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Why is authenticity associated with being and acting extraverted? Exploring the mediating role of positive affect

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ABSTRACT

Extraversion is linked to higher levels of authenticity. Why? Across four studies, we examined positive affect as a potential mediator. In Study 1 ($N = 205$), we tested our mediation model at the trait level. Then, focusing on the within-person state level: Study 2 ($N = 97$) involved a 10-week lab-based experience sampling protocol; Study 3 ($N = 147$) involved a preregistered week-long daily-life experience sampling protocol; and Study 4 ($N = 129$) involved a two-week naturalistic experience sampling protocol. In all four studies, positive affect explained moderate to high proportions of the effects of extraversion on authenticity (Study 1 = 29%, Study 2 = 38%, Study 3 = 87%, Study 4 = 86%). We discuss several theoretical interpretations.

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Psychological wellbeing is a multidimensional construct that broadly encapsulates (a) feeling good and (b) functioning well (Keyes & Annas, 2009). Researchers sometimes draw a sharp distinction between these two conceptions of wellbeing (Huta & Waterman, 2014; Kashdan et al., 2008; Ryan & Deci, 2001). In this view, *Hedonia* is typically operationalized as subjective wellbeing – the balance of positive and negative affect, as well as a global judgment of life satisfaction (Diener, 2000). *Eudaimonia* encompasses a wider range of constructs, including personal growth, meaning, virtue, relationships and engagement (Huta & Waterman, 2014; Kashdan et al., 2008). Notably, large scale studies using cutting-edge psychometrics have established these domains as empirically distinguishable (Joshanloo, 2016). Others debate the idea that these dimensions can be separated cleanly but still note the value of looking at multiple dimensions of well-being (e.g., Disabato et al., 2016; Kashdan et al., 2008). Supporting this idea, different dimensions of well-being typically have different correlates (e.g., Anglim et al., 2020; Sun et al., 2018). *Authenticity*, the focus of the current paper, is a core element of nearly all definitions of wellbeing (Huta & Waterman, 2014). Thus, understanding the conditions under which people feel most authentic may have broader implications for fostering wellbeing.

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In memory of Will Dunlop: radiant personality psychologist, generous colleague and friend, gone too soon.

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Note that throughout this paper, we refer to our constructs of interest (authenticity, extraversion, positive affect) at the trait level and state level. Traits are enduring and relatively stable individual differences in affective, behavioral, cognitive, and motivational characteristics (Revelle, 1995). We adopt the definition of a state commonly used in personality research: a short-term manifestation of the psychological content (e.g., affective, behavioral, cognitive, motivational) of its respective trait (Fleeson, 2001; Jayawickreme et al., 2019).

Subjective authenticity

We focus on subjective authenticity, which may be defined as the perception or feeling that one is behaving or feeling true (vs. false) to oneself (Fleeson & Wilt, 2010). Whereas claims to the existence of an objective, "true self" may be unfalsifiable (Waterman, 1984), subjective authenticity is in line with the conceptualization of the "true self-concept" presented by Schlegel and colleagues (Schlegel & Hicks, 2011; Schlegel et al., 2009, 2013): The true self-concept refers to cognitive schema, beliefs, and feelings about which aspects of one's self-concept reflect true, core characteristics. Aspects of the self-concept that may be considered as reflective of one's true self include traits (Fleeson & Wilt, 2010), values (Smallenbroek et al., 2017), roles (Sheldon et al., 1997), feelings (Lenton et al., 2013), relational functioning (Wickham et al., 2015), and social identity (Schmader & Sedikides, 2018), among others (Jongman-Sereno & Leary, 2019). Thus, subjective authenticity occurs when one judges or feels that one is acting in line with some aspect of the true self-concept. Note that this judgment may be independent from enacting typical traits, values, roles, etc.; rather, it is a judgment about the alignment of one's current way of being with one's true way of being. This conceptualization of authenticity is featured in the most prominent trait measures of authenticity (Kernis & Goldman, 2006; Wood et al., 2008) and used exclusively in burgeoning research on state authenticity (Lenton et al., 2016; Sedikides et al., 2017). Previous research tested the hypothesis that people may feel heightened state authenticity when they behave in line with their personality traits (Fleeson & Wilt, 2010). The rationale for this test is that if a person's actual trait levels are part of the true self-concept, then behavior in line with the trait should feel authentic; for example, a trait introvert should feel more authentic when they are acting relatively introverted (vs. extraverted). But contrary to this intuitive view, a series of studies found that people felt most authentic in moments when they enacted higher levels of state extraversion, agreeableness, openness, conscientiousness, and emotional stability, *regardless* of their dispositional levels of these traits (Fleeson & Wilt, 2010). These results suggested that there is something about the content of those personality states, regardless of a person's trait level, that feels authentic.

The present research focuses primarily on state extraversion and examines whether state positive affect (PA) may explain why state extraversion is associated with greater state authenticity. We focused specifically on extraversion for three main reasons. First, compared to the other Big Five traits (agreeableness, conscientiousness, emotional stability, openness), extraversion has a uniquely robust correlation with PA that has been established over decades of research and many studies (see Anglim et al., 2020; Wilt & Revelle, 2016). Second, the causal association between state extraversion and state PA has been demonstrated repeatedly (e.g., Fleeson et al., 2002; Jacques-Hamilton et al.,

2019; McNiel & Fleeson, 2006; McNiel et al., 2010), whereas there is no causal evidence linking other Big Five states to PA. Third, as discussed in the next section, there is interest and controversy surrounding the idea that extraverted behavior may be beneficial to introverts' wellbeing, whereas this interest is less salient for other Big Five states that have a more clearly socially desirable (vs. undesirable) pole (e.g., agreeableness vs. disagreeableness). Nevertheless, we also explored whether PA mediates the associations between other Big Five traits and states with authenticity (see the Supplemental Materials). We focused on PA instead of negative affect (NA) because extraversion is more strongly linked to PA than NA, with some evidence indicating that extraversion is independent of NA (e.g., McNiel & Fleeson, 2006; Rusting & Larsen, 1997).

Extraversion, wellbeing, and authenticity

Extraversion is a basic trait domain of personality (John et al., 2008). Those scoring high on extraversion (*extraverts*) tend to be talkative, assertive, and sociable, whereas low scorers (*introverts*) tend to be quiet, unassertive, and reserved. Extraversion can also be described at the *state* level – the extent to which a person is talkative and sociable in any given moment, or over a short period of time (Fleeson, 2001). According to the density distribution perspective (Fleeson, 2001; Fleeson & Gallagher, 2009), personality traits manifest as personality state distributions. For extraversion specifically, there is evidence that scores on trait questionnaires correspond closely to aggregated state measures (Rauthmann et al., 2018), suggesting that an "extravert" is simply a person who tends to act more extraverted, more often, than an "introvert." This is the view we adopt in the current paper.

The association between trait extraversion and many dimensions of wellbeing (Anglim et al., 2020) can potentially be explained in terms of extraverted states (Blackie et al., 2014; Fleeson et al., 2002). That is, because extraverted states are associated with greater wellbeing in the moment, extraverts may have higher well-being because they tend to act more extraverted more often than introverts (Wilt et al., 2012). In line with the extraverted states view, experiments demonstrate that introverts can reap the affective benefits of being an extravert simply by *acting* more extraverted (Fleeson et al., 2002; Sun et al., 2017; Zelenski et al., 2012).

Despite the apparent benefits of enacted extraversion on wellbeing, an important question is whether dispositional introverts suffer any repercussions from acting more extraverted. A key tenet of free trait theory (Little, 2008) is that extended periods of free-traited (i.e., counterdispositional) behaviors may have negative consequences for emotional and physical health. Introverts instructed to act more extraverted within laboratory studies do not appear to experience increased negative affect (McNiel et al., 2010; Zelenski et al., 2012, 2013), nor impaired self-regulation and cognitive functioning (Gallagher et al., 2011; Zelenski et al., 2012). However, these studies did not investigate effects of acting extraverted on authenticity. It seems intuitive to expect that it would feel inauthentic to act "out of character" (i.e., against one's natural tendencies). A reserved, quiet person channeling an ebullient party animal might not feel true to herself and may even feel confused about who she "really is" (Little, 2008). Indeed, Fleeson and Wilt (2010) found that an overwhelming majority of participants believe that people will feel most authentic when acting in line with their dispositional traits (i.e., the *trait-consistency*

hypothesis); for example, 88% of participants believed that introverts would feel most like themselves when acting introverted. These intuitions have also taken flight in popular culture, with one best-selling author warning introverts against the "inauthenticity" of acting extraverted (Cain, 2012, ch. 9). Thus, logic appears to favor the trait-consistency hypothesis, that acting more extraverted may decrease authenticity for more introverted individuals.

The trait-consistency hypothesis has also received theoretical and empirical attention in personality science. An essentialist view of traits, which posits that traits are integral to who one is as a person (McCrae & Costa, 1994), suggests that people should feel most true to themselves when they are true to their traits. One early study also found that people retrospectively reported feeling more authentic in roles in which they reported acting in line with their traits (Sheldon et al., 1997). Further, a recent study found that debating against the value of one's trait level of extraversion (e.g., introverts asked to argue against the value of introversion) decreased felt authenticity but did not change affect (Bossom & Zelenski, 2022). However, Fleeson and Wilt (2010) found that acting in accordance with one's dispositional trait levels was not necessarily associated with feelings of authenticity. Across three experience sampling studies, participants reported feeling more authentic in moments when they reported acting more extraverted, regardless of their trait level of extraversion (as measured using the items from the Big-Five adjectives markers extraversion scale; Goldberg, 1992). Thus, introverts paradoxically felt truer to themselves when they were acting out of character – that is, in more extraverted ways than usual.

Fleeson and Wilt's (2010) unexpected finding was echoed by results from three subsequent studies (Ching et al., 2014; Cooper et al., 2018; Sherman et al., 2012). The first shows that, across five cultures, people perceived that their behavior in everyday situations was more "freely chosen and consistent with my true interests and values" when they were acting more extraverted (Ching et al., 2014). The second study found that overall congruence – the degree to which a person behaved in line with their personality traits – only predicted psychological adjustment for people with normative (i.e., typical) personalities (Sherman et al., 2012). Finally, another experience sampling study found that higher levels of state extraversion predicted greater state authenticity, whereas a measure of trait – behavior consistency (based on discrepancies between Big Five traits and their state expressions) did not (Cooper et al., 2018).

In contrast with these correlational studies, a recent randomized controlled trial revealed that highly introverted participants who were instructed to act more extraverted in their daily lives reported lower levels of authenticity at the end of the study. However, this apparent cost of enacted extraversion did not emerge in experience sampling measures during the study (Jacques-Hamilton et al., 2019). Taken together, these findings may suggest that counter-dispositional behavior is beneficial in the short term but costly over longer timeframes.

Positive affect as an explanation

Why might most people – even introverts – feel more authentic when they act more extraverted? We suspect that the well-established link between extraversion and PA may help to explain this seemingly paradoxical finding. PA is an affective dimension including positive states that reflect high levels of activation (e.g., excited, elated) (Watson &

Tellegen, 1999). An extensive amount of research shows that extraverts experience higher levels of PA (e.g., Lucas & Fujita, 2000; Smillie et al., 2015). Some theorists even include PA as a facet of extraversion (Lee & Ashton, 2004; McCrae & Costa, 1992) or conceive of PA as the affective core of extraversion (Watson & Clark, 1997). Further, there is experimental evidence that engaging in extraverted behavior yields increased PA for extraverts and introverts alike – both in laboratory settings (Fleeson et al., 2002; Smillie et al., 2015) and in daily life (Jacques-Hamilton et al., 2019; Margolis & Lyubomirsky, 2020; van Allen et al., 2021). This latter evidence is important for establishing the causal effect of extraverted behavior on PA.

The literature contains a few prominent explanations for why extraversion may lead to PA at the trait level. First, temperamental explanations focus on fixed mechanisms (Rosenberg, 1998). Examples of fixed explanations are the idea that extraverts simply have a higher baseline level of PA (Gross et al., 1998) and that introverts and extraverts react differently to PA-inducing stimuli – regardless of how they behave (Smillie et al., 2012). In contrast, the sociability hypothesis is based more on what extraverts do, as it states that extraverts exhibit higher levels of PA because they engage in more social behaviors, which lead to PA (Argyle & Lu, 1990). And a more general behavioral explanation is that trait extraversion is linked to higher trait PA through more frequent enaction of extraverted states (Wilt et al., 2012). Explanations for the state level association include social contribution (Smillie et al., 2015; Sun et al., 2017) and rate of progress toward goals (Wilt et al., 2017). Theories continue to be tested and refined (e.g., Smillie et al., 2015), but what is clear and relevant to this paper is the strong empirical and theoretical support for the idea that extraversion leads to greater PA.

There are also well-established links between PA and subjective authenticity, in both cross-sectional (Ito & Kodama, 2007; Sheldon & Kasser, 1995; Wood et al., 2008) and daily diary studies (Heppner et al., 2008). Using a narrative methodology, Slabu et al. (2014) found that narratives of "most me" experiences contained more PA words than narratives of "least me" and control conditions, across four cultures. Similarly, narratives of an "authenticity scene" (i.e., memory about feeling highly authentic) included more themes reflecting contentment (e.g., enjoyment and relaxation) than narratives of an "inauthenticity scene" (i.e., memory about feeling highly inauthentic) and an "emotionally vivid scene" (i.e., memory including strong emotions) (Wilt et al., 2019). Although this relation is often interpreted as an effect of authenticity on PA (Goldman & Kernis, 2002; Sutton, 2020; Wood et al., 2008), longitudinal studies suggest that bi-directional effects are plausible (Reinecke & Trepte, 2014). The strongest evidence for our proposed directionality comes from three mood induction studies showing that participants felt more authentic after being induced into a more positive vs. negative mood (Lenton et al., 2013). Further, recalling memories about acting in congruence with one's values is also associated with increases in positive affect (Smallenbroek et al., 2017). This provides experimental evidence for the notion that PA can increase perceptions of authenticity (Kifer et al., 2013). An important caveat to all this research is that people may be biased in evaluating positive behavior as authentic (Jongman-Sereno & Leary, 2016). If so, the strength of the relationship between authenticity and PA may be overestimated.

Notwithstanding ongoing concerns about the precise magnitude of the strength of the authenticity-PA relationship, we now consider why might PA increase perceptions of authenticity. Several theories and findings in the literature imply that PA may signal to

individuals that their behavior is authentic. For example, one explanation for the PA – authenticity relationship – and the one offered by Lenton et al. (2013)—is that people use affect as a heuristic source of information (Schwarz & Clore, 1983) when making judgments about their authenticity: *"I feel good, therefore I must be authentic"*. In this way, PA may function as an indicator that *"life is going well"* (Lyubomirsky et al., 2005). Another explanation in line with this idea comes from cybernetic models of behavioral self-regulation (e.g., Carver & Scheier, 1998). Specifically, cybernetic models propose that PA provides a signal of rapid progress toward desired goals. If such goals are perceived as being aligned with authenticity – which is highly likely because people are motivated to seek authenticity (Lenton et al., 2013), a finding that generalizes across several cultures (Slabu et al., 2014) – PA may be an indicator of progress toward authenticity. Furthermore, King et al. (2006) demonstrated a causal role of PA on a different well-being construct, namely perceived meaning in life. Thus, it is possible that the effects of PA may generalize to other aspects of wellbeing, including subjective authenticity.

Other theories and findings suggest that PA may not merely signal authenticity but may also lead to more authentic ways of being and behaving. For example, according to the broaden-and-build theory (Fredrickson, 2001), positive emotions promote flourishing, which may include perceptions of subjective authenticity (Sutton, 2020). Supporting this theory, frequent experiences of PA are associated with a range of indicators of psychosocial flourishing (Lyubomirsky et al., 2005). Furthermore, because PA facilitates approach behaviors (Isen & Reeve, 2005; Lyubomirsky et al., 2005), goal-directed action (Carver & Scheier, 1990), and flexible re-prioritization of goals (Fulford et al., 2010), we can surmise that PA prompts people to actively explore their environments. From humanistic perspectives (Maslow, 1968; Rogers, 1961), which view growth and exploration as authentic expressions of human potential, such growth-oriented behaviors could facilitate increased perceptions of authenticity.

The theoretical links just reviewed clarify that PA may increase authenticity via a variety of psychological mechanisms, beyond simply sharing positive valence. The notion of PA as a source of information (Schwarz & Clore, 1983) is a more cognitive explanation. Cybernetic models (Carver & Scheier, 1982) emphasize goals and thus motivation. And humanistic theories (Maslow, 1968; Rogers, 1961) touch upon specific types of behaviors that may connect PA and authenticity. Though we do not test potential cognitive, motivational, or behavioral mechanisms explicitly, we find it useful to highlight the plethora of ways that PA could increase authenticity.

Aims of the present research

To summarize, extraverts and people who act extraverted experience higher PA (Wilt & Revelle, 2016), which is in turn associated with feeling more authentic (Lenton et al., 2013). This suggests that PA may partially explain why people feel more authentic when they act extraverted (see Figure 1). No study to our knowledge has directly tested this possibility. Two studies have shown that state extraversion and state PA uniquely predict authenticity when entered simultaneously in multilevel models (Cooper et al., 2018; Fleeson & Wilt, 2010), but neither examined the crucial indirect effect of extraversion on authenticity through PA. Although our mediation model might be inferred from previous results, our studies provide a direct test of such inferences, taking an incremental step toward

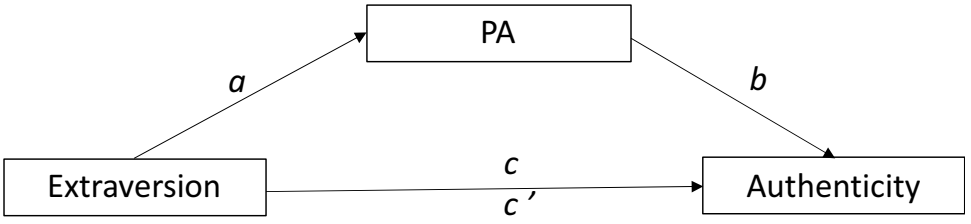

Figure 1. Proposed model depicting PA as a mediator of the effect of extraversion on authenticity. The present research tests this model at the trait (Study 1) and state (studies 2, 3, and 4) levels. Note that this particular model, in which state PA follows state extraversion and leads to state authenticity, is not the only model that can account for the data reviewed previously. Prior work cannot rule out different orderings of the variables or bidirectional links and doing so is not the focus of this study. Indeed, it might be impossible to determine the ordering of the effects because they may be nearly instantaneous and simultaneous. Nevertheless, there are several factors that make our model appealing. First, from a practical standpoint, state extraversion is arguably the most amenable to volitional change. People are readily able to increase extraversion in the short-term (e.g., Fleeson et al., 2002) and longer-term (Jacques-Hamilton et al., 2019) by simply enacting experimental instructions to do so, whereas there is no evidence that instructions to experience more PA or feel more authentic work in a similar way. Second, there is causal evidence supporting paths from state extraversion to state PA (e.g., Fleeson et al., 2002; Jacques-Hamilton et al., 2019; McNiel & Fleeson, 2006; McNiel et al., 2010) and state authenticity (Jacques-Hamilton et al., 2019; Margolis & Lyubomirsky, 2020), as well as causal evidence supporting the path from state PA to state authenticity (Lenton et al., 2013). Furthermore, there is a large body of theoretical work conceptualizing PA as an outcome of extraversion (see Wilt & Revelle, 2009, 2016 for reviews), and we have reviewed several theoretical arguments consistent with the idea that authenticity is an outcome of PA.

establishing the plausibility of the model and doing so with a high level of rigor. Our model may also bear on the state content significance hypothesis, which posits that the psychological content of states, regardless of trait levels, explains associations between the Big Five states and authenticity (Fleeson & Wilt, 2010). Specifically, we may be able to identifyPA as part of the content of extraverted states that is relevant to authenticity. Furthermore, if PA is part of the explanation, this may provide a straightforward and compelling reason for the counterintuitive finding that introverts feel more authentic when they act more extraverted; that is, people may be evaluating their authenticity based more on positive feelings than the discrepancy between trait and state levels of extraversion.

