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ORIGINAL PAPER

Examining the implications of perceiving one's future health as a goal or a standard for affect, motivation, and health behaviour

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Abstract
Based on an integrative self-regulatory framework, we examined the implications of viewing one's anticipated future health as a goal (desired for the future) or a standard (desired at present). Two studies, one experimental ($N=747$; M age = 25; 54% female) and one correlational ($N=407$; M age = 24; 55% female), assessed beliefs about future health, affect, motivation, health behaviour intentions (both studies), and health behaviour choices (Study 2). In both studies, whether anticipated future health functioned as a goal or as a standard did not moderate the predictive effects of the magnitude of perceived discrepancy and perceived rate of discrepancy reduction between one's current and anticipated future health. However, greater perceived discrepancy reduction predicted more positive affect, greater motivation, and stronger health behaviour intentions. Thus, irrespective of whether future health functions as a goal or a standard, it may be most productive to perceive a greater rate of progress toward a healthier future.

Keywords Health · Motivation · Affect · Intentions · Self-regulation

Introduction

Many young adults believe that their health is getting better and better over time. But do such beliefs facilitate progress towards improved future health? And might some ways of perceiving one's anticipated future health be more productive than others? In the present work we report two studies examining such notions based on the distinction proposed by Boldero and Francis (2002) between viewing a positive reference value as a goal or a standard.

Positive beliefs about one's future health

Even independent of objective indicators of health, more positive perceptions of one's health status are predictive of more adaptive health outcomes, such as reduced mortality, better physical functioning, and greater engagement in health-promoting behaviours (Idler & Benyamini, 1997; Han et al., 2005; Lee et al., 2012; Marcinko, 2015). Whereas much research on subjective health examines individuals' perceptions of their current health or their health overall, other studies have demonstrated the importance of understanding how individuals view their health across time, including their remembered past and/or anticipated future health (e.g., Staudinger et al., 2003; Sargent-Cox et al., 2010; Tasdemir-Ozdes et al., 2016; Sheppard et al., 2017). Young adults (18–44 years old) typically report that their anticipated future health will be more positive than their current health (Bunda & Busseri, 2019a). Such beliefs among younger adults may be biased, since self-rated health typically does not improve over time, particularly beyond early middle age (Besdine, 2019; Bunda & Busseri, 2019b). Nonetheless, such optimistic thinking about future health has been shown to predict more positive health-related intentions (Bunda & Busseri, 2019a). Less well understood, however, are the psychological processes underlying such associations.

Goals and standards: Implications for affect, motivation, and behaviour

Intending to change one's health involves self-regulation (Carver & Scheier, 1982; Sirois, 2015), which is a multi-step process requiring comparing oneself against a reference value, determining the resulting discrepancy, and acting to

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reduce that discrepancy (Carver & Scheier, 1982; Higgins, 1987). Reference values can be positive or negative, and can include versions of the self that one aspires to be, feels obliged to be, and even fears becoming (Markus & Nurius, 1986; Higgins, 1987; Ogilvie, 1987; Busseri & Merrick, 2016; Busseri & Merrick, 2016). Comparisons against a reference value can have behavioural consequences. Indeed, according to prominent self-regulation theories (e.g., Carver & Scheier, 1982, 1990; Higgins, 1987), if the reference value is a positive state (e.g., good health for the future), an individual will engage in behaviours that align with the reference value. Comparing oneself against a reference value can also lead to affective and motivational consequences. For example, discrepancy with a positive reference value (e.g., if the individual's present health is perceived to be worse than their desired health) will produce heightened negative affect and promote greater motivation to change one's behaviour in order to increase alignment with the reference value (Carver & Scheier, 1990; Higgins, 1987).

With respect to the underlying psychological process, however, there are contrasting views concerning whether the affective, motivational, and behavioural consequences of self-regulation are primarily a result of perceived discrepancy *magnitude* or perceived discrepancy *reduction rate* (Boldero & Francis, 2002). According to Self-Discrepancy Theory (Higgins, 1987), the magnitude of the discrepancy perceived between the current state and the reference value determines the emotional, motivational, and behavioural outcomes. Specifically, a larger perceived discrepancy with a positive reference value (wherein the self is viewed as inferior to the reference value) results in more negative affect, greater motivation to reduce the discrepancy, and more behavioural change. In contrast, according to Control Theory (Carver & Scheier, 1990), the emotional, motivational, and behavioural changes depend on the perceived rate of discrepancy reduction, that is, the perceived rate of progress relative to the expected rate. A discrepancy reduction rate (relative to a positive reference value) that is perceived to be worse than expected will lead to more negative affect, as well as greater motivation and more behavioural change.

Seeking to integrate these perspectives, Boldero and Francis (2002) proposed that a reference value can function as a goal and/or as a standard. Although such terms are sometimes used interchangeably, these authors proposed that goals and standards have distinct implications for self-regulation. When a reference value is desired for the self in the future, it functions as a goal; when a reference value is desired for the self in the present, it functions as a standard. The same reference value may function as either a standard or a goal, depending on context, time, or the individual.

According to Boldero and Francis (2002), whether a reference value serves as goal or a standard has important implications for the consequences of self-regulation. When a reference value functions as a standard, the affective, motivational, and behavioural consequences depend on the perceived discrepancy magnitude (consistent with Self-Discrepancy Theory; Higgins, 1987). Discrepancy between the current state and a positive reference value creates a negative psychological situation. Accordingly, a larger perceived discrepancy from a positive reference value results in greater negative affect and greater motivation to reduce the perceived discrepancy. In contrast, when a reference value functions as a goal, it represents a desired state for the future, rather than the present; thus, discrepancy between the current state and a positive reference value does not create a negative psychological situation. Rather, the affective, motivational, and behavioural consequences depend on the perceived discrepancy reduction rate (consistent with Control Theory; Carver & Scheier, 1982). Accordingly, a perceived rate of progress relative to a positive reference value that is worse than expected will result in greater negative affect, greater motivation to achieve the desired future state, and greater discrepancy-reducing behaviour.

Together, these notions suggest that whether a reference value functions as a goal or a standard will moderate the roles of perceived discrepancy magnitude and perceived discrepancy reduction rate in producing various consequences associated with self-regulation. Boldero and Francis' (2002) framework thus offers a resolution to the competing predictions made by Control Theory (Carver & Scheier, 1982) and Self-Discrