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The Futures We Want: How Goal-Directed Imagination Relates to Mental Health

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Abstract
Imagination is an adaptive ability that can be directed toward the pursuit of personal goals. Although there is a wealth of research on goals and on imagination, few studies lie at the intersection—little is known about individual differences in *goal-directed imagination*. In 153 adults, we examined how 28 aspects of goal setting, pursuit, and goal-directed imagination relate to mental health. Higher well-being and lower depressive symptoms were strongly linked (a) to having goals that were more attainable, under control, and expected to bring more joy and (b) to goal-directed imagination that was clearer, more detailed, more positive, and less negative. Importantly, the emotional valence of goal-directed imagination strongly predicted well-being at a 2-month follow-up even after controlling for mental health at baseline. These findings underscore the relevance of goal-directed imagination to well-being and depressive symptoms and highlight potential targets for goal- and imagery-based interventions to improve mental health.

Keywords
goal setting, episodic simulation, future thinking, depression, dysphoria, open data, open materials, preregistered

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> I dreamed of it, ceaselessly and vividly . . . so that I could more clearly picture to myself how I would act when the time came. I was full of enthusiasm. More and more my intended action began to seem both likely and possible.
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> —Fyodor Dostoevsky (1864/2010, p. 61)

From learning a new language to making new friends, most people possess at least a few personal goals that they hope will become a reality. *Goals* are personally meaningful ambitions, dreams, or aims that require some effort to be realized but are nevertheless realistically achievable (MacLeod, 2017; cf. with fantasy; Oettingen, 2012). It is widely agreed that the setting and pursuit of personal goals is fundamental to subjective well-being (Klinger, 1977; Klug & Maier, 2015). Setting goals provides structure to life, directing action and motivating engagement (Little, 1989; Seligman, 2011), and has long been important in clinical practice (Wadsworth & Ford, 1983). Goal pursuit can be inherently rewarding: Positive, anticipatory feelings of energy and excitement increase as goals draw nearer (Emmons, 1986), and making progress toward, and ultimately achieving, goals gives rise to a sense of mastery or attainment—core components of some models of well-being (e.g., Seligman, 2011). Moreover, these rewarding emotions can initiate a positive feedback loop by increasing the likelihood of persevering in the face of difficulties and engaging further in rewarding behaviors (Bandura, 2009).

Unsurprisingly, individual differences in goal setting and pursuit have been linked to mental health (Wiese, 2007). One of the earliest studies found that happiness was associated with pursuing a greater number of goals (i.e., “goal fluency”; Wessman & Ricks, 1966), and setting more specific goals (e.g., “run a marathon next April”

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vs. "be fit") is correlated with higher positive affect and purpose in life (Dickson & Moberly, 2013; Freund & Baltes, 2002). On the negative side of mental health, dysfunctional goal setting and pursuit has been linked to depression and depressive symptoms. People with major depressive disorder tend to view their personal goals as more important to their future happiness and identity, known as *conditional goal setting* (e.g., "If only I can marry Jane, I will finally be happy"; Street, 2002), while simultaneously viewing attainment of those goals as less likely and less under their control (Dickson et al., 2011). Depression has also been linked to having fewer *approach* goals (i.e., reaching something positive) but not more *avoidance* goals (i.e., moving away from something negative; e.g., Dickson & MacLeod, 2004a). Furthermore, pursuing more intrinsically rewarding and autonomously motivated goals predicts both fewer depressive symptoms and higher well-being (Sheldon & Elliot, 1999; Winch et al., 2015), and having meaningful goals across various life domains may be protective against depression (Champion & Power, 1995).

Goal-Directed Simulation: The Intersection of Intention, Planning, and Episodic Simulation

Goal setting and pursuit are not the only forms of future-oriented thinking relevant to mental health. Szpunar et al.'s (2014) "taxonomy of prospection" defines four modes of future thinking: *prediction* (estimating the chance of a future event occurring), *intention* (the mental act of setting a goal), *planning* (organizing the steps necessary to reach the goal), and *simulation* (imagining a future event or state and the resulting mental representation). The four modes of prospection are not necessarily orthogonal; they can overlap, interact, and build on one another (Szpunar et al., 2014). *Goal-directed simulation* (or *goal-directed imagination*) is the relatively understudied intersection between three modes of prospection—intention, planning, and simulation—and in the current study, we focused on its links with mental health and well-being. Goal attainment involves both the motivational process of goal setting or forming intentions and the volitional process of goal pursuit whereby intentions are translated into plans of required actions (Gollwitzer, 1996). Critically, however, goal attainment can be augmented by simulation to imagine the ways in which those planned actions might be executed. Although some simulations focus primarily on the actions (see implementation intentions; Gollwitzer, 1999), here we focus specifically on *episodic simulation*: the flexible combination of details from episodic memory to construct often elaborate mental representations of one's life events (Addis, 2018; Schacter & Addis, 2007). When directed toward the futures one wants, episodic simulation can be a particularly powerful and adaptive cognitive tool (Schacter, 2012; Szpunar et al., 2013): Imagining the required steps, planning and preparing for contingencies, visualizing goal attainment, and contextualizing the goals within one's own life serves to enhance successful outcomes (Andrews-Hanna et al., 2013; Conway, 2005; D'Argembeau, 2016; McMillan et al., 2013; Taylor et al., 1998).

As with goal setting and pursuit, individual differences in episodic simulation have been linked to mental health. In depression and dysphoria, positive future events tend to be less specific and less vivid and comprise fewer sensory details (reviewed in Gamble et al., 2019) and are often experienced from an observer (third person) rather than field (first person) perspective (Holmes et al., 2016). In addition, focusing excessively on the positive outcomes of goal attainment rather than the process of moving toward a goal (Taylor et al., 1998) may predict later increases in depressive symptoms (Oettingen et al., 2016). Critically, however, most studies on episodic simulation and mental health have not required participants to imagine future scenes related to their *own* goals. Indeed, commonly used measures of episodic simulation, such as the Adapted Autobiographical Interview (Addis et al., 2008), the prospective imagery task (Holmes et al., 2008; Stöber, 2000), and the scene construction task (Hassabis et al., 2007), require participants to imagine future events that are nonpersonal and/or highly constrained. These nomothetic approaches to episodic simulation increase experimental control but at the expense of the ecological validity required to examine links with personal goal setting and pursuit.

Given the value of personal goals and the adaptiveness of episodic simulation, surprisingly little is known about individual differences in goal-directed simulation and how these relate to mental health (Gerlach, 2013). We propose that goal-directed simulation may be especially relevant to psychological functioning. Generating vivid mental imagery about one's personal goals increases the perceived likelihood of goal attainment (Kahneman & Tversky, 1982) and produces stronger feelings of positive anticipation (Holmes & Mathews, 2010). Moreover, recent empirical evidence that positive imagery can increase anticipatory pleasure and engagement in rewarding behaviors in depression (Hallford et al., 2019; Renner et al., 2017) and amplify motivation for personal goals (Renner et al., 2019) has important implications for the design of clinical interventions. Clearly, goal-directed simulation is an important ability and warrants further investigation.

Present Study

Here, we aimed to bridge this gap by investigating the role of goal-directed simulation in mental health. Specifically, in this study, we addressed several pertinent questions: Do people with higher well-being simulate their goals differently than people with lower well-being or depression? If so, what are those differences? Do certain styles of simulation predict actual goal progress or change in mental health over time? We also aimed to extend the current research in several ways.

First, considering the plethora of variables that have been studied in relation to goal setting/pursuit and episodic simulation, we developed a new task to assess many of these variables simultaneously. This task allowed for examination of not only which variables relate to mental health but also the relative magnitude of those associations. Second, given that each person possesses a unique constellation of goals (Klinger, 1977), we took an idiographic approach, having participants imagine scenes related to their own goals, maximizing ecological validity. Third, although researchers of many studies in this area have used categorical designs (e.g., depressed patients vs. control participants), depressive symptoms exist along a continuum of severity throughout the population (Ayuso-Mateos et al., 2010); we thus employed a correlational design. And fourth, it has been suggested that a thorough examination of mental health should account for both positive and negative dimensions of experience (MacLeod, 2017), so we included measures of both well-being and depressive symptoms.

We had specific, preregistered directional hypotheses for many of the goal and simulation variables and their relationship to mental health; these are shown in the Results section with quantified evidence for each. In brief, given the findings discussed above, we predicted that higher well-being and lower depressive symptoms would be associated with (a) having goals that were more specific, attainable, under control, approach focused, intrinsically rewarding, varied across life domains, and less central to one's identity and with (b) goal-directed simulation that was more detailed, vivid, sensory, process focused, positive, seen from a field (rather than observer) perspective, less fragmented, and less negative. In addition to these confirmatory analyses, we also explored which aspects of goal setting, pursuit, and simulation predicted later goal progress and mental health at a 2-month follow-up.

Method

Our hypotheses, design, and analysis plan were preregistered on the OSF before data collection (https://osf.io/8jgd4). The analysis script, variables codebook, deidentified summary data, and other relevant files for this project are available online (https://osf.io/4v536); we provide links to specific files throughout the following sections. All analyses were run using the R software environment (Version 3.6.0; R Core Team, 2019); the R packages used for data cleaning, analyses, and visualizations are listed in the analysis file (https://osf.io/8erf6/).

Participants

Participants in the final sample were 153 adults from the general Auckland community (98 women, two gender diverse; mean age = 26.0 years, *SD* = 5.8; mean years of education = 17.0, *SD* = 3.0). The sample was highly diverse, with participants born in 34 countries, including New Zealand (24.2%), India (14.4%), China (7.2%), the Philippines (7.2%), and the United States (6.5%); additional demographic data are available at https://osf.io/8erf6/. The target sample size was determined a priori to provide 80% power to detect small to medium sized correlations ($\rho = .2$) at $\alpha = .05$. This effect size was not based on prior findings, which are often inflated because of publication bias, but on the smallest effect size of interest (Lakens & Evers, 2014).

Participants were recruited via flyers posted around the University of Auckland (UoA) campus and broader community, e-mails and social media posts to relevant groups, online advertising on the UoA Psychology Research page, and word of mouth. To encourage a sample spanning a spectrum of mental health, some advertisements were targeted at individuals with depressive symptoms, whereas others were worded more generically (for examples, see https://osf.io/27m8w). Inclusion criteria were 18 to 50 years of age, no history of neurological or psychiatric conditions (other than depression/anxiety but including substance use disorders), and fluency in English. An additional four participants (beyond the final $N = 153$) attended the session but had not disclosed during screening information that they did not meet inclusion criteria (because of a history of epilepsy, a history of drug addiction, current alcohol addiction, and an insufficient level of English); these participants were excluded from analyses. All participants received a $25 grocery voucher, and participants who completed the online follow-up survey ($n = 136$; 88.9%) also entered a draw to win one of two $250 grocery vouchers. Written informed consent was obtained from all participants (including permission to share their deidentified summary data on the OSF), and the study was approved by the UoA Human Participants Ethics Committee (ref: 019029).

Procedure

Participants were prescreened for eligibility via a brief form sent over e-mail (https://osf.io/t9vzg). Sessions were conducted one-on-one by B. Gamble in an interview room at the UoA and lasted around 2.5 hr, with breaks offered whenever needed. Sessions comprised four parts: (a) demographics and screening (15 min), (b) goals and simulation (60 min), (c) well-being and mood questionnaires (15 min), and (d) a cognitive battery (60 min). An overview of the entire task flow can be viewed at https://osf.io/t4mg9. Sections b and d were counterbalanced to reduce any order effects of those tasks, such that participants completed either [a, b, c, d] or [a, d, c, b]. Section c, comprising less demanding self-report tasks, always separated sections b and d to reduce any participant fatigue. We administered the cognitive battery to explore later which cognitive abilities may relate to simulation, but this question was beyond the scope of the current article and is not mentioned further (data are available at https://osf.io/djqcf/).

Measures

Demographics and screening. After obtaining informed consent, the experimenter conducted the Structured Clinical Interview for DSM-5 Research Version (SCID-5-RV; First et al., 2015), which was shortened to include only those questions relevant for the current study. Specifically, we administered questions from the Nonpatient Overview to collect demographics (age and educational and occupational history) as well as medical information (e.g., history of psychiatric conditions) to screen more thoroughly for study eligibility and questions from Module A to derive researcher-based diagnoses for major depressive episode (current or past; A1-53).

Goals and simulation. We developed a comprehensive new measure of idiographic goals and simulation, the goal-directed simulation task (GDST). Altogether, the GDST yields 14 variables related to goal setting and pursuit and 14 variables related to goal-directed simulation. These are outlined below, but see the variables codebook online (https://osf.io/yt6bh) for a more thorough description of each variable and how it was scored. The GDST was delivered online via Qualtrics; the .qsf file is available for reuse or adaptation (https://osf.io/6rpb5).

The task began with the experimenter at the computer and the participant opposite. Participants were told they would be asked to think of goals they wanted to achieve in their life over three time periods (short term, medium term, long term), and goals were defined as "important aims, dreams or ambitions that you're working towards, or planning to work towards, in your life." We instructed that goals should be personally relevant, plausible, and specific and gave examples of a nonspecific goal ("I want to be happy") and a specific goal ("I want to pass my end of term exams") in line with Belcher and Kangas (2014). Short-term goals were defined as "goals you want to achieve over the next few weeks," medium-term goals as " . . . over the next few months," and long-term goals as " . . . more than one year from now." The purpose of including multiple time periods was not to examine temporal differences per se (although that could be later explored) but to obtain a more representative assessment of goal setting and simulation across time—in other words, to increase content validity.

Participants were given 60 s to verbally name as many of their short-term goals as possible and then, with no time limit, were asked to choose the two most important of those goals (following Steca et al., 2016); meanwhile, the experimenter entered all goals generated into Qualtrics. The process was repeated for medium-term goals and then long-term goals. After this goal-generation phase, the participants sat at the computer and were presented with seven questions about each of their six chosen goals. The order of goals and questions was randomized to reduce any effects of temporal sequence or repetitive presentation on responses. The seven questions tapped into the variables of perceived attainability, sense of control, degree of difficulty, expected joy (if the goal is achieved), expected sorrow (if the goal is not achieved), importance of the goal, and centrality to the participants' identity. Response options were presented on horizontal scales from 0 to 100 (e.g., 0 = *not at all*, 100 = *extremely*); participants were also asked to write a few words about their underlying motive for each goal in a text box.

The six chosen goals for each participant (a total of 918 trials) were later scored on an additional six variables by a trained research assistant, who was blind to study hypotheses and the identity of participants. The six variables were goal specificity, life domain, whether the goals were intrinsically or extrinsically focused, whether goals and motives were approach or avoidance, and whether motives were autonomous or controlled. More information about how each of these variables was scored can be found in the online scoring manual (https://osf.io/rzdqk). To assess interrater reliability, B. Gamble scored a random subset of 10% of trials (n = 92); Cohen's κs for each variable were as follows: specificity (.66), life domain (.84), intrinsic compared with extrinsic (.86), approach goals compared with avoidance goals (.73), approach motives compared with avoidance motives (.71), and autonomous motives compared with controlled motives (.89). These scores indicated moderate (.60–.79) and strong

(.80–.90) interrater reliability according to McHugh's (2012) grading system. The total number of goals generated across the three time periods was also taken as a measure of goal fluency.

For the simulation phase of the GDST, participants were presented with each of their six important goals in random order and given 3 min to imagine and verbally describe a specific future scene or scenes in their life related to that goal. Participants were instructed to imagine and describe the scene or scenes in as much detail as possible and were told that they could occur before or after achieving the goal as long as they were in the future. We instructed that participants should project themselves into the scenes as though they were really there and could use all of their senses (i.e., describe what they could see, hear, feel, taste, and smell). If participants were silent for longer than 30 s or struggled to generate a specific scene (e.g., if they provided only semantic information), they were given up to three generic prompts per goal to remind them of the task, such as, "When you think about this goal, are there any particular scenes or images that come to mind?"

In addition to their six chosen goals, participants also simulated scenes related to two predefined control goals, which were randomly selected from a set of three previously used by Vincent et al. (2004): "getting on well with someone close to you," "feeling good about yourself," or "having an enjoyable job." Including these control goals allowed for possible future analysis of nomothetic simulation (i.e., uninfluenced by the idiosyncratic nature of personal goals themselves), although the present article is focused only on participants' six idiographic goals. Presentation was again counterbalanced so that control goals appeared before or after personal goals. All verbal descriptions were recorded and later transcribed for scoring. After each simulation, participants were presented with a further seven questions, again in random order and on scales from 0 to 100, about the simulation itself. These questions related to the variables of positivity, negativity, vividness, detail, clarity, fragmentation, and perspective (first vs. third person); exact wording of questions can be seen in the online codebook (https://osf.io/yt6bh).

Transcriptions were later scored by the research assistant to examine the degree to which the simulation was focused on the *process* or *outcome* of the goal, in line with the distinction proposed by Taylor et al. (1998). More specifically, we assessed the proportion of total words generated that were related to the steps leading up to the goal (i.e., process) compared with achieving the goal or the time after (i.e., outcome). Words not obviously related to either process or outcome were not coded. To assess interrater reliability, B. Gamble scored a random subset of 10% of simulations (92 trials); intraclass correlations were .83 for process words and .75 for outcome words, indicating moderate to strong reliability.

Finally, transcriptions were also analyzed using the Linguistic Inquiry and Word Count Dictionary (LIWC; Pennebaker et al., 2015), which Hach, Tippett, and Addis (2016) previously used as an objective, microlevel measure of the episodic detail of simulations. We used the LIWC to count the number of words in transcriptions falling into five predefined categories: Negative and positive words were used as additional measures of emotional valence; perceptual words (i.e., related to seeing, hearing, feeling) as a measure of the extent to which simulations were "sensory"; space-related words as a measure of "spatial coherence"; and present-focused words as a measure of engagement during the simulation (following Park et al., 2011).

All participants verbally confirmed throughout the session that they understood the tasks, and the experimenter was present in the room to answer any questions. No goals or simulations were excluded from subsequent analyses because we considered any variation in aspects of these responses, such as lack of specificity or detail, as directly relevant to the research questions; in other words, this variability was the very topic of interest.

Well-being and mood questionnaires. We assessed well-being using the PERMA-Profiler (Butler & Kern, 2016), a 23-item self-report on the five "pillars" of well-being: positive emotion, engagement, relationships, meaning, and accomplishment (Seligman, 2011). Questions included, for example, "How often do you feel positive?" (0 = *never*, 10 = *always*) and "To what extent do you feel loved?" (0 = *not at all*, 10 = *completely*). Participants' overall well-being scores could range from 0 to 160 (from low to high well-being) and were calculated from the sum of responses from three questions from each pillar and one more general question about happiness. The PERMA-Profiler has excellent internal reliability (Cronbach's α = .94) and good test-retest reliability (Pearson's *r*s range = .69–.88; Butler & Kern, 2016).

We measured depressive symptoms using the Center for Epidemiological Studies Depression Scale–Revised (CESD-R; Eaton et al., 2004), a 20-item self-report on depressive symptoms over the past 2 weeks (e.g., "My appetite was poor" and "I could not shake off the blues"). Five response options were provided: 0 = not at all or less than one day, 1 = one to two days, 2 = three to four days, 3 = five to seven days, and 4 = nearly every day for two weeks, yielding a total score of 0 to 80 (0 = absence of symptoms, 80 = severe depression). This continuous score was our main outcome of interest for depressive symptoms, although we also used the algorithm from Eaton et al. (2004) to classify each participant into one of five categories: meets criteria for major depressive episode (MDE), probable MDE, possible MDE, subthreshold depressive symptoms, or symptoms of no clinical significance. The CESD-R has excellent internal reliability (Cronbach's α = .92), and the classification scheme yields base rates of depression in line with epidemiological studies (Van Dam & Earleywine, 2011). We also administered a brief seven-item self-report measure of anxiety (GAD-7; Spitzer et al., 2006) to allow for later exploratory analyses, but anxiety was beyond the scope of the present article and is not included in our analyses (anxiety data are available in the "GAD7" tab at https://osf.io/djqcf).

Follow-up survey. Two months after the session, participants were e-mailed a link to a brief follow-up survey on Qualtrics to be completed remotely on a computer, tablet, or smartphone. The survey involved retaking the well-being and mood questionnaires and responding to two statements about progress made so far on each of the six chosen goals; surveys were personalized to include participants' own personal goals. The two statements were "I have made a great deal of progress concerning this goal" and "I have had quite a lot of success in pursuing this goal" (from Steca et al., 2016), with response scales from 0 to 100 (0 = *completely disagree*, 100 = *strongly agree*). As described a priori, the mean of these two responses was used as the main measure of goal progress. The order of the four blocks in the follow-up survey (i.e., well-being, depressive symptoms, anxiety, and goal progress statements) was randomized, as was the order of goals and the two progress statements (see the task flow document at https://osf.io/t4mg9).

Inference

As planned, we used Bayesian statistics for the primary analyses. A Bayesian approach allowed for quantification of the evidence for null effects (i.e., evidence of absence) rather than only failing to reject the null (absence of evidence). This approach was particularly important in the present study because we were equally interested in quantifying the presence or absence of effects. We used default noninformative Cauchy priors for the Bayesian correlational analyses. The primary statistic for inference was the Bayes factor (BF_{10}), representing the relative evidence for an effect (in either direction) compared with no effect. For example, a BF_{10} of 4.34 can be interpreted as an effect being 4.34 times more likely than no effect given the data. We interpreted BF_{10} values of 3 to 10 as substantial evidence for an effect, values of 10 to 30 as strong evidence, values of 30 to 100 as very strong evidence, and more than 100 as extreme evidence (see, e.g., Lee & Wagenmakers, 2013). The same criteria were applied, but inversely, to evidence for a null effect (i.e., BF_{10} values of 1/3–1/10, 1/10–1/30, 1/30–1/100, and < 1/100, respectively). BF_{10} values of 1/3 to 3 were taken as insufficient evidence to draw any conclusions. For the confirmatory analyses, the corresponding frequentist findings are also presented online for comparison (https://osf.io/bhyk7/). As planned, we did not correct for multiple comparisons given that (a) we had a separate and specific directional hypothesis for each analysis, (b) the focus of Bayesian inference is on quantifying relative evidence rather than controlling error rates, and (c) all confirmatory analyses were preregistered and fully reported, which mitigates the multiple comparison problem (Cramer et al., 2016).

Results

Preliminary analyses

Missing data. No data relating to well-being or depressive symptoms at Time 1 (T1) were missing or incomplete. A small number of data points relating to goals were missing because of some goals and motives that were too ambiguous for the research assistant to classify into one of the specified categories. This was the case for some motives scored for approach compared with avoidance (3.7% of trials) and autonomous compared with controlled (1.6%); it was also the case for some goals scored for specificity (2.2%), intrinsic compared with extrinsic (1.0%), and approach compared with avoidance (0.2%). In all instances, we imputed these missing data using the mean of the participant's other scores for each variable.

The 2-month follow-up surveys were completed by 136 participants (88.9% of the sample). We ran logistic regression analyses to check whether completion compared with noncompletion of surveys as a binary outcome was related to other key variables of interest; if so, it may have indicated nonrandom sampling at Time 2 (T2). We found no evidence that survey completion was related to T1 scores on well-being, $b = -0.10$, p = .422; depressive symptoms, $b = 0.10$, p = .634; or any goal and simulation variable, all ps > .05. Follow-up surveys thus appeared to be missing at random, at least relative to baseline scores.

Assumptions check. Following the preregistered decision tree (https://osf.io/j6npa), we checked whether the main confirmatory analyses (i.e., correlations between goals/simulation and well-being and depressive symptoms) met criteria for parametric or nonparametric analysis. For all the correlations of interest, Shapiro-Wilk tests showed evidence of nonnormality of residuals, indicated by W < .99 and $p < .05$. Visual inspection of the QQ-plots further suggested that the distribution of residuals was nonnormal (Section 3.1 of the analysis file at https://osf.io/8erf6). These preliminary tests indicated that all subsequent correlational analyses should be nonparametric; thus, rather than Pearson's *r*, we used Kendall's τ,[1] a method of rank-order correlation that is robust to nonnormality. To calculate Kendall's τ, we used the *psych* package (Version 1.8.12; Revelle, 2019) for the R software environment, and to calculate the associated Bayes factors, credible intervals, and posterior distributions, we used a function created by van Doorn et al. (2018). Kendall's τ is robust to the presence of outliers; nonetheless, as planned, we inspected all data points with a standard deviation above 3.0 to determine whether they may have resulted from researcher error or participant noncompliance. All outliers appeared to be legitimate scores, and so all data points were included in the analyses.

Descriptive statistics

Well-being and depressive symptoms. The sample encompassed a wide spectrum of well-being ($M = 109.2$, $SD = 24.2$; range = 37–147) and depressive symptoms ($M = 13.6$, $SD = 14.6$; range = 0–67) as measured on the PERMA-Profiler and CESD-R, respectively. Well-being and depressive symptoms were strongly negatively correlated ($r = -.44$, $BF_{10} > 10{,}000$). The distribution of well-being scores was similar to base rates reported in a previous large validation study ($M = 112.3$, $SD = 26.6$; Butler & Kern, 2016), and levels of depressive symptoms in our sample were consistent with base rates in the general population ($M = 10.3$, $SD = 11.7$; Van Dam & Earleywine, 2011). According to the CESD-R's algorithmic classification, 10 participants met criteria for MDE (6.5% of the sample), four for probable MDE (2.6%), four for possible MDE (2.6%), 23 for subthreshold symptoms (15.0%), and 112 for symptoms of no clinical significance (73.2%). We corroborated these classifications by comparing them with researcher-based diagnoses from the SCID-5-RV; according to the latter, 17 participants met criteria for current MDE (11.1% of the sample). Cohen's κ was .65, indicating moderate convergence of CESD-R and SCID-5-RV diagnoses. Overall, these results suggested adequate variability in well-being and depressive symptoms in our sample to examine links with the other variables of interest. We also ran paired *t* tests to explore any overall changes in mental health from T1 to T2 and found no change in well-being, mean difference = −0.15, $t(135) = -0.12$, $BF_{10} = 0.10$, or depressive symptoms, mean difference = 0.52, $t(135) = 0.68$, $BF_{10} = 0.12$.

Goal and simulation variables. On average, participants generated 17.2 goals across the three time periods ($SD = 5.0$; range = 9–35), and all participants were able to name at least two goals for each time period. In general, the six chosen goals for each participant were rated as highly attainable ($M = 76.5$, $SD = 11.5$; range = 36.7–99.8) and personally important ($M = 78.3$, $SD = 11.6$; range = 51.5–100). Most goals (53.2% of the 918 trials) related to the life domain of work and education (e.g., "getting a job after I graduate"). The rest of the goals were categorized as follows: close relationships, 9.6% (e.g., "having a happy family"); hobbies and growth, 7.5% (e.g., "continue reading books at a book per week"); health and fitness, 6.9% (e.g., "fully recover from my injury"); home life, 6.4% (e.g., "get rid of my agapanthus in the front yard"); travel, 6.1% (e.g., "book a flight to Thailand for April next year"); money, 4.8% (e.g., "clear off debt"); emotions and feelings, 2.5% (e.g., "trying to feel better with myself"); social life, 1.5% (e.g., "see my new friends"); community and volunteering, 1.4% (e.g., "educate younger people about primates"); and spirituality and religion, 0.1% ("get initiated into the Hare Krishna movement").

Overall, aspects of goal setting and pursuit and goal-directed simulation showed a large degree of variability across participants, with the exception of goals and motives scored for approach compared with avoidance. Only 4.5% of goals and 8.7% of motives were classified as avoidance, suggesting it may be difficult to detect links between these and other key variables. Full descriptive statistics for all goals and simulation variables are presented in Section 2.5 of the analysis file (https://osf.io/8erf6).

Confirmatory analyses

The confirmatory analyses (i.e., planned and with preregistered predictions) refer to correlations between the 28 goals and simulation variables and concurrent well-being and depressive symptoms. The specific directional hypothesis for each correlation and whether that hypothesis was supported by the findings is shown in Figures 1 and 2. All correlations (as Kendall's τ) and their 95% credible intervals and Bayes factors are also presented in Figures 1 and 2. Posterior distributions of the Kendall's τ values can be viewed in Section 4.1 of the analysis file https://osf.io/8erf6; for comparison, the frequentist versions of these analyses can be viewed in Section 4.4.2. In general, the frequentist analyses were less conservative than the planned Bayesian analyses and would have resulted in more of our predictions being labeled as *correct* (i.e., 18 of 46 vs. 22 of 46 predictions inferred as correct from the Bayesian vs. frequentist analyses, respectively).[2]

Goal setting/pursuit and well-being. Of the 14 variables related to goal setting and pursuit, there was extremely strong evidence that attainability and sense of control were

Variable (T1)	Correlation With Well-Being (T1)					
	Effect Size	τ	95% CrI	BF_{10}	Prediction	Correct?
Goal Setting and Pursuit						
Approach vs. Avoidance[a]		−0.07	[−0.17, 0.04]	0.35	↓	?
Attainability[a]		0.37	[0.25, 0.45]	> 10,000	↑	✓
Central to Identity[a]		0.16	[0.05, 0.26]	11.61	↓	✗
Difficulty[a]		−0.13	[−0.23, −0.02]	2.41	↓	?
Expected Joy[a]		0.20	[0.09, 0.30]	156.19	–	–
Expected Sorrow[a]		0.01	[−0.09, 0.12]	0.16	–	–
Fluency		0.08	[−0.03, 0.18]	0.44	–	–
Importance[a]		0.14	[0.03, 0.24]	4.10	–	–
Intrinsic vs. Extrinsic		0.04	[−0.07, 0.14]	0.20	↓	✗
Motives: Approach vs. Avoidance		−0.03	[−0.14, 0.07]	0.19	↓	✗
Motives: Autonomous vs. Controlled		0.09	[−0.02, 0.19]	0.55	↓	?
Number of Life Domains		−0.05	[−0.15, 0.05]	0.24	↑	✗
Sense of Control[a]		0.25	[0.14, 0.35]	6,297.54	↑	✓
Specificity[a]		0.13	[0.02, 0.23]	2.65	↑	?
Goal-Directed Simulation						
Clarity[a]		0.27	[0.16, 0.36]	> 10,000	↑	✓
Detail[a]		0.26	[0.14, 0.35]	8,122.29	↑	✓
Engagement (LIWC)		−0.08	[−0.18, 0.02]	0.47	↑	?
Fragmentation[a]		−0.13	[−0.24, −0.03]	3.08	↓	✓
Negativity[a]		−0.25	[−0.35, −0.14]	4,727.50	↓	✓
Negativity (LIWC)		−0.12	[−0.23, −0.02]	2.01	↓	?
Outcome Focus		−0.02	[−0.12, 0.09]	0.17	–	–
Perspective: First vs. Third Person[a]		−0.06	[−0.17, 0.04]	0.30	↓	✗
Positivity[a]		0.28	[0.16, 0.37]	> 10,000	↑	✓
Positivity (LIWC)		0.08	[−0.03, 0.18]	0.41	↑	?
Process Focus		0.04	[−0.07, 0.14]	0.20	↑	✗
Sensorialness (LIWC)		0.02	[−0.08, 0.12]	0.17	↑	✗
Spatial Coherence (LIWC)		0.09	[−0.02, 0.19]	0.55	↑	?
Vividness[a]		0.22	[0.10, 0.31]	370.41	↑	✓

Fig. 1. Correlations (as Kendall's τ) between the 28 goal and simulation variables (from the goal-directed simulation task) and concurrent well-being. Effect sizes and their 95% credible intervals (CrI) are shown as a forest plot, and the vertical dashed line represents $\tau = 0.0$. Bayes factors (BF_{10}) > 3 show evidence for an effect (in either direction); $BF_{10} < 0.33$ show evidence for a null effect. The directions of preregistered predictions are depicted as arrows (up and green when positive; down and orange when negative), and dashes indicate variables for which no prediction was made. In the "Correct?" column, checkmark/tick icons represent correct predictions (evidence for an effect in the predicted direction), cross icons represent incorrect predictions (evidence for the opposite effect or the null), and question-mark icons represent insufficient evidence to draw a conclusion. Entries followed by a superscript a indicate self-report variables. LIWC = Linguistic Inquiry and Word Count.

	Correlation With Depressive Symptoms (T1)					
Variable (T1)	Effect Size	τ	95% CrI	BF_{10}	Prediction	Correct?
Goal Setting and Pursuit						
Approach vs. Avoidance		0.10	[−0.01, 0.20]	0.77	↑	?
Attainability[a]		−0.24	[−0.33, −0.12]	1,458.46	↓	✓
Central to Identity[a]		−0.06	[−0.17, 0.04]	0.31	↑	✗
Difficulty[a]		0.15	[−0.04, −0.25]	7.65	↑	✓
Expected Joy[a]		−0.17	[−0.27, −0.06]	14.49	–	–
Expected Sorrow[a]		0.02	[−0.08, 0.12]	0.17	–	–
Fluency		−0.01	[−0.11, 0.10]	0.16	–	–
Importance[a]		−0.03	[−0.13, 0.08]	0.18	–	–
Intrinsic vs. Extrinsic		−0.11	[−0.22, −0.01]	1.34	↑	?
Motives: Approach vs. Avoidance		0.09	[−0.02, 0.19]	0.64	↑	?
Motives: Autonomous vs. Controlled		−0.15	[−0.25, −0.04]	5.47	↑	✗
Number of Life Domains		0.16	[0.04, 0.25]	8.48	↓	✗
Sense of Control[a]		−0.14	[−0.24, −0.03]	3.49	↓	✓
Specificity		−0.11	[−0.12, 0.09]	0.16	↓	✗
Goal-Directed Simulation						
Clarity[a]		−0.15	[0.16, 0.36]	7.06	↓	✓
Detail[a]		−0.14	[−0.24, −0.03]	3.58	↓	✓
Engagement (LIWC)		0.16	[0.05, 0.26]	11.48	↓	✗
Fragmentation[a]		0.11	[0.00, 0.21]	1.22	↑	?
Negativity[a]		0.17	[0.06, 0.27	24.35	↑	✓
Negativity (LIWC)		0.17	[0.06, 0.27]	16.61	↑	✓
Outcome Focus		0.11	[0.00, 0.21]	1.03	–	–
Perspective: First vs. Third Person[a]		0.03	[−0.08, 0.13]	0.18	↑	✗
Positivity[a]		−0.14	[−0.24, −0.03]	3.68	↓	✓
Positivity (LIWC)		0.02	[−0.08, 0.13]	0.17	↓	✗
Process Focus		−0.16	[−0.26, −0.05]	8.51	↓	✓
Sensorialness (LIWC)		0.05	[−0.05, 0.16]	0.26	↓	✗
Spatial Coherence (LIWC)		−0.02	[−0.13, 0.08]	0.17	↓	✗
Vividness[a]		−0.15	[−0.25, −0.05]	8.09	↓	✓

Fig. 2. Correlations (as Kendall's τ) between the 28 goal and simulation variables (from the goal-directed simulation task) and depressive symptoms. Effect sizes and their 95% credible intervals (CrI) are shown as a forest plot, and the vertical dashed line represents $\tau = 0.0$. Bayes factors (BF_{10}) > 3 show evidence for an effect (in either direction); $BF_{10} < 0.33$ show evidence for a null effect. The directions of preregistered predictions are depicted as arrows (up and green when positive; down and orange when negative), and dashes indicate variables for which no prediction was made. In the "Correct?" column, checkmark/tick icons represent correct predictions (evidence for an effect in the predicted direction), cross icons represent incorrect predictions (evidence for the opposite effect or the null), and question-mark icons represent insufficient evidence to draw a conclusion. Entries followed by a superscript a indicate self-report variables. LIWC = Linguistic Inquiry and Word Count.

positively correlated with well-being (in line with predictions), as was the level of joy expected from goal success (for which we had made no prediction). There was substantial evidence that the degree to which goals were central to participants' identity was positively correlated with well-being (we had predicted a negative correlation). Another six variables yielded substantial evidence for having no relationship with well-being, whereas the remaining four variables did not yield conclusive evidence either way (see Fig. 1). Overall, of the 10 directional hypotheses made regarding links between goal setting and pursuit and well-being, only two were correct (i.e., evidence for an effect in the predicted direction), five were incorrect (i.e., evidence for either the null or an effect in the opposite direction), and three were inconclusive (i.e., no substantial evidence either way).

Goal setting/pursuit and depressive symptoms. There was extremely strong evidence for a negative correlation between depressive symptoms and attainability (as predicted) and strong evidence for a negative correlation between depressive symptoms and the level of joy expected from goal success (no prediction was made). In addition, there was substantial evidence for depressive symptoms being positively correlated with perceived goal difficulty (as predicted), number of life domains, and having more autonomous motives (for the latter two variables, we had predicted the opposite). There was substantial evidence for a negative correlation between sense of control and depressive symptoms (as expected). Five variables showed substantial evidence for no relationship with depressive symptoms, and the remaining three were inconclusive (see Fig. 2). Of the 10 directional hypotheses made regarding links between goal setting/pursuit and depressive symptoms, three were correct, four were incorrect, and three were inconclusive.

Goal-directed simulation and well-being. Of the 14 variables related to goal-directed simulation, there was extremely strong evidence that self-reported clarity, detail, vividness, and positivity were positively correlated with well-being and that negativity was inversely correlated with well-being (all as predicted). There was also substantial evidence that fragmentation was negatively correlated with well-being (as predicted). There was evidence for the absence of a relationship between well-being and four simulation variables, and evidence for the remaining four variables was inconclusive. Overall, of the 13 directional predictions made regarding goal-directed simulation and well-being, six were correct, three were incorrect, and four were inconclusive (see Fig. 1).

Goal-directed simulation and depressive symptoms. There was strong evidence that negativity (as measured by both self-report and the LIWC) was positively correlated with depressive symptoms (as predicted). Unexpectedly, there was also strong evidence that engagement (as measured on the LIWC) was positively correlated with depressive symptoms; we had predicted the opposite effect. There was substantial evidence that the variables process focus, clarity, detail, vividness, and positivity were negatively correlated with depressive symptoms (as predicted). There was evidence for no relationship between depressive symptoms and perspective: first person compared with third person as well as the three other variables measured on the LIWC (positivity, sensorialness, and spatial coherence); we had predicted negative correlations. The two remaining variables, fragmentation and outcome focus, showed only inconclusive evidence. Of the 13 directional predictions made regarding goal-directed simulation and depressive symptoms, seven were correct, five were incorrect, and one was inconclusive (see Fig. 2).

Exploratory analyses

Clinical levels of depressive symptoms. We aimed to determine whether the observed effects relating to depressive symptoms were generalizable beyond normal-range mood disturbance. In other words, did these correlational effects also manifest as categorical differences between participants with clinical levels of depressive symptoms and those with no clinical symptoms? We ran two-sample *t* tests comparing scores on all goal setting and simulation variables in participants who met criteria for current, probable, or possible MDE (n = 18) and those who scored below subthreshold depressive symptoms (n = 112) on the CESD-R. Overall, the pattern of effects was very similar to the correlations reported above; results of the *t* tests are shown in Section 5.4 of the analysis file (https://osf.io/8erf6). Note that expected joy was extremely reduced in participants with clinical levels of depressive symptoms compared with participants with no clinical symptoms (Hedges's g = 1.27, BF_{10} = 7,610.52), as was the clarity and positivity of simulations (g = 1.10, BF_{10} = 654.79 and g = 1.07, BF_{10} = 452.38, respectively), and the frequency of negative words in simulations was greatly heightened (g = 1.23, BF_{10} = 4,708.21).

Factor analysis. We next explored whether aspects of goals and simulation at T1 predicted goal progress and mental health at a 2-month follow-up (T2). With so many variables, it was impractical to run these analyses on every aspect separately (potentially 84 analyses), so we reduced the dimensionality of variables via Bayesian exploratory factor analysis (BEFA; Conti et al., 2014). This method also allowed us to explore whether aspects of goal setting/pursuit and goal-directed simulation might be more

