Johnson, McCann, & Jesse, 2008; Ross et al., 2016). Given that depressed individuals are characterized by more self-referential cognitions and increased DMN activity (Sheline et al., 2008), these changes in one's sense of self seem to be an important mechanism underlying clinical changes associated with psychedelic drugs.

Finally, the degree to which one has a "mystical" experience while on the drugs predicts therapeutic outcomes (Garcia-Romeu et al., in-press; Garcia-Romeu, Griffiths, & Johnson, 2014; Griffiths et al., 2016; Roseman, Nutt, & Carhart-Harris, 2018; Ross et al., 2016; Russ, Carhart-Harris, Maruyama, & Elliot, in-press; Schmid & Liechit, 2018) as well as changes in openness

(MacLean, Johnson, & Griffiths, 2011). Mystical experiences are marked by a profound sense of meaning/sacredness, interconnectedness with others and the world, transcendence of time and space, ineffability, and a deep positive mood (Grob, Bossis, & Griffiths, 2013; Kelmendi et al., 2016). Deactivation of the DMN seems to be one component in having a mystical experience (Swanson, 2018), which may explain their shared therapeutic outcomes. Declines in DMN activity are consistent with the decreases in self-referential processing as well as feelings of spacelessness and timelessness associated with mystical experiences (Barrett & Griffiths, 2017). Griffiths et al. (2011) found that the dosage of psilocybin which yielded the highest probability of a mystical experience was also the dosage participants reported as the most personally meaningful, spiritually significant, and the session which they would most want to repeat given the opportunity. Similarly, Grob et al. (2013) argued that the mystical experience is critical in mediating psychedelic-related benefits, particularly in palliative care. They hypothesized that the patient's self-image can be "recalibrated" during this time of transcendence, such that they adopt a broader existential perspective and the concept of death is less anxiety-provoking. Psilocybin's tendency to increase a sense of continuity after death (Griffiths et al., 2011) may also be contributing to declines in end-of-life distress.

Safety

A natural concern when considering administering illicit drugs is safety. It is not recommended for seniors (or anyone) to take these substances unsupervised or without professional medical consultation. The tendency for psychedelics to induce acute increases in blood pressure, body temperature, heart rate, plasma cortisol, and epinephrine should be considered by consulting physicians (Nichols, 2016). Current researchers put a strong emphasis on mentally preparing individuals for the experience, and they stress that the benefits derived

from psychedelic-assisted psychotherapy sessions may not generalize to recreational psychedelic use (Honig, 2019). That being said, correlational studies have shown that psychedelic use is not linked to mental health problems or suicidal behavior (Johansen & Krebs, 2015), and their use is linked to reduced psychological distress and suicidality (Hendricks et al., 2015). Further, Buoso et al. (2012) found that regular ayahuasca users scored lower on every psychopathology measure they administered compared to non-users who were similar in sex, age, education, and income. When evaluating the abuse potential of psilocybin according to the 8 factors of the U.S. Controlled Substances Act, Johnson et al. (2018) concluded that there is limited harm associated with the drug. Lastly, rather than being a gateway drug, psychedelic users are at a 40% reduced risk of abusing opiates in the last year (Pisano et al., 2017), and they haven't been shown to induce dependence (Rucker, Jelen, Flynn, Frowde, & Young, 2016). Given the rapidly rising rates of opiate abuse in older adults (SAMHSA, 2017), this could be another potential benefit for this population. This is not to say that psychedelics are risk-free; they can induce experiences that are incredibly psychologically challenging, particularly when used in the absence of proper "set" and "setting" (Barrett, Badstreet, Leoutsakos, Johnson, & Griffiths, 2016). However, limited harm has been reported in the new era of psychedelic research, which utilizes rigorous preparation, support, and integration procedures. Indeed, Ross and colleagues (2016) noted that in the new era of psychedelic research, over 2000 participants have been run through carefully monitored sessions with zero long-term aversive side effects reported (see Johnson, Richards, & Griffiths, 2008 for safety guidelines).

Future Directions

There are several logistical and practical concerns that must be addressed to implement psychedelic treatment for age-related changes in cognition and affect. First, researchers need to

identify when the best time is for individuals to take these substances to maximize their therapeutic properties. Perhaps taking them in early adulthood can buffer against downstream effects from chronic traits that psychedelics have been shown to change (i.e., creativity, executive functioning, openness to experience, depression, pessimism). On the other hand, it is still unclear how long psychedelic-related changes in cognitive/affective processing are maintained. While several contemporary studies have demonstrated changes lasting for at least a year (Gasser et al., 2014; Gasser, Kirchner, & Passie, 2015; Griffiths et al., 2008, 2011) and there is evidence that some changes endure as long as 25 years after a single session (Doblin, 1991), other studies suggest that "booster" sessions may be valuable (Barbosa, Cazorla, Giglio, & Strassman, 2009; Noorani et al., 2018). It seems likely that more robust longitudinal studies will emerge as the number of experimental studies has skyrocketed in recent years, and these can inform researchers about optimal timing, dosage, and number of sessions required.

The extent to which all of these changes generalize to older adults is another remaining question. Given the unique changes and life challenges associated with older adulthood, the treatments designed for younger individuals would not be expected to always be appropriate for older adults (and vice-versa). For example, treatments like cognitive behavioral therapy (CBT) for mental illness are equally effective in younger and older adults, but administered differently (Laidlaw, 2014). Older adult CBT focuses on additional concerns such as mobility, bereavement, loneliness, and medical issues that are not common concerns for younger adults. In the same way, psychedelic treatment for young adults may differ in its implementation compared to older adults, and this warrants future study. In any case, some contemporary psychedelic studies have incorporated older adults and demonstrated a variety of positive outcomes (Griffiths et al., 2016;

Ross et al., 2016); thus, there is emerging evidence that administering psychedelics during late-life can lead to cognitive and affective changes.

Conclusion

In short, the reviewed literature demonstrates robust theoretical links between psychedelics and changes in cognition and affect associated with older age. Though many older adults suffer declines in creativity and executive functions, psychedelics have been shown to boost creativity and have been related to improved executive functioning. Older adulthood has also been associated with reduced openness to experience, empathy, and meaningful experiences, all of which can be increased by psychedelic drugs. Their compelling therapeutic potential for depression, pessimism, suicide, and palliative care may also be of benefit to the elderly. Enhanced neurogenesis, neuroplasticity, connectedness, and mystical experiences have been argued to underlie many of the cognitive and affective changes. Finally, recent studies endorse that these drugs are relatively safe when used with professional preparation and supervision. Given that several of these studies have utilized older adults, it seems that they can be implemented into this population. Altogether, the prior research supports that using psychedelics to treat age-related changes in cognition and affect can be a viable, and likely impactful, area of study. This review proposes a novel area of research, and the findings from our critical analysis of the background literature reveal that researchers should consider self-selection biases, experimenter biases, standardized dosages, control groups, and generalizability to improve future experimental methodology in psychedelic science.

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