Our program of work consists of four studies, testing our mediation model at the trait and state levels, and employing diverse methods for doing so. In Study 1, we examine whether individual differences in trait PA mediate the relation between trait extraversion and trait subjective authenticity. In Study 2, we employ an experience sampling methodology (ESM) design in a laboratory setting to test whether momentary (state) levels of PA mediate the relation between extraverted states and authenticity states. This study includes multiple assessments of constructs in a narrow time span (20 minutes), allowing for tests of directional associations. In Study 3, we use an experience sampling design with experimental manipulation of extraverted behavior to test the preregistered hypothesis that state PA mediates the association between extraverted states and authenticity states. We also explore whether the experimental manipulation leads to increases in authenticity via the path of state extraversion and state PA. Finally, because Studies 2 and 3 made use

of nontraditional ESM designs (e.g., Study 2 was conducted in the lab, in the context of an experiment), we added Study 4 to test the state mediation model in the context of a traditional, naturalistic ESM study. In all studies, we measured subjective authenticity with items that that have been used in previous research on authenticity states (e.g., Fleeson & Wilt, 2010; Jacques-Hamilton et al., 2019), which fits with our primary aim of explaining relations between extraversion and authenticity states.[1]

Causal inference

Though we primarily employed correlational rather than experimental designs, it is important to state explicitly that we are inherently interested in causal effects rather than simply description or prediction (Grosz et al., 2020). That is, our theoretical position is that increases in state extraversion cause increases in PA which in turn cause increases in authenticity, and that the effects of state extraversion on state authenticity can be partially explained by state PA. Previous experimental studies lend support to the plausibility of this causal chain (e.g., Fleeson et al., 2002; Jacques-Hamilton et al., 2019; Lenton et al., 2013), but had not directly tested our hypothesized mediation process. However, it is well-known that the strength of causal conclusions from correlational data is limited in large part because (a) controlling for confounders is implemented statistically rather than by using randomization and (b) the temporal ordering of effects is more difficult to determine because variables are observed rather than manipulated (Rohrer et al., 2022). Though we take steps to increase the plausibility of a causal interpretation (by conducting time-lagged analyses in Study 2; by controlling for a potential confounder, socializing, in Study 3; and by examining the effects of an experimental manipulation in Study 3), the estimates that we report likely reflect causal effects as well as third variables and bidirectional associations. Additionally, it is important to state explicitly that, given the correlational nature of the majority of our data, we largely cannot make strong causal inferences. Put simply, we characterize our stance on causal inference as follows: If indeed the causal paths we hypothesized are true, we would expect to find that our mediation models would receive support; however, the estimates from these models are likely overestimates of causal effects for the aforementioned reasons.

Furthermore, it is important to reiterate that alternative models (e.g., a reverse model wherein authenticity leads to PA which in turn leads to extraversion) are also possible and that our studies are not designed to test models against each other. Indeed, it is not possible to do this convincingly with correlational data. Rather, given the rationale presented in the section, Aims of the Present Research, we wanted to test whether our proposed model is a plausible given the patterns of associations in the present studies.

Study 1: trait extraversion, positive affect and authenticity

Method

In Study 1, we test our proposed mediation model at the between-person level. Of course, cross-sectional individual differences in measures of extraversion, PA, and authenticity cannot shed light on the within-person processes we have hypothesized. Nevertheless, this study serves a few important purposes.

Evaluating whether within-person processes are reflected in between-person associations has long been recognized as an important endeavor in personality psychology (Underwood, 1975). Its value rests in part in it being a test of trait – state isomorphism, in which traits (typically measured at the between-person level) and states (typically measured at the within-person level) are characterized as having similar psychological content and consequences (Fleeson, 2001). Trait – state isomorphism implies that people could improve their average or trait levels by changing their short-term states over time (Wrzus & Roberts, 2017). Applying this logic to our model, trait – state isomorphism would imply that increasing state levels of extraversion in the short term could result in enduring, trait-level increases in authenticity via increased trait levels of PA. However, trait – state isomorphism is not a given; indeed, previous research has shown that relations between constructs can differ across levels (Fisher et al., 2018). Thus, empirical research is needed to test for state-trait isomorphism, and there are important implications for the results of such tests. Examining whether our model holds at the between-person level in addition to the within-person level has both theoretical value (as a test of trait-state isomorphism) but also practical value – as results that support isomorphism would suggest that acting extraverted could have enduring benefits.

Participants and procedure

US-based Mechanical Turk workers ($N = 205$; 48% female) aged 18–66 ($M = 34.89$, $SD = 10.04$) participated in this study (in exchange for US$2) as part of a larger project concerning personality and wellbeing. The correlation between trait extraversion and PA [citation masked for review] and other well-being variables have previously been reported [citation masked for review], but neither of these studies examined subjective authenticity. Apart from these previous uses of this dataset, the current analyses are novel and have not been reported elsewhere. Most workers (81%) identified as White/Caucasian, with the remainder identifying as Hispanic/Latino (9%), Black/African American (8%), and "Other" (2%). Participants completed the questionnaires described below, as well as other measures that were unrelated to the aims of this study (available at https://osf.io/r52jz/?view_only=027b5e6962c6438cb234654a627f4076), via an online Qualtrics™ survey. All procedures received ethical approval at [Anonymized].

Measures

Extraversion was assessed using the corresponding 20-item scale from the Big Five Aspects Scales (BFAS; DeYoung et al., 2007). Items on the *enthusiasm* aspect scale describe behaviors and experiences relating to social closeness and positive emotion (e.g., "warm up quickly to others"), whereas items on the *assertiveness* aspect scale describe behaviors and experiences relating to social dominance and drive (e.g., "see myself as a good leader"). Participants indicated their agreement with such items on a scale from 1 (*strongly disagree*) to 5 (*strongly agree*).

Positive Affect was assessed using the corresponding scale of the Positive and Negative Affect Schedule (PANAS; Watson et al., 1988), which provides a 20-item assessment of the two major axes of affective space. The PA (PA) scale comprises 10 items (e.g., "strong," "proud," "alert"). Here, participants rated the extent to which they felt each of

these affective descriptors "IN GENERAL" from 1 (*very slightly or not at all*)to 5 (*extremely*). This PA scale is an excellent marker of what is sometimes described as "positive activation" or "activated pleasant affect" – the primary affective correlate of trait extraversion, at both the domain and aspect levels (Smillie et al., 2015).

Authenticitywas assessed using five statements adapted from the authenticity measures described by Fleeson and Wilt (2010): "I act like my true self," "I feel authentic in the way I act," I feel like I am really being me," I feel like I am putting on an act" (reverse-scored), and "People would have an accurate impression of me from the way I act." Participants rated their degree of agreement with each of these statements "IN GENERAL" from 1 (*strongly disagree*) to 7 (*strongly agree*).

Data analysis

All analyses were conducted within R (R Core Development Team, 2020) via the base functions and *psych* package (Revelle, 2020). We report α internal consistencies and $\omega_{hierarchical}$ reliabilities. The $\omega_{hierarchical}$ statistic indicates the reliability of a general factor for the measure using exploratory factor analysis, controlling for specific factors (Zinbarg et al., 2005). We used the *mediate* function in the *psych* package to estimate bias-corrected standard errors (from 2,000 bootstrap samples) and 95% confidence intervals for the indirect effect of extraversion on authenticity via PA (see MacKinnon et al., 2004; Preacher & Hayes, 2004). All estimates are unstandardized regression coefficients.

Results and discussion

Means, standard deviations, and intercorrelations for all variables are shown in Table 1. Extraversion, enthusiasm, and assertiveness had strong associations with PA and moderate-to-strong associations with authenticity.

As hypothesized, PA significantly mediated the relation between extraversion and perceived authenticity (see Figure 2, which appears at the beginning of the General Discussion): The indirect effect of extraversion on authenticity via PA ($b = 0.20$; 95% CI = .07–.34), accounted for 29% of the total effect of extraversion on authenticity. The direct effect of extraversion on authenticity remained statistically significant ($b = 0.49$, $p < .001$; 95% CI = .25–.73). Further analyses showed that the mediating role of PA held for each aspect of extraversion (e.g., enthusiasm), controlling for the other aspect (e.g., assertiveness; see Supplemental Materials). It is important that the results held for the

Table 1. Descriptive statistics for study 1.

					Intercorrelations			
	M	*SD*	α	*ω*	*1*	*2*	*3*	*4*
1. Extraversion	3.28	0.71	.92	.56				
2. Enthusiasm	3.32	0.79	.85	.75	.85			
3. Assertiveness	3.23	0.84	.91	.83	.87	.49		
4. Positive Affect	3.06	0.89	.93	.84	.60	.56	.47	
5. Authenticity	5.57	1.12	.91	.80	.44	.44	.32	.39

All correlations shown are Pearson's *r* values. All values are significant at $p < .001$.
Note that correlations between Extraversion and its aspects are inflated due to item overlap, as the Extraversion scale is composed of the Enthusiasm and Assertiveness measures.

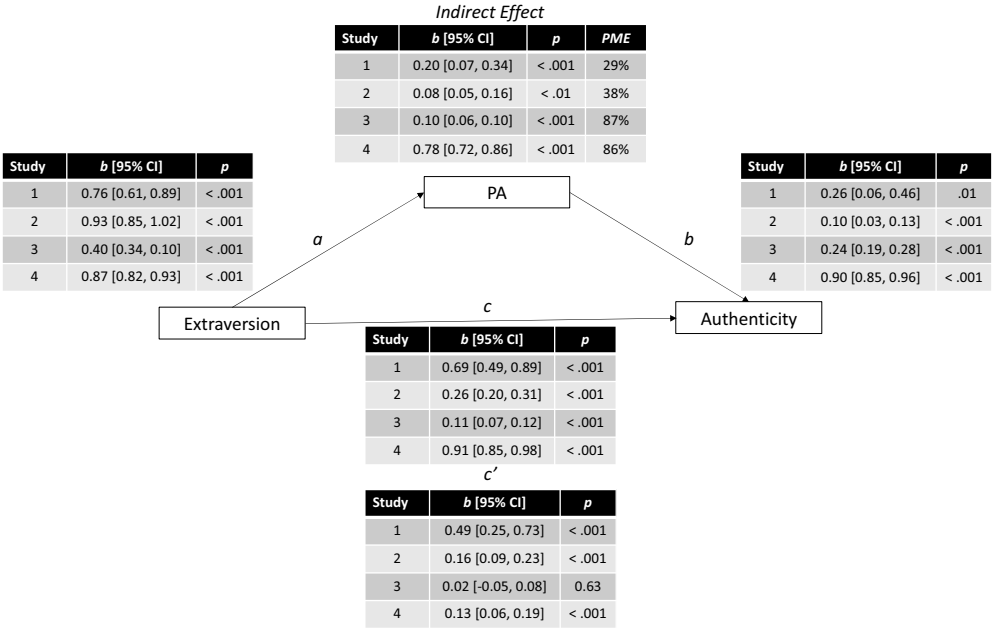

Figure 2. Estimates from models testing the hypothesis that PA mediates the association between extraversion and authenticity at the trait (Study 1) and state (studies 2, 3, and 4) levels. *PME* = percent mediated effect.

assertiveness aspect, as this reduces the likelihood that the results for the enthusiasm aspect can be explained by content overlap with the PA scale. These findings raise the possibility of trait-state isomorphism, which would be confirmed if the mediation model holds at the within-person level as well as the between-person level.

We also conducted a parallel set of analyses (descriptive statistics, correlations, and mediation analyses) for other Big Five traits and report the full set of results in the Supplemental Materials. In general, the results showed similar mediation effects to those we found for extraversion, suggesting that PA may be a common mediator of the trait-level associations between the Big Five and authenticity.

Study 2: extraverted behavior, positive affect and authenticity

Building on our "proof of concept" established in Study 1, we then sought to further evaluate our proposal that PA partly explains the link between extraversion and authenticity. In Study 2 we obtained momentary reports of state extraversion, PA, and authenticity on multiple occasions over time, enabling us to examine lagged effects. These were collected in a laboratory setting, unlike typical daily-life experience sampling studies that sample participant experiences across different, naturally occurring situations. Our lab setting ensured that participants made ratings across a number of similar activities (see the Supplemental Materials). This design feature decreases the likelihood that associations between states are due to self-selection of situations. Additionally, having a set of controlled situations removes between-person variation in situational choice, which reduces potential confounds as compared to a traditional

ESM design. The descriptive statistics and within-person associations between extraverted behavior and PA (Wilt et al., 2012) and between extraverted behavior and authenticity (Fleeson & Wilt, 2010) for the data used in the current study have been previously reported, but neither of these studies examined the current mediation model. Apart from these previous uses of this dataset, the current analyses are novel and have not been reported elsewhere.

Method

Participants and procedure

Participants were 97 undergraduate students enrolled at [details masked for review] from the [details masked for review] who participated as part of a larger project (details about other measures are available at https://osf.io/r52jz/?view_only=027b5e6962c6438cb234654a627f4076). Participants were recruited through class announcements, flyers posted around campus, e-mails to student listservs, and advertisements in the student newspapers and webpage. The ads were designed to be informative without introducing demand characteristics ("Participate in a Study about Personality and Behavior"). Participants attended ten 50-minute sessions over a 10-week period in groups of two to four ($M = 3.25$ per session). Each session consisted of a group activity such as debating a social issue or playing a game (described in the Supplemental Materials). Twice during the sessions (after 20 minutes and again after 40 minutes), participants reported their state extraversion, state PA, and state authenticity. The response rate for reports was 89% (an average of 17.8 out of 20 possible reports; $SD = 3.65$; range = 2–20). Participants were compensated up to $210 for their participation. Importantly, simulation studies have shown that the sample size of level 2 units (97) and average level 1 units (17.8) in this study result in good power for detecting at least medium effect sizes at the within-person level using multilevel modeling approaches (Scherbaum & Ferreter, 2009). All procedures were approved by the [Anonymized] IRB.

Measures

State extraversion was assessed with Big-Five adjective markers (Goldberg, 1992). Participants were asked to describe their behavior during the previous half of each session (e.g., "During the last 20 minutes, I was . . . ") and made self-ratings on four bipolar items (silent – talkative, unenergetic – energetic, unassertive – assertive, and timid – bold) using a 7-point scale from 1 (*very slightly or not at all*) to 7 (*extremely*).[1]

State positive affect was assessed with adjectives from the PANAS-X (Watson & Clark, 1994). Participants rated their affect during the previous half of each session ("During the last 20 minutes, I was . . . [enthusiastic/excited/happy]") on a 7-point scale (1= very slightly or not at all, 7 = extremely).

State authenticity was assessed with the following three items that were created as face valid measures for this study: "'How much were you acting like your true self?';" "'How much were you putting on an act (reverse-scored)?';" "'How accurate an impression would someone have of you from the way you were acting?'" Participants made ratings on 7-point scales from 1 (*very slightly or not at all*) to 7 (*extremely*).

Analyses

Descriptive statistics and correlations for all scales were again calculated using R. Within-person ω reliabilities employing a multilevel confirmatory factor analytic approach (Geldhof et al., 2014; Shrout & Lane, 2012) were calculated in *MPlus version 7.4* (Muthén & Muthén, 2012). See the Supplemental Materials for analyses examining the discriminant validity of state measures.

The data had a multilevel structure, with reports (level 1) nested within persons (level 2). Therefore, we employed a multilevel path analytic approach to examine our mediation hypotheses within *MPlus version 7.1* (Muthén & Asparouhov, 2011; Muthén & Muthén, 2012; Preacher et al., 2010, 2011). Multilevel analyses allow separation of within-person effects, which were of interest in this study, from between-person effects. This path model had a 1–1–1 structure, as each of the variables in our path model (state extraversion → state PA → state authenticity) was assessed at level 1. All variables were centered within-persons and all estimates are unstandardized regression coefficients.

Results and discussion

Descriptive statistics and intercorrelations among variables are shown in Table 2. Within-person variations accounted for a substantial portion of the total variance in each measure (between 46% and 76%), and within-person reliabilities for each measure were acceptable. As expected, all measures were positively intercorrelated at both the within- and between-person levels.

The multilevel path model (see Figure 2, which appears at the beginning of the General Discussion) revealed a direct effect from extraverted behavior to PA ($b = 0.93$, $p < .001$, 95% $CI = 0.85$–1.02) and from PA to authenticity ($b = 0.10$; $p < .001$, 95% $CI = 0.03$–0.13). A significant indirect effect showed that the effect of extraverted behavior on authenticity was partially mediated by PA ($b = 0.08$; $p < .01$, 95% $CI = 0.05$–0.16), accounting for 38% of the total effect of extraverted behavior on authenticity. The direct effect of extraverted behavior on authenticity remained significant when controlling for PA ($b = 0.16$; $p < .001$, 95% $CI = 0.09$–0.23). The direct effects of state extraversion on state PA and state authenticity were not moderated by trait extraversion (see Supplemental Materials).

We next examined bivariate, within-person lagged effects of states reported during the first half of the session (T1) on states reported during the second half of the session (T2). We estimated these effects by conducting pooled within-person correlations. We

Table 2. Descriptive statistics, reliabilities, and Intercorrelations among Study 2 measures.

						Correlations		
	M	SD_{BP}	SD_{WP}	1–*ICC1*	ω_{WP}	1.	2.	3.
1. Extraverted behavior	4.41	.60	.92	.76	.62	-	.72	.38
2. Positive Affect	3.44	.96	1.16	.65	.90	.69	-	.33
3. Authenticity	5.99	.76	.59	.46	.70	.45	.34	-

SD_{BP} and SD_{WP} = between- and within-person standard deviations, respectively. The *ICC1* reflects the percentage of total variation due to between-person variation; thus, the 1–*ICC1* represents the percentage of total variation due to within-person variation (Shrout & Fleiss, 1979). Within-person ω reliabilities (ω_{WP}) were calculated using the multilevel confirmatory factor analysis approach described in Geldhof et al. (2014). Similar to $\omega_{hierarchical}$ reported for trait measures in Study 1, these statistics index the reliability of the general factor of the measure, controlling for specific factors. Between-person correlations are presented below the diagonal, and average within-person correlations are presented above the diagonal. All correlations are significant at $p < .001$.

conducted zero-order correlations to assess within-person autocorrelations, and we conducted partial correlations to examine cross-lagged associations between different states. For example, to assess the cross-lagged association between extraverted behavior and PA, we examined the pooled within-person correlation between T1 extraversion and T2 PA while controlling for T1 PA.

Because prospective associations are consistent with downstream effects, these analyses enable stronger claims about the directionality of within-person effects than did the cross-sectional analyses in Study 1. Specifically, effects of T1 extraverted behavior on T2 PA and T2 authenticity (controlling for T1 PA and T1 authenticity, respectively), and of T1 PA on T2 authenticity (controlling for T1 authenticity), would suggest that extraversion has downstream effects on PA and authenticity, and that PA has downstream effects on authenticity.

The within-person autocorrelations for these states were all strong and positive (for extraverted behavior, $r = .65$; for PA, $r = .74$; and for authenticity, $r = .57$; all $ps < .001$), indicating that they were relatively stable within-persons throughout each session.

When controlling for T1 PA, T2 PA was related to T1 extraverted behavior ($r = .10$, $p < .01$) but not to T1 authenticity ($r = -.02$, *ns*). This provides evidence for the extraversion to PA path (a) in our model. When controlling for T1 authenticity, T2 authenticity was related to both T1 extraverted behavior ($r = .12$, $p < .001$) and T1 PA ($r = .11$, $p < .01$). These results provide evidence for the extraversion to authenticity (c path) and PA to authenticity path (b). When controlling for T1 extraverted behavior, T2 extraverted behavior was associated with T1 PA ($r = .22$, $p < .001$) but not T1 authenticity ($r = -.02$, *ns*). These results suggest that the association between extraversion and PA is bidirectional.

In sum, the pattern of results from these lagged analyses are consistent with the notion that extraverted behavior had downstream effects on PA and that extraversion and PA had downstream effects on authenticity. The results also suggest that authenticity did not have downstream effects on either extraverted behavior nor on PA. Finally, the results suggest a bidirectional effect between extraverted behavior and PA over time. Although these effects are consistent with our mediation model, it is important to note that this pattern of associations may also be consistent with other directional models, such as from PA to extraversion to authenticity. We also cannot rule out third variable explanations in these lagged analyses. We reiterate that our focus was on examining the plausibility of the extraversion to PA to authenticity model for the theoretical, empirical, and practical reasons given in the introduction, but we encourage future research to explore alternative directionalities.

Study 3: a preregistered test of our mediation model in daily life

The results of Study 2 build on the trait-level findings of Study 1, suggesting that state PA partially explains the association between momentary extraverted behavior and state authenticity. In Study 3 we aimed to build further on these findings through a daily-life ESM study with random assignment to conditions. Specifically, participants were enrolled in a two-group randomized intervention design (see below) with baseline measures, ESM measures during the week-long intervention, and posttest and follow-up surveys. The original study was designed primarily to test the effects of an "act extraverted" intervention on several psychological states,

including PA and authenticity (see citation blinded for review). However, here, we focus on testing our mediation model using the naturally-occurring within-person fluctuations in extraverted behavior, PA, and authenticity across the whole sample (i.e., collapsing across conditions).

The two most important contributions of this study are preregistration (see below) and improved ecological validity. To replicate results from previous studies, our preregistration comprised the predictions that (1) extraverted behavior will relate to greater within-person levels of PA (*a* path); (2) PA will relate to greater within-person levels of authenticity (*b* path); and (3) that extraverted behavior will have a positive indirect effect on subjective authenticity via increased state PA (*a* x *b* path). Because this study involved naturally occurring situations in daily life, ecological validity was enhanced compared to Study 2, which used ESM in a lab setting.

Another potentially important contribution of Study 3 is the experimental manipulation of extraverted behavior, which is rare in work examining the association between extraversion and authenticity (but see Jacques-Hamilton et al., 2019; Margolis & Lyubomirsky, 2020). Though the experimental manipulation is not a central focus of Study 3, this design feature offers some advantages beyond the previous studies in this manuscript. The previous studies focused on the relation between trait extraversion and subjective authenticity (Study 1), as well as between naturally occurring variations in extraverted behaviors and authenticity (Study 2). This leaves unanswered the intriguing question of whether our results would equally hold for participants who have been instructed to act extraverted, compared to participants who are spontaneously acting extraverted (a possibility that we evaluate using multigroup models). Furthermore, in Study 2, extraverted behavior may have been perceived as highly socially desirable because all activities occurred in group settings. In Study 3, we contrasted the extraversion manipulation with a sham behavioral manipulation that was designed to be equally socially desirable. If the multigroup analyses show that the mediation model holds similarly for participants in both groups, this can help to reduce concerns that effects of extraverted behavior on PA and authenticity can be explained by social desirability.

Finally, by using an experimental design to manipulate extraversion, we can test a mediation model that features causal effects of extraversion on PA and authenticity. Specifically, we can test whether people in the Act Extraverted condition experienced more authenticity on average throughout the duration of the study and whether this potential increase in authenticity is mediated by an increase in average PA. It is important to note that this is a between-person mediation model (in contrast to the within-person model described above). Therefore, causal inference is not at the level of the individual; that is, we are not explicitly testing whether increases in an individual's state extraversion lead to increases in PA and authenticity. Rather, we are testing whether people who are instructed to act more extraverted over time have higher levels of PA and authenticity over time. Further, these analyses were exploratory and not preregistered.

This research received ethical approval from [anonymized]. Data, analysis scripts and copies of materials used are provided at [https://osf.io/r52jz/?view_only=027b5e6962c6438cb234654a627f4076].

Method

Participants and procedure

Participants were 147 individuals, aged 18–55 ($M = 24.12$; 70% female), who were recruited through flyers posted at [details masked for review] and advertisements posted online. We randomly assigned participants to either an Act-Extraverted or Sham experimental condition intended to cause mildly introverted behavior, described below. Eligibility was based on age (18 years or older), fluency in English, and access to a mobile device running Android 4.1 (or higher), or iOS 7.0 (or higher). Participants were compensated with $15 AUD cash for completing baseline questionnaires. Participants who completed at least 75% of the ESM surveys and the follow-up surveys received another $20 AUD (cash or gift voucher), entry into a drawing for $300 AUD cash, and feedback on their personality and wellbeing based on their baseline and ESM survey responses. The response rate for ESM surveys was 80% in the Act-Extraverted condition and 84% in the Sham condition (across conditions, participants averaged 34.9/42 reports; $SD = 5.65$; range = 16–42). Simulation studies have shown that the sample size of level 2 units (147) and average level 1 units (34.9) in this study result in good power for detecting at least medium effect sizes at the within-person level using multilevel modeling approaches (Scherbaum & Ferreter, 2009).

Initial session. On day 1, participants attended a small-group introductory session during which they provided informed consent, installed an ESM mobile app (MetricWire Inc., 2017), and completed a baseline questionnaire via Qualtrics™. Participants were then given instructions regarding the intervention (see below) and for using the app to complete the ESM questionnaires. To reduce between-group differences in improvement expectations, all participants were told that the study aimed to investigate how behavior influences mood and wellbeing in everyday life (Boot et al., 2013). Otherwise, participants were blind to the purpose of the study and the experimental groupings.

Experimental conditions. Using a cluster randomization design (see citation blinded for review), participants were randomly assigned to either the Act-Extraverted or Sham conditions, which each lasted 7 days (Days 2–8). In the Act-Extraverted condition, participants were instructed: "in your interactions with other people across the next week, act in a bold, talkative, outgoing, active, and assertive way, as much as possible." Each adjective marks the high pole of extraversion (e.g., Goldberg, 1992). In the Sham condition (i.e., an active control group intended to elicit mildly introverted behavior) participants were told: "in your interactions with other people across the next week, act in an unassuming, sensitive, calm, modest, and quiet way, as much as possible." Adjectives marked the low pole of extraversion (e.g., "quiet") and the high pole of other Big Five traits (e.g., "sensitive," "modest"). We chose these adjectives because we sought a comparison condition that (a) was non-extraverted but also not highly introverted, (b) involved a coherent set of behaviors, and (c) was socially desirable. On average, these adjectives were equal in social desirability to the extraverted adjectives (for social desirability norms, see Hampson et al., 1987). Matching for social desirability may help to reduce concerns that participants in the Sham condition would not be as compliant with instructions as those in the Act Extraverted condition.

Participants in each condition were told to disregard instructions if the behaviors were inappropriate for a given situation; for example, acting quiet may be judged as disadvantageous for a job interview. Note that this instruction might have the potential to confound social desirability with condition if participants disregarded instructions for behavior to a greater extent in one condition. Therefore, participants were given specific examples of what "inappropriate to the situation" meant. They were things like driving a car or being in a job interview – situations in which expressing higher extraversion would have significant consequences and potentially be unsafe. We retained these instructions based on a cost-benefit analysis weighing the scientific advantages of perfect compliance against potential costs of discomfort to participants. Instructions were shown on the participant's mobile after each ESM survey ("Remember to continue acting in [an unassuming, sensitive, calm, modest, and quiet/a bold, talkative, outgoing, active, and assertive] way in your interactions with other people").

ESM protocol. Participants received 6 ESM surveys every day for 7 days. The MetricWire application delivered these at random times between 9:00 am and 10:00 pm (but at least 90 minutes apart). Participants were reminded to complete the survey if they did not do so within 15 minutes of delivery, and the survey could not be accessed 30 minutes after delivery. The experimenter contacted each participant on the third and fifth days to give feedback on their progress and provide encouragement. Experimenters reminded participants who were unlikely or unable to reach the 75% requirement that they could withdraw from the study.

Exclusion criteria. We used three exclusion criteria, of which the first two were preregistered. First, surveys with mostly identical responses were excluded on suspicion of inattention. This criterion applied to ESM reports with 17 or more of the 20 questions (i.e., ≥85%) with the same value (2 reports were excluded). Second, participants with fewer than 15 valid ESM reports were excluded (12 participants were excluded, 6 in each experimental condition). We also decided to exclude ESM reports if they were not submitted within 35 minutes after the survey was triggered, which was possible due to occasional software errors (6 reports were submitted late and excluded). In all, this study had a high rate of compliance; more detailed information on compliance is provided in [anonymized for review].

Measures

All questionnaires relating to the present hypotheses are reported below. Extraneous questionnaires are available on the OSF

(https://osf.io/r52jz/?view_only=027b5e6962c6438cb234654a627f4076). Responses were averaged to produce a score for each scale.

ESM questionnaire

The ESM questionnaire measured momentary extraversion, PA, and authenticity. Extraverted behavior was assessed with four items ("in the past hour, how [bold; quiet (reverse-scored); assertive; reserved (reverse-scored)] were you?" (Goldberg, 1992).; Momentary PA was assessed with three items from the PANAS-X ("how

[excited; lively; enthusiastic] do you feel right now?;" Watson & Tellegen, 1999). Authenticity was assessed with two items ("in the past hour, [how much were you acting like your true self; "how accurate an impression would someone have of you from the way you were acting?];" Fleeson & Wilt, 2010). All items were answered on an 11-point integer sliding scale. The extraverted behavior items were anchored by 0 (*Not at all*) and 10 (*Very*). PA items were anchored by 0 (*Not at all*) and 10 (*Extremely*), and authenticity items were anchored by 0 (*Not at all*) and 10 (*Very much*). Participants also reported the number of minutes engaging in social activity in the last hour; they were told to exclude "business-like" conversations (e.g., speaking to your boss or coworkers about topics at work, making a business phone call, etc.) in these estimates.

Analyses

Descriptive statistics and reliabilities were calculated the same way as in Study 2, separately for the Act-Extraverted and Sham conditions. See the Supplemental Materials for analyses examining the discriminant validity of state measures.

As in Study 2, we conducted a 1-1-1 (state extraversion → state PA → state authenticity) multilevel mediation model in *MPlus version 7.4* (Muthén & Muthén, 2012). Time since participant's first ESM report was included as a predictor of state PA and state authenticity to remove time-varying confounds, following recommendations from Bolger and Laurencau (2013). Time spent socializing (social time) was included as a predictor of state PA because research shows that social activity is positively related to PA (Lucas et al., 2008). Social time is a potential confounder in our model because people are likely to act extraverted and feel happier when socializing with others.[2] Authenticity, PA, extraverted behavior, and social time were within-person centered. As in Study 2, we report unstandardized *b* coefficients. We applied the multilevel mediation model across the entire sample, and we also conducted a multigroup analysis to determine whether effects differed between the Sham group and the Act-Extraverted condition. Thus, these models test whether mediation effects occur in both conditions (i.e., whether the relationship between state extraversion and state authenticity is mediated by state PA in each condition). We did not test longitudinal mediation models (e.g., state extraversion → state PA at lag 1→ state authenticity at lag 2) because it seems much more likely that mediation occurs over relatively short timeframes, and reports were spaced at least 90 minutes apart.

All analyses were conducted in accordance with the preregistration except for the following departures: We did not use random slopes or intercepts for the effect of the covariate social interactions on PA because the model did not converge. We did not use bootstrapped confidence intervals for the indirect effects because Mplus does not handle bootstrapping for multilevel models (instead, Mplus calculates confidence intervals based on normal theory for multilevel mediation models). The exploratory analyses relating to the experimental manipulation of extraverted behavior were not preregistered.

Table 3. Descriptive statistics and reliabilities for Study 3.

	M	SD_{BP}	SD_{WP}	1–*ICC1*	ω_{WP}
Act-Extraverted Condition					
Extraverted behavior	5.69	1.26	1.65	.68	.74
Positive Affect	5.18	1.64	1.53	.51	.66
Authenticity	7.18	1.77	1.40	.43	.71
Sham Condition					
Extraverted behavior	3.97	1.13	1.22	.58	.74
Positive Affect	4.40	1.75	1.60	.48	.66
Authenticity	6.49	1.47	1.43	.52	.59

SD_{BP} and SD_{WP} = between- and within-person standard deviations, respectively. 1–*ICC1* = the percentage of total variation due to within-person variation. Within-person ω reliabilities (ω_{WP}) were calculated across the entire sample based on using the multilevel confirmatory factor analysis approach described in Geldhof et al. (2014). Similar to $\omega_{hierarchical}$ reported for trait measures in Study 1, these statistics index the reliability of the general factor of the measure, controlling for specific factors.

Results and discussion

Table 3 shows descriptive statistics separately for the two experimental conditions. The manipulation check reported in the original article (anonymized) showed that the Act Extraverted condition produced higher levels of average state extraversion. Overall levels of PA and authenticity were also higher in the Act Extraverted condition (anonymized). As in Study 2, within-person variation accounted for a substantial portion of the total variance in each measure (between 43% and 68%) and scores for each measure achieved acceptable reliabilities.

Preregistered multilevel path models

The whole sample multilevel path model (see Figure 2, which appears at the beginning of the General Discussion) revealed that the total effect of extraverted behavior on authenticity was significant ($b = 0.11$; $p < .001$; 95% *CI* = 0.07–0.12), as were the direct effects from extraverted behavior to PA ($b = 0.40$; $p < .001$; 95% *CI* = 0.34–0.45) and from PA to authenticity ($b = 0.24$; $p < .001$; 95% *CI* = 0.19–0.28). The indirect effect was also significant ($b = 0.10$; $p < .001$, 95% *CI* = 0.06–0.10), and showed that PA accounted for 87% of the total effect of extraverted behavior on authenticity. The direct effect of extraverted behavior on authenticity was not significant when controlling for PA ($b = 0.02$; $p = .63$; 95% *CI* = –0.05–0.08). Multigroup analyses revealed nearly identical results; all estimates for each group were within .01 of the estimates from the model conducted on the entire sample (see Supplemental Materials). The direct effects of state extraversion on state PA and state authenticity were slightly stronger for those who had higher levels of trait extraversion (see Supplemental Materials).

Exploratory analyses

We then explored whether participants in the Act Extraverted group experienced higher levels of authenticity, and whether the effect of the manipulation on authenticity was mediated by PA. That is, we conducted a multilevel path model to examine whether the Act-Extraverted condition produced a direct between-person effect on authenticity and a significant indirect between-person effect on authenticity via PA. This model had a 2-1-1 structure, with experimental condition at level 2 (a between-groups manipulation), and state authenticity, and state PA at level 1 (within-person repeated measures).

Due to the exploratory nature of this analysis, we report both 95% CIs and 99% CIs and focus on effect size estimation rather than null hypothesis significance testing. The between-person direct effect of the Act Extraverted condition on PA was large ($b = 0.78$; $p < .01$, 95% $CI = 0.21–1.34$, 99% $CI = 0.03–1.53$), whereas the effect on authenticity was small ($b = 0.18$; $p = .06$, 95% $CI = 0.00–0.35$, 99% $CI = -0.06–0.41$). The indirect effect of condition on authenticity through PA was similarly small ($b = 0.14$; $p = .06$, 95% $CI = 0.00–0.28$, 99% $CI = -0.05–0.32$). These results indicate that people in the Act Extraverted condition may have experienced small increases in authenticity over the course of the study (relative to the sham condition) and that a small portion of this increase was due to higher levels of average PA. Note that differences in the effect sizes for this analysis and the 1-1-1 model suggest that the within-person mediation model is more strongly supported than the between-person mediation model.

Study 4: testing our mediation model in a traditional esm study

Although findings from Studies 2 and 3 supported the within-person mediation model, these studies had a few noteworthy limitations. First, both studies used non-traditional ESM designs: Study 2 involved a reanalysis of ESM data collected in the lab, and Study 3 used an experimental design instructing participants to act in certain ways. These features may limit ecological validity. Furthermore, bivariate associations between variables had already been documented in the data from Study 2. Though our formal test for mediation was novel, it is possible that our findings could have been inferred from the previous results. Finally, the strength of mediation effects differed considerably across studies (38% in Study 2; 87% in Study 3), raising questions about method effects. We therefore sought to test the mediation model would hold in an independent data set collected using a traditional, naturalistic ESM design. We were also interested in exploring whether the mediation model would apply to other Big Five states or if it would be unique to extraversion. Therefore, this study builds on previous findings by: (a) complementing the designs employed in Studies 2 and 3, (b) testing the mediation model in an independent data set in which associations between constructs have not been examined, (c) potentially shedding light on why the strength of the within-person mediation effects differed across studies, and (d) testing whether the mediation model generalizes across other Big Five states.

Method

We used data from Wave 7 (Year 3) of a longitudinal study [study name masked] Study ([acronym masked]). Data collection procedures were approved by the Institutional Review Boards at [masked for review] (IRB ID: 201206090; Study; Title: [study name masked]). Other published articles have used the [acronym masked] dataset (for a full list of citations, see [link masked]), including the experience sampling method (ESM) happiness and positive emotion variables [citations masked] and the personality state measures [citations masked] from Wave 1, as well as the personality state measures from Wave 4 [citation masked]. Of these, the most closely related paper [citation masked] examined within-person associations between fluctuations in four of the Big Five states (extraversion, agreeableness, conscientiousness, and neuroticism) and affect. However,

none of the previous articles used data from Wave 7, nor examined the connections between authenticity and PA or personality states.

Participants and procedure

The full sample at Wave 1 of the longitudinal study involved 434 students at [university name masked] who were recruited in 2012 and 2013 via flyers and classroom announcements across the campus. At each of the three major assessment waves (Waves 1, 4, and 7, each spaced 1 year apart), participants completed ESM measures of personality states, PA, and authenticity four times per day (over 15 days) for $20 plus the opportunity to win $100 (odds of winning were 1 in 10 if all ESM reports were completed). We only used data from Wave 7 because it was the only assessment wave to include a measure of all Big Five states (as Waves 1 and 4 only included state extraversion, agreeableness, conscientiousness, and neuroticism). After attrition, 129 participants (99 women, 29 men, 1 gender not reported) participated in the ESM component at Wave 7. These participants ranged in age from 19.72 to 28.92 years ($M = 20.96$, $SD = 1.66$) and identified as White (53%), Asian (26%), Black (10%), American Indian or Alaska Native (1%),, Other (8%), or did not disclose their ethnicity (2%).

ESM procedure. Participants attended a laboratory session in which they received instructions on the ESM protocol and completed a practice survey. Following the laboratory session, four times per day (at 12 p.m., 3 p.m., 6 p.m., and 9 p.m.) for 15 days, participants received a text message notification and were emailed a link to a survey that contained ESM measures of their Big Five personality states, PA, and authenticity in the hour that preceded the notification (11 a.m.–12 p.m., 2 p.m.–3 p.m., 5 p.m.–6 p.m., and 8 p.m.–9 p.m.).

ESM exclusions. In line with exclusion criteria applied in previous papers that used the ESM data from this study, we excluded ESM reports (a) if they were completed more than 3 hr after the notification was sent, (b) if participants completed fewer than 75% of the items, (c) if participants used the same response option for at least 70% of the items, or (d) if participants indicated that they were asleep during the entire target hour. We also excluded practice ESM surveys that were completed during the participant's laboratory session. After these exclusions, 1,450 reports from 129 participants remained. The response rate was 19% (11.24/60 reports; $SD = 11.35$; range = 1–57). Note that rates of response were likely to be lower than in other studies because (a) participants were providing responses for the chance of winning a larger monetary prize rather than being directly compensated based on completion rate and (b) some participants may have experienced survey fatigue, considering that this was the third time that they were participating in a fairly burdensome two-week ESM protocol. Simulation studies have shown that the sample size of level 2 units (129) and average level 1 units (11.24) achieve adequate power for detecting at least medium effect sizes at the within-person level using multilevel modeling approaches (Scherbaum & Ferreter, 2009).

Measures

Here, we report only the measures that are relevant to the current study. Codebooks for all measures in the larger study can be accessed at [link masked].

Extraverted behavior. Participants reported on their extraverted behavior ("quiet" [reverse-scored]; "outgoing, sociable") in each target hour (e.g., "From [11am – noon], how ['outgoing, sociable'] were you?"). Responses were made on a 5-point scale with anchors of 1 (*Not at all*), 3 (*Somewhat*), and 7 (*Very*). Participants also reported on the other Big Five states, which we used in supplemental analyses (see Supplemental Material).

State positive affect. To measure state PA, we averaged two items about participants' experiences in the past hour: "How much positive emotion did you experience?" and "How happy were you?". Both items were anchored with 1 (*Not at all*), 3 (*Some*), and 5 (*A lot*). Due to a programming error, the positive emotion item was missing in the 11am–12 pm survey. To use all available data, we computed composites based on both items for the three other time points, and only the "happy" item for the 11am–12 pm time point.

State authenticity. Momentary authenticity was assessed with one face-valid item: "From [11am – noon], how authentic were you?" with anchors of 1 (*Not at all*), 3 (*Somewhat*), and 5 (*Very*).

Analyses

Descriptive statistics, reliabilities, and the focal E-PA-Authenticity 1-1-1 multilevel mediation model were computed using the methods described in Studies 2 and 3 (see the Supplemental Materials for analyses examining the discriminant validity of state measures). We also explored 1-1-1 mediation models for other Big Five states and compared the results to those for extraversion (we report results for other Big Five states in the Supplemental Materials). As in Study 3, we included time since participant's first ESM report as a predictor of state PA and state authenticity in 1-1-1 models (to remove time-varying confounds), and included a variable assessing whether the participant was interacting with others as a predictor of state PA (because social interaction is a potential confounder in our model). Again, we centered variables within-persons and report unstandardized *b* coefficients for these models. As in Study 3, we did not test longitudinal mediation models because mediation likely occurs over relatively short timeframes, and the time lag between reports in this study was three hours.

Table 4. Descriptive statistics, reliabilities, and Intercorrelations among Study 4 measures.

						Intercorrelations		
	M	SD_{BP}	SD_{WP}	1–*ICC1*	ω_{WP}	1.	2.	3.
1. Extraverted behavior	2.68	.66	1.01	.87	.82	-	.48	.24
2. Positive Affect	3.36	.65	.74	.65	.84	.44	-	.39
3. Authenticity	3.73	.77	.75	.46	–	.32	.62	-

SD_{BP} and SD_{WP} = between- and within-person standard deviations, respectively. The *ICC1* reflects the percentage of total variation due to between-person variation; thus, the 1–*ICC1* represents the percentage of total variation due to within-person variation (Shrout & Fleiss, 1979). Within-person ω reliabilities (ω_{WP}) for multi-item measurse were calculated using the multilevel confirmatory factor analysis approach described in Geldhof et al. (2014). Similar to $\omega_{hierarchical}$ reported for trait measures in Study 1, these statistics index the reliability of the general factor of the measure, controlling for specific factors. Between-person correlations are presented below the diagonal, and average within-person correlations are presented above the diagonal. All correlations are significant at $p < .001$.

Results and discussion

Table 4 shows descriptive statistics. As in Study 2, within-person variation accounted for a substantial portion of the total variance in each measure (between 46% and 87%) and scores for each multi-item measure achieved high reliabilities.

Multilevel path models

The multilevel path model for extraversion (see Figure 2, which appears at the beginning of the General Discussion) revealed that the total effect of extraverted behavior on authenticity was significant ($b = 0.91$; $p < .001$; 95% CI = 0.85–0.98), as were the direct effects from extraverted behavior to PA ($b = 0.87$; $p < .001$; 95% CI = 0.82–0.93) and from PA to authenticity ($b = 0.90$; $p < .001$; 95% CI = 0.85–0.96). The indirect effect was also significant ($b = 0.78$; $p < .001$, 95% CI = 0.72–0.86), and showed that PA accounted for 86% of the total effect of extraverted behavior on authenticity. The direct effect of extraverted behavior on authenticity when controlling for PA remained significant but weak ($b = 0.13$; $p < .001$; 95% CI = 0.06–0.19). When comparing results for extraversion to the results for other Big Five states, it is notable that the mediation effect was larger for extraversion; PA accounted for between 42–57% of the effect of the other Big Five states on authenticity (see Supplemental Materials). This suggests that PA may be a common mediator of the relations between the Big Five states and authenticity, but it seems to be an especially strong mediator of the relation between state extraversion and state authenticity.

General discussion

Across four studies, we examined whether PA could help explain the relation between extraversion and subjective authenticity (Fleeson & Wilt, 2010), at both the trait (Study 1) and state (Studies 2–4) levels. All studies supported this hypothesis, albeit to different degrees across studies: In Study 1, PA explained 29% of the relation between trait extraversion and global subjective authenticity. In Study 2 (ESM in the lab), momentary PA accounted for 38% of the total effect of state extraversion on authenticity. In Study 3, our preregistered multilevel path model showed that PA accounted for 87% of the total effect of state extraversion on authenticity, and this result held for both the experimental and control groups. In Study 4 (naturalistic ESM), results were similar to Study 3, as momentary PA accounted for 86% of the total effect of state extraversion on authenticity. These findings are summarized in Figure 2.

To further probe these results, we also evaluated a reverse mediation model in which authenticity mediated the relation between extraversion and PA (see Supplemental Materials). In all four studies, the indirect effects of extraversion on PA via authenticity were weaker compared to those evaluated in our proposed model. Although these results do not confirm causal ordering (Thoemmes, 2015), they do suggest that the evidence that PA mediates the extraversion – authenticity relationship is stronger than the evidence that than authenticity mediates the extraversion – PA relationship. Stronger support for the direction of our proposed effects was obtained via the lagged analyses we report in Study 2: T1 extraverted behavior predicted T2 PA (the *a* path in the mediation model) and T2 authenticity (the *c* path), and T1 PA predicted T2 authenticity (the *b* path), but T1 authenticity did not predict T2 extraverted behavior nor T2 PA. These results provide

some encouragement for the causal direction implied by our theoretical rationale for this research, an issue we examine in more detail next.

Although the results of our analyses largely matched our predictions, the support these findings provide for our hypotheses hinge on several assumptions. Most obviously, we have assumed a particular direction of causation – that extraverted behavior leads to PA which then leads to subjective authenticity. Study 2 provided (correlational) evidence for such a temporal ordering, and many prior studies have demonstrated that experimental manipulations of extraverted behavior increase PA (e.g., Fleeson et al., 2002), and that manipulations of PA increase subjective authenticity (Lenton et al., 2013). On the other hand, Study 2 also suggested bidirectional associations between extraversion and PA, and bidirectional associations between PA and subjective authenticity have been reported in a prior longitudinal study (Reinecke & Trepte, 2014). Thus, it seems unlikely that our proposed model depicted in Figure 1 is the only way to understand relations among these variables. Our model is also too simple in that it (implicitly) assumes that each of our variables is isolated from potential confounding factors, which is extremely unlikely. In Study 3 we examined one plausible confound, social activity, reasoning that people will likely act more extraverted and experience higher PA when socializing. But there are other confounds that were not measured in any of our datasets (e.g., pursuit of valued goals that may entail more extraverted behavior and produce increases in multiple aspects of wellbeing), and likely still others that we have not thought of. We thus regard our findings as suggesting that PA is one plausible mechanism that could help explain why people feel more authentic when they are acting more extraverted. This tentative conclusion is necessary given the limitations of conducting statistical mediation on correlational data (see Rohrer et al., 2022).

Implications for extraversion, authenticity, and wellbeing

A potential implication of our findings is that the relation between extraversion and authenticity is simply an artifact of positive feelings. This idea is compelling because it seems counterintuitive that introverts would feel more authentic when acting extraverted. The possibility that introverts report higher subjective authenticity when acting extraverted simply because they feel more positive may solve this apparent paradox. However, our findings do not seem wholly consistent with the artifact interpretation. First, the mediation models in Studies 1 and 2 showed partial mediation, leaving much of the variance between extraversion and authenticity (at the trait and state levels) unexplained. Thus, there are likely additional reasons beyond PA by which extraversion leads to authenticity. The strong mediation effects in Studies 3 and 4 are more in line with the artifact interpretation, leading to questions about why this discrepancy emerged.

We speculate that this discrepancy may be partly attributable to the lab context in Study 2 as compared to naturally occurring contexts in Studies 3 and 4. In naturally occurring contexts in which situations and activities are chosen freely, participants may have evaluated the authenticity of their extraverted behaviors by their hedonic correlates (i.e., "I feel good, I must be acting authentically."), leading to a stronger mediation effect. In contrast, participants in the lab engaged in activities that were determined by the study protocol. Some of those activities (see the supplemental materials) may have elicited extraverted behaviors that were perceived as authentic not just because they felt good.

For example, speaking up in a debate may have allowed for expression of one's true opinions, even if it felt uncomfortable. Similarly, being more forthcoming while sharing an embarrassing story allowed participants to be transparent and vulnerable with others, even if this may not have felt positive.

As described in the introduction, the idea that people evaluate their authenticity at least partially by their affect is consistent with several theories. Feelings-as-information theories (Lenton et al., 2013; Schwarz & Clore, 1983) and cybernetic self-regulation perspectives (Carver & Scheier, 1998; Lyubomirsky et al., 2005) suggest that PA may signal authenticity. Another viable interpretation of our findings is based on the broaden-and-build theory of positive emotions (Fredrickson, 2001) and humanistic perspectives on personality (Maslow, 1968; Rogers, 1961). The broaden-and-build theory suggests that PA helps to facilitate exploratory approach behaviors. Applied to our findings, the enthusiastic and assertive behaviors associated with extraversion may generate a positive internal feeling state that spurs one to try new things, explore the environment, and experiment with different ways of being. From a humanistic perspective, these behaviors provide the opportunity for growth toward one's true self.