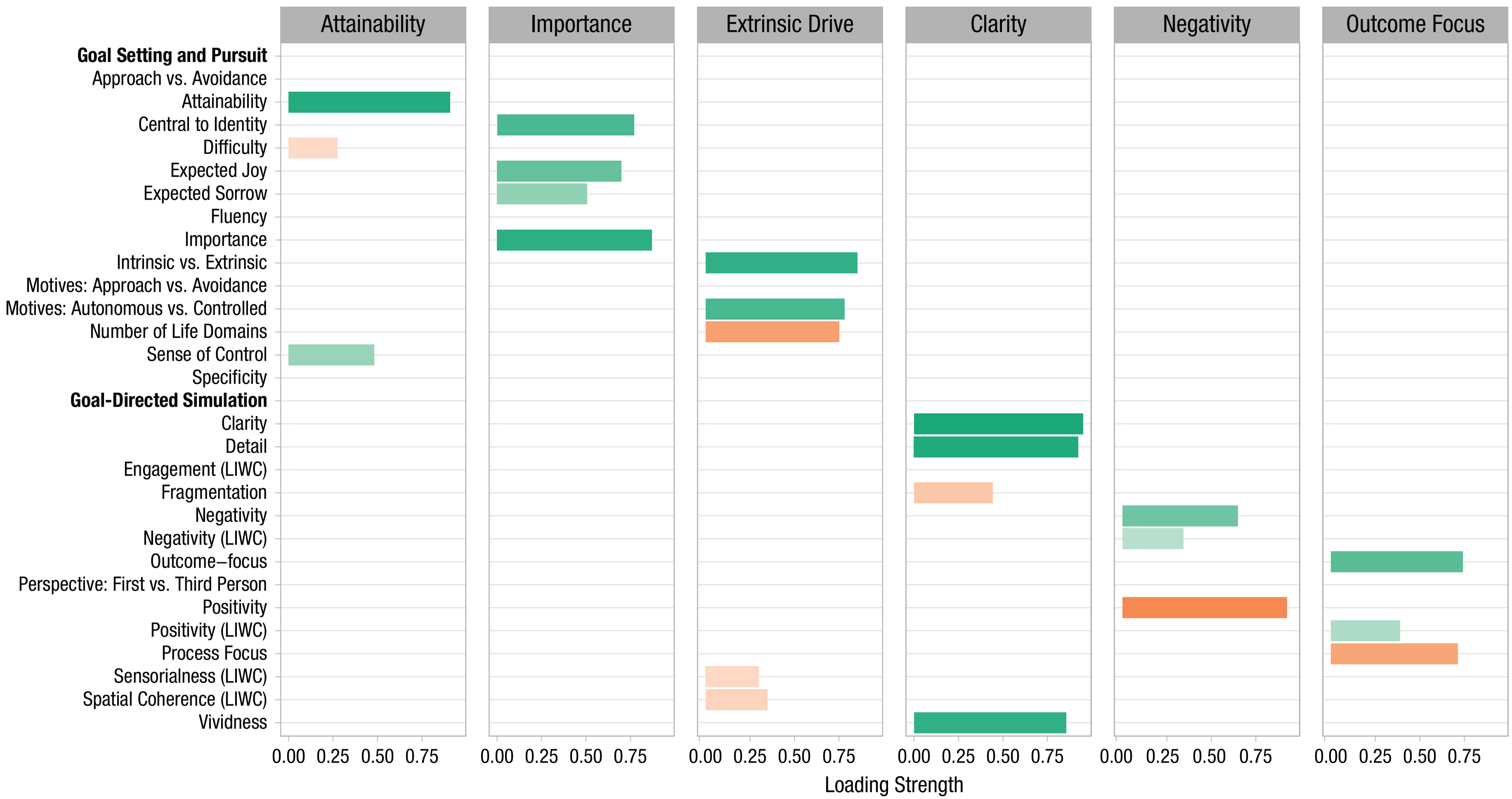

Fig. 3. The six factors underlying goal and simulation variables, as generated by Bayesian exploratory factor analysis (BEFA). The first three factors relate generally to goal setting and pursuit and the next three factors to goal-directed simulation. Darker green shading and darker orange shading reflect stronger positive and negative factor loadings, respectively. LIWC = Linguistic Inquiry Word Count.

parsimoniously explained by broader underlying factors. For example, *detail* and *vividness* have often been used interchangeably in studies of simulation (for a meta-analysis, see Gamble et al., 2019), although we are not aware of any empirical justification to do so, and it is unknown how closely these terms relate to other concepts, such as *fragmentation*. We reasoned that such variables might be explained by a broader underlying factor reflecting the "clarity" of simulations.

We used BEFA because it has been shown to vastly outperform traditional methods of factor analysis (Conti et al., 2014). BEFA uses Markov chain Monte Carlo via the Metropolis-Hastings algorithm to simultaneously estimate the latent factor structure, the allocation of variables to factors, and the factor loadings. The model is dedicated (i.e., each variable loads on to only one factor), and factors are allowed to correlate. BEFA was run using the *BayesFM* package (Version 0.1.2; Piatek, 2017) for the R software environment, which requires the specification of a number of prior parameters relating to, for example, plausible values for the number of factors (K) and correlations between the factors (Section 5.1.2 of the analysis file: https://osf.io/8erf6; see *BayesFM* package documentation for the equations for each parameter). Note that the prior specification can have a substantial impact on the factor structure revealed (Conti et al., 2014); we simulated plausible prior distributions using built-in functions in the *BayesFM* package, according to the number of manifest variables included (n = 28) and a specified maximum number of latent factors (maximum $K = 8$). The sampler was run for 100,000 iterations (40,000 burn-in). A clear six-factor solution emerged (K = 6; probability = .93), with a Metropolis-Hastings acceptance rate of .36. Although the most likely identification matrix had only a low posterior probability of .05 (relative to all possible models visited by the sampler), the next nine most likely models revealed similar solutions, with all suggesting six factors.

The first three factors related to goal setting and pursuit (see Fig. 3) and were labeled and interpreted as follows. Attainability reflected the perceived likelihood of goal achievement and sense of control over the outcome of goals. Importance reflected the extent to which goals were important and central to participants' identity as well as the likely impact of goal achievement in terms of expected joy or sorrow. Extrinsic Drive represented the extent to which goals were externally focused (rather than intrinsically rewarding) and motived by controlled reasons rather than autonomous reasons. This factor also included the extent to which a participant's goals spanned only a narrow variety of life domains, reflecting that many individuals who cited work/education goals scored low on number of life domains and high on extrinsic focus. The Extrinsic Drive factor also had small loadings from two simulation variables as measured on the LIWC: sensorialness and spatial coherence; that is, extrinsic goals were linked to simulations that contained fewer sensory words (related to seeing, hearing, feeling) and space-related words (e.g., up, down, left, right).

The next three factors related to the process of goal-directed simulation. As expected, detail, vividness, clarity, and (to a lesser extent) fragmentation of simulations loaded onto a single factor, which we labeled as Clarity. Self-rated negativity and (inversely) positivity of simulations and negativity measured on the LIWC loaded onto a factor that we labeled Negativity. Finally, the extent to which simulations were process and outcome focused loaded (inversely) onto a factor that we labeled Outcome Focus. Positivity measured on the LIWC also loaded onto this factor, indicating that outcome-focused simulations typically contained more positive words. Having reduced the dimensionality of goal and simulation variables at T1 to six interpretable factors, we next explored their links with mental health and goal progress at a 2-month follow-up.

Which factors predict later functional outcomes? We first ran exploratory correlational analyses between the six goals and simulation factors at T1 and mental health and goal progress at T2 (i.e., 2 months later; see Section 5.2 of https://osf.io/8erf6). In general, higher attainability and importance of goals and higher clarity and lower negativity of simulations at T1 were strongly associated with higher well-being, lower depressive symptoms, and greater goal progress at T2. There was inconclusive evidence or evidence in favor of the null for associations with extrinsic drive of goals and the outcome focus of simulations. Nonetheless, these relationships may have been partly confounded by strong associations of these variables with baseline mental health scores. To account for this, we ran exploratory regression analyses to examine which factors of goals and simulation predicted T2 outcomes over and above mental health at T1.

The regressionBF function of the *BayesFactor* package (Version 0.9.12-4.2; Morey, 2018) was used to identify the best regression models (i.e., those with the highest BF_{10}) predicting well-being, depressive symptoms, and goal progress at T2 from all possible combinations of T1 predictors (see Section 5.3 of the analysis file for more detail; https://osf.io/8erf6). Results are shown in Table 1. There was very strong evidence that lower negativity (and higher positivity) of goal simulations was predictive of well-being at T2 even after controlling for well-being at T1, and together, these variables accounted for 73% of the variance in T2 well-being. Depressive symptoms at T2 were best accounted

Table 1. Best Regression Models Predicting Mental Health and Goal Progress at Time 2 From Mental Health and Goals/Simulation Factors at Time 1

Dependent variable (T2) and predictor variable (T1)	β	*SD*	BF_{10} predictor	Adjusted R^2	BF_{10} model
Well-being					
Well-being	0.75	0.05	> 10,000	.73	> 10,000
Factor 5: Negativity of simulations	−0.18	0.05	37.31		
Depressive symptoms					
Depressive symptoms	0.64	0.07	> 10,000	.60	> 10,000
Well-being	−0.20	0.07	3.40		
Goal progress					
Well-being	0.32	0.08	140.19	.28	> 10,000
Factor 1: Attainability of goals	0.27	0.09	18.94		

Note: The "best" models are those with the highest Bayes factor (BF_{10}) identified via exploratory analysis of all possible regression models (i.e., all possible combinations of predictor variables). The BF_{10} predictor column shows improvement in evidence relative to a model without that predictor. The BF_{10} model column shows improvement in evidence relative to an intercept-only model. T1 = Time 1; T2 = Time 2.

for simply by mental health scores at T1. Goal progress at T2 was best predicted by well-being at T1 and the perceived attainability of goals at T1.

Discussion

To our knowledge, this study is the first detailed assessment of goal-directed imagination and its links to mental health. In a community sample, we found strong associations between many aspects of goal setting and imagination and well-being and depressive symptoms. Effects were evident whether examining depressive symptoms correlationally or when comparing individuals with clinical levels of depressive symptoms with individuals with symptoms of no clinical significance. We also found a number of null and unexpected effects that, in some cases, ran counter to theory or prior findings. Furthermore, we explored the broader factors that may underlie goal setting/pursuit and goal-directed simulation and found that some of these factors predicted goal progress and mental health at a 2-month follow-up over and above baseline mental health. These findings may have implications for the design of goal- and imagery-based interventions to reduce depressive symptoms or increase positive aspects of functioning. We first discuss the findings related to goal setting and pursuit before turning to goal-directed imagination.

Goal setting and pursuit

In terms of goal setting and pursuit, some of the strongest links with mental health were higher perceived attainability, sense of control, and lower expected difficulty in achieving one's goals. These results were generally as predicted and align well with prominent theories of well-being and depression. For example, Seligman's (2011) PERMA model includes feeling a sense of attainment or mastery over one's goals as a core aspect of well-being. Likewise, Bandura (2009) argued that perceived self-efficacy—which partly reflects people's belief in their ability to attain goals—is crucial to engaging in rewarding behaviors and thus to emotional well-being: "Unless people believe they can produce desired effects by their actions, they have little incentive to undertake activities or to persevere in the face of difficulties" (p. 1534). Perceived goal attainability was indeed the strongest predictor of later goal progress. On the negative side of mental health, depression has also long been associated with a perceived lack of control over one's surroundings (i.e., the learned helplessness model of depression; Abramson et al., 1978). Viewing goals as unattainable and out of one's control may be a key maintenance factor in depression whereby individuals avoid activities that could lead to positive emotions (e.g., exercise; Hopko & Mullane, 2008).

We had made no prediction about expected joy (from goal attainment) and sorrow (from failure) and links to mental health given some apparently mixed prior findings. For example, Street (2002) proposed that depression is associated with conditional goal setting whereby future happiness is seen as contingent on reaching important goals. On the other hand, another body of work suggests that a core feature of depression is an absence of positive expectancies such that depressed people would predict experiencing less joy upon reaching their goals (reviewed in Roepke & Seligman, 2016). Our findings indicated that higher depressive symptoms and lower well-being were related to lower expected joy (and not at all to expected sorrow), which aligns with the theory that depression is characterized by a deficit in positive prospection rather than conditional goal setting.

Considering the notion of conditional goal setting (Street, 2002), we had also predicted that depressive symptoms would be linked to having goals that were more central to a participant's sense of identity—given that their goals might be seen as the key to a future happy life. However, we found no relation between depressive symptoms and centrality to identity; the latter was, in fact, associated with higher well-being. Thus, although it is possible that some depressed participants expect to reach happiness if they succeed in their goals, the more general trend seems to be that depressive symptoms are linked to lower expected joy and to viewing one's goals as less central to one's sense of identity. Individuals who rated their goals as more important to them also tended to report greater progress on those goals 2 months later.

The *why* of goals—whether autonomously motivated and intrinsically rewarding or driven by some extrinsic pressure—generally showed weaker links to mental health. Counter to predictions, pursuing more autonomously motivated goals was not associated with well-being and was weakly correlated with higher depressive symptoms. This result is surprising in the context of self-determination theory, which posits that goals pursued for their own sake should naturally bring one closer to a sense of autonomy and thus confer a greater well-being benefit (Ryan & Deci, 2000). Our finding may have been confounded by a third variable: Goals that were less autonomously motivated also happened to be viewed as more attainable; as described above, attainability was strongly associated with lower depressive symptoms.

Autonomously motivated and intrinsically rewarding goals also tended to span a wider variety of life domains; these three variables loaded onto a single broader factor (labeled as External Drive; see Fig. 3). Surprisingly, having goals across a wider variety of life domains was not related to well-being and was related to higher depressive symptoms. We had predicted the opposite given previous findings that having few and unvaried goals is a cognitive vulnerability factor for depression (Champion & Power, 1995). Again, this association may have been confounded by attainability; having goals across fewer life domains was also linked to higher attainability, which was correlated with lower depressive symptoms.

Unexpectedly, we found substantial evidence that the specificity of goals was not related to depressive symptoms. Higher specificity did show a small positive correlation with well-being, but the evidence was not strong enough to conclude the presence of an effect. In previous research, the "macro-level" specificity of future thinking (i.e., at the level of the event or goal itself) generally shows small but robust inverse correlations with depressive symptoms (Gamble et al., 2019). What, then, could explain our null finding? The scoring of specificity in this study, although showing moderate interrater reliability, was nevertheless the least reliable of our researcher-rated variables; Cohen's κ was .66, slightly lower than the score of .78 reported in the original study (Dickson & MacLeod, 2004b). Perhaps our null finding was due to measurement imprecision (and thus low power) rather than a true null effect. Whether the specificity of personal goals is truly reduced in depression remains an open question for future research.

We also did not find the expected effects for goals and motives scored for approach compared with avoidance; there was no substantial evidence that these variables were linked to mental health. These results are surprising in the context of many previous studies that have shown that the frequency of approach compared with avoidance is associated with both well-being and depression (reviewed in MacLeod, 2017). It is difficult to explain why we did not replicate these findings. The proportions of avoidance goals and motives that participants reported were very small (4.5% and 8.7%, respectively), suggesting that, in general, people set goals to move toward something positive rather than away from something negative. Perhaps there was not enough variability in approach goals compared with avoidance goals and motives to detect relationships with mental health. Given substantial prior evidence of the importance of goal framing, we do not suggest that the approach compared with avoidance distinction is unrelated to mental health, although perhaps the magnitude of the effects is smaller than previously thought.

Goal-directed simulation

In terms of goal-directed simulation, variables reflecting the emotional valence of episodic simulation showed some of the strongest links with mental health. As predicted, higher depressive symptoms and lower well-being were associated with simulations self-rated as less positive and more negative. Higher depressive symptoms were also associated with negativity as measured by the number of negative words generated (according to the LIWC). Our predictions were based on previous findings that people with depression often experience both a lack of positive mental imagery and an excess of negative intrusive mental imagery (Holmes et al., 2016). We suspected these processes would also plausibly occur during the imagining of one's goals, and the results supported this view. Our findings also highlight that the relationship between emotional valence and depression may depend on the mode of prospection under investigation (Szpunar et al., 2014). When setting goals (i.e., the *intention* mode of prospection), depression seems to be characterized by a marked lack of positive expectancies but not an increase in negative expectancies. However, when it comes to the *simulation* mode of prospection, depression seems to feature not only a deficit in positive future imagery but also an increase in negative future imagery (Holmes et al., 2016). Emotional valence of simulations also appears to be particularly important in the context of predicting mental health over time, given that the Negativity factor was a strong predictor of later well-being even after covarying for baseline mental health. That imagining a more negative (and less positive) future actually predicts later decreased well-being underscores this process as a potential intervention target.

As predicted, higher well-being and lower depressive symptoms were correlated with greater clarity, vividness, and detail (although the association between detail and depressive symptoms did not quite reach the threshold for substantial evidence). The magnitude of these effects was almost identical to that estimated in our recent meta-analysis on the specificity of future thinking in depression (Gamble et al., 2019). Evidence for the fragmentation of simulations was inconclusive despite small correlations in the predicted directions. As expected, fragmentation was also correlated (moderately) with clarity, detail, and vividness; these variables loaded onto the same broader factor that we labeled as Clarity. Individuals who scored highly on this factor tended to report making greater progress on their goals over time. This finding aligns with existing work on the importance of mental imagery and episodic simulation for functioning in general (e.g., Holmes & Mathews, 2010; Schacter, 2012) and maps well onto three recent experimental studies that showed generating vivid imagery of the future can increase engagement, anticipatory pleasure, motivation, and actual completion of goals (Hallford et al., 2019; Renner et al., 2017, 2019).

In addition to these quantitative results on clarity, we note some anecdotal findings that give a window into the subjective experience of goal-directed simulation. One participant, who met criteria for a current MDE, expressed how difficult it was to imagine a clear future and speculated that this might affect goal setting itself: "Everything is just so blurred, it's just like blackness. . . . That's probably why I don't set goals—because I don't see anything." Another participant, who did not have depression but went on to experience a substantial drop in well-being, conveyed a similar idea: "It's just like blank. It's so weird. It's just like gray. And I'm struggling to get beyond my current reality. Like I can't imagine being or feeling different than I do now." For these individuals, struggling to see a clear future seemed to have a notable impact on their everyday functioning.