Regardless of how one interprets these mediation effects, the current findings shed new light on the relation between extraversion and wellbeing. Whereas there have been many attempts to understand the relation between extraversion and PA (e.g., Lucas et al., 2008; Smillie et al., 2012, Smillie et al., 2015; Wilt et al., 2017), there have been considerably fewer efforts to explain why extraversion is also related to a host of broader "eudaimonic" constructs, including autonomy, self-acceptance, personal growth, and purpose in life (see Anglim et al., 2020; Smillie et al., 2015). Our findings suggest that the relation between extraversion and authenticity – and perhaps other components of wellbeing – may be in part due to increased PA, a critical building block of various forms of wellbeing (Fredrickson, 2001).

Although wellbeing constructs and research programs are often split into the "hedonic" and "eudaimonic" camps (Huta & Waterman, 2014; Kashdan et al., 2008; Ryan & Deci, 2001), our findings encourage the perspective that hedonic and eudaimonic processes may work in tandem (Biswas-Diener et al., 2009; Disabato et al., 2016; Kashdan et al., 2008; King et al., 2006), and that affective processes can build broader positive psychological resources (Fredrickson, 2001). KKing et al. (2006) exemplified this approach by demonstrating that PA increases perceptions of meaning in life. The current findings further support the utility of this approach by suggesting that the broader wellbeing-promoting effects of PA extend to judgments of subjective authenticity – another component of wellbeing and positive functioning (Huta & Waterman, 2014). A promising research direction is therefore to explore whether PA may mediate the relation between extraversion and other indicators of wellbeing, such as meaning, engagement, and personal growth.

By illuminating these processes, Studies 2, 3, and 4 provide further support for the potential utility of enacted extraversion as a pathway to increased wellbeing (Blackie et al., 2014; Fleeson et al., 2002; McNiel et al., 2010). Thus, contrary to the view from popular folk-theories (e.g., Cain, 2012), "being yourself," by acting in accord with one's trait levels, may not always be optimal for wellbeing (Ching et al., 2014; Fleeson & Wilt, 2010; Sherman et al., 2012). Instead, the PA-boosting effects of acting extraverted can contribute to increased perceptions of authenticity. This conclusion may be tempered, however, by

the finding that acting extraverted over longer periods of time was associated with no change or lower levels of authenticity for people who reported very low levels of trait extraversion (Jacques-Hamilton et al., 2019).

Unresolved questions and future directions

One limitation of our findings is that all four studies rely on correlations, which precludes strong inferences about causal direction. Furthermore, Study 3, which tested the between-person effects of an extraversion manipulation, generated inconclusive evidence about whether being instructed to act extraverted increased authenticity due to increases in PA. Thus, reverse mediation, wherein authenticity mediates the relation between extraversion and PA, is still a plausible possibility. Indeed, one study showed that a state autonomy satisfaction measure (which included content similar to authenticity) partially mediated the association between state extraversion and state PA (Howell et al., 2017). Thus, the effects we report here are likely bidirectional. Confounding effects may also be possible, though statistically controlling for a highly plausible confounder (time spent socializing) did not affect estimates in our third study. Nonetheless, given that the causal effect of mood on subjective authenticity has been demonstrated experimentally (Lenton et al., 2013), and that the reverse mediation models showed that authenticity explained a relatively low proportion of the effect of extraversion on PA, the causal direction proposed in this paper remains plausible.

Second, and relatedly, only one study addressed the time course of effects: Study 2 showed that, over a time lag of 20 minutes, extraversion predicted PA and authenticity, and PA predicted authenticity. Although studies 3 and 4 also comprised within-person data, the lags between each time point (multiple hours) made it unrealistic to assess the time course of our effects. In line with previous research, all other within-person associations were examined concurrently and thus do not bear on how quickly effects emerged or dissipated. Though we suspect that the effects do occur rapidly, and perhaps nearly simultaneously, experimental studies with frequent assessment of the relevant states are needed to understand this issue. Even then, as evidenced by the controversy in the bipolar vs. bivariate affect debate (e.g., Larsen, 2017), it will be difficult to pin down the temporal relationship between states.

Third, in Studies 1 and 2, PA explained less than half of the association that trait extraversion and extraverted behavior have with subjective authenticity. Our focus in this set of studies was to rigorously test the role of PA in explaining the extraversion – authenticity relationship (rather than to fully explain this relationship), however, future research may identify additional explanations. One possibility, as noted above, is that the assertive, talkative, and sociable behaviors that comprise extraverted states might facilitate the expression of one's values, beliefs and opinions, thereby increasing a person's perceptions of being "true to one's self" (Fleeson & Wilt, 2010). A second possibility is that extraverted behaviors could facilitate the pursuit of important personal projects. For example, Little (2008) has suggested that people can strategically enact "free traits" (i.e., counterdispositional behaviors) to enhance core projects that are central to their identity. For example, an introverted professor who is passionate about teaching may employ extraverted behaviors to achieve the goal of being an engaging and effective lecturer. A recent longitudinal study showed that success in

personal projects predicts various forms of subjective wellbeing (Bedford-Petersen et al., 2019). In this way, enhanced project pursuit may be especially relevant for explaining the trait-level relation between extraverted behaviors and authenticity across extended periods of time.

Fourth, given that Fleeson and Wilt (2010) found that other Big Five states (higher levels of agreeableness, conscientiousness, emotional stability, and openness) also predicted higher state authenticity, testing PA as a mediator of these relationships may be a potentially fruitful research direction. Our exploratory tests showed that PA also partially mediated the relations between trait (Study 1) and state (Study 4) levels for the other Big Five domains (see Supplemental Materials). These tests provide preliminary evidence for PA as a common mediating factor of the relation that other traits and states have with authenticity. Relatedly, in the interest of further investigation of discriminant validity, it would be interesting to extend the model to other potential subjective wellbeing mediators, such as negative affect and life satisfaction (Kahneman et al., 1999). We would expect mediation effects, if they are present at all, to be weaker than for PA given the robust relationship between extraversion and PA previously noted. Further, it may be important to test for discriminant effects on outcome variables that are closely aligned conceptually with authenticity, such as perceived meaning or autonomy (e.g., Howell et al., 2017).

Fifth, our use of short measures that assess potentially similar constructs may raise concerns about whether our results can be explained by content overlap. Note that this issue may be particularly relevant to Study 2, where excluding the "unenergetic-energetic" item resulted in a weaker association between extraversion and PA and a weaker mediation effect (see the Supplemental Materials). To assess discriminant validity, we conducted multilevel confirmatory factor analyses (ML-CFAs) that compared a one-factor model (in which all state items were indicators of one latent factor at the within- and between-person levels) to a three-factor model (in which items measuring each of the three states were specified to load on three separate factors at the within- and between-person levels) in each sample. These analyses showed that the measures were moderately to strongly related but ultimately distinguishable from each other (see Supplemental Material for details). This represents the first test of discriminant validity among state extraversion, PA, and authenticity. We encourage researchers to continue to investigate overlap and convergence among state-level variables in the future. Further, the results add to evidence indicating that different dimensions of well-being are empirically distinct (e.g., Baumeister et al., 2013; Dwyer et al., 2017; Joshanloo, 2016; Oishi & Westgate, 2022; Sun et al., 2018). These results also substantiate the validity of previous research which has universally employed short, face-valid measures to examine associations between these personality states (reviewed extensively in the Introduction) without formally examining the factor structure of these measures.

Our results at the state level are in line with past work which has established that the relationship between extraversion and PA is not tautological or artifactual at the trait level (Lucas & Fujita, 2000). It is worth noting, however, that some measures of trait extraversion do include PA content, including the enthusiasm aspect of the BFAS (DeYoung et al., 2007), which we used in Study 1. Thus, it was important to show that PA mediated the association between the assertiveness aspect and authenticity even when controlling for enthusiasm; this finding reduces the likelihood that our trait-level mediation effects were simply due to content overlap.

Finally, because we tested our model in WEIRD samples (Henrich et al., 2010), we do not know how well our findings generalize to other cultures. Since the model includes multiple paths, generalizability depends on the relative strengths of each path across cultures. Encouragingly, there is some evidence that within-person associations for extraversion and both PA and authenticity do hold across some non-WEIRD cultures (Ching et al., 2014). Nevertheless, it remains for future research to directly assess the generalizability of the present findings.

Conclusion

In sum, we have proposed and found evidence to support one explanation for the links that trait extraversion and state extraverted behavior have with feelings of authenticity: PA statistically mediated associations between extraversion and authenticity at the trait and state levels, which is consistent with the ideas that (a) extraverts feel more authentic because they feel more PA in general, and (b) most people feel more authentic when enacting extraverted states because those states are also associated with increased PA. These findings provide the impetus for further studies to examine whether PA also helps explain the relation between extraversion and other non-affective components of wellbeing. In turn, these studies encourage the optimistic view that people may be able to increase both affective *and* authentic components of wellbeing by enacting extraverted states.

Note

1. We did not assess authenticity as conceptualized in trait authenticity models, which include a general authenticity domain as well as facet-level constructs (e.g., Kernis & Goldman, 2005; Wood et al., 2008). We believe that our measures are likely highly related to the constructs assessed by such models because our items contain similar content at face value. For example, our items and measures of the models referenced above assess perceptions of behaving in line with one's true nature and perceptions of acting phony or putting on an act.
2. It is also important to note that socializing may also be an outcome of state extraversion and state PA, and thus controlling for socializing may introduce collider bias that would artificially inflate the estimated effects. Therefore, we conducted follow-up models not controlling for time spent socializing. Results did not change (see the Supplemental Materials).

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Data availability statement

Studies 1, 2, and 4 were not preregistered; the preregistration for Study 3 can be accessed at [https://osf.io/b95v7/?view_only=1ae4162498034d5e842d130815c2f193]. Analysis scripts and de-identified data for all studies are available at [https://osf.io/r52jz/?view_only=027b5e6962c6438cb234654a627f4076].

Open practices

The preregistration for Study 3 is available at https://osf.io/b95v7, and de-identified data, data analysis scripts, and copies of materials used in this study are available at https://osf.io/r52jz/?view_only=027b5e6962c6438cb234654a627f4076

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