Surprisingly, the perspective adopted during simulation—whether from a field (first person) or observer (third person) viewpoint—was not related to mental health. Prior studies have shown that people with depression are more likely than healthy control subjects to experience mental imagery from an observer perspective (Holmes et al., 2016). Adopting an observer perspective may reflect psychological distancing, which can downregulate distress associated with negative imagery (e.g., Williams & Moulds, 2008) but can also mitigate the beneficial effects of positive imagery (e.g., Lemogne et al., 2006). Most prior studies on perspective-taking in depression have focused on memories, but Hallford (2019) also found that dysphoric individuals (compared with control participants) reported a greater frequency of the observer perspective during future thinking; there was, however, no group differences in field perspective. Perhaps the unexpected null finding in the present study can be partly explained by methodological differences. We used a single item to assess perspective, with field versus observer options presented at either end of a single scale, whereas Hallford used separate items to assess each perspective. That he found group differences in the frequency of observer perspective but not field perspective suggests these may be distinct dimensions of simulation rather than opposing ends of the same spectrum. If so, individual differences in perspective may not have been adequately captured by our single-item measure.

Our predictions regarding the focus of goal-directed simulation (i.e., whether on the process or outcome) were partially supported. We had predicted that higher well-being and lower depressive symptoms would be correlated with a tendency to focus on the steps leading to goal attainment (i.e., the process) given the many reported benefits of simulation when used for planning and problem-solving, including on mental health (reviewed in Bulley & Irish, 2018). We found that greater process focus was indeed correlated with lower depressive symptoms, although it was not related to well-being. We had made no prediction regarding outcome focus and mental health, considering what we saw as some mixed prior findings. For example, although some studies have reported that outcome simulations (or related positive fantasies) are associated with poorer affect regulation (Taylor et al., 1998) and an increase in depressive symptoms over time (Oettingen et al., 2016), others have suggested that imagining positive future events may boost motivation for rewarding activities

(Renner et al., 2019). Our results showed no substantial evidence for a link between outcome focus and mental health—perhaps reflecting a middle ground between prior findings. Envisioning a positive outcome may boost motivation in some individuals and for some goals but for others, might cross over into fantasy and even demotivation; a combination of these factors could plausibly have produced the overall null effect reported here. We note also that the way in which imagery was generated differed across previous studies: Whereas Oettingen et al. (2016) examined longer, spontaneous responses to open-ended scenarios, Renner et al. (2019) had participants generate brief flashes of clearly specified goal-directed behavior. Future research could help to determine the optimal timing and focus of goal-directed simulations to boost motivation.

In general, simulation variables as measured objectively by the LIWC were not as strongly related to mental health as we had expected given that microlevel measures of simulation (i.e., at the level of individual words) have been linked to depression (e.g., Hach et al., 2016). For example, we did not find evidence that depressive symptoms or well-being were correlated with sensory and space-related words in simulations. It is difficult to explain why we did not replicate prior findings, but the discrepancy could be due to any number of methodological differences. For example, Hach et al. (2016) required participants to imagine future events related to nonpersonalized prompts (e.g., "on the motorway") rather than personal goals; perhaps the former is more difficult, revealing more a more obvious distinction between depressed people and control participants.

We had also expected higher well-being and lower depressive symptoms to correlate with greater engagement in simulation, measured as the number of present-focused words (by the LIWC). The use of the present tense during remembering (e.g., "I see the smoke" vs. "I saw the smoke") may indicate a stronger sense of reexperiencing (Park et al., 2011)—an effect that we expected would extend to *pre*experiencing. Surprisingly, we found that a higher frequency of present-focused words was associated with higher depressive symptoms. Although this finding may suggest (counterintuitively) that depressed people are more engaged during simulation, such a conclusion would not fit well with our other results (e.g., that depression is associated with reduced clarity). On reflection, we think present-focused words as categorized by the LIWC may not tap into engagement as expected but may sometimes reflect more abstract and metacognitive statements during simulation. For example, a participant who states, "I don't know. I can't imagine much at all—it is not very clear," would potentially score highly on engagement when defined as present-focused words (Pennebaker et al., 2015).

Limitations and future directions

We believe the current study provides valuable insights into the little studied process of goal-directed imagination and its links to mental health. There are, however, some limitations of the study to bear in mind. First, although our participants spanned a wide spectrum of well-being and depressive symptoms, a relatively small proportion of the sample met criteria for MDE. Thus, inferences from our study may not necessarily extend to individuals with the most severe and chronic depression. Even so, a similar pattern of effects emerged whether assessing depressive symptoms correlationally throughout the sample or comparing individuals with clinical levels of depressive symptoms with individuals with symptoms of no clinical significance. This indicates some generalizability of the findings beyond normal-range mood disturbance. Second, although our sample was diverse in terms of ethnicity and country of origin, it was by and large a sample of young and highly educated adults; it is unknown whether the findings would generalize to other demographics. Third, despite our attempts to be as comprehensive as possible in the assessment of goal setting and simulation, there are countless more aspects of these processes that could be examined; for instance, the extent to which goal-directed simulation contains intrusive images may be heightened in depression (Holmes et al., 2016). Fourth, it is unknown to what extent goal-directed simulation during the lab-based task resembles that during everyday life. We aimed for simulation to reflect real life by having participants imagine their own goals, but ecological validity could be further examined via methods such as experience sampling (e.g., Andrews-Hanna et al., 2013).

Finally, given that our aim was to assess individual differences, the study design was correlational; we cannot conclude that manipulating aspects of goal setting and simulation would lead to changes in mental health. Nonetheless, correlational and longitudinal evidence often serves as a basis for future intervention studies by highlighting potential targets for manipulation. Evidence has emerged, for example, that engaging in positive imagery of the future can enhance behavioral activation in depression (Renner et al., 2017). The current study complements such findings by highlighting additional variables that seem to be important for functioning—such as confidence in goal attainability, expected joy, and the clarity of goal-directed simulations.

In a topic as broad as imagination and mental health, there are, of course, myriad more questions to be addressed. By making our data openly available, we hope to facilitate future investigations into questions that fall beyond the scope of the present article. For instance, how does goal setting and simulation relate to other aspects of mental health such as anxiety? Is mental health more strongly linked to the setting and simulation of short-term, medium-term, or long-term goals? And how are goal setting and simulation related to other participant characteristics, such as gender, age, or history of depression, or to antidepressant medication? These are just some of the questions that can be explored using the available data set.

Conclusion

This study underscores the intimate links between aspects of goal-directed simulation and mental health—both concurrently and over time—and demonstrates the utility and ecological validity of adopting a theoretical framework that investigates multiple aspects of prospection (Szpunar et al., 2014). Individuals lower in depressive symptoms and higher in well-being tended to see their goals as markedly more attainable and expected to bring more joy, and they simulated their goals in a way that was less negative, more positive, clearer, and more detailed. We also report evidence that the emotional valence of simulations is a strong predictor of well-being over time even after controlling for baseline mental health. These and other findings contribute to the growing understanding of the role of prospection and mental health, and they highlight potential targets for future goal-based and imagery-based clinical interventions to reduce depressive symptoms or improve positive aspects of functioning. Imagination is clearly an adaptive ability—and one that might be better harnessed to help individuals reach the futures they want.

Transparency

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Author Contributions
B. Gamble, D. R. Addis, and L. J. Tippett developed the study concept and design. B. Gamble conducted the participant sessions, analyzed the data, and drafted the manuscript, with critical revisions from L. J. Tippett, D. Moreau, and D. R. Addis. All of the authors approved the final manuscript for submission.
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The author(s) declared that there were no conflicts of interest with respect to the authorship or the publication of this article.
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Open Practices
Data and materials have been made publicly available via OSF and can be accessed at https://osf.io/4v536. The design and analysis plans for the experiments were preregistered at https://osf.io/8jgd4. This article has received badges for Open Data, Open Materials, and Preregistration. More information about the Open Practices badges can be found at https://www.psychologicalscience.org/publications/badges.

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Notes

1. Although Spearman's ρ is a more common nonparametric correlation than Kendall's τ, this preference in the literature is due more to historical than statistical reasons; the latter test is thought to be more robust, efficient, and interpretable (Croux & Dehon, 2010).
2. In interpreting the magnitude of effect sizes throughout the results section, we suggest readers refer to the new benchmarks proposed for correlational analyses in psychology by Funder and Ozer (2019). Although these refer to Pearson's correlations, Kendall's τ values are typically lower than r, making our interpretations slightly more conservative. The benchmarks are as follows: r = .05 is a very small effect, r = .10 is a small effect, r = .20 is a medium effect, r = .30 is a large effect, and r = .40 is a very large effect.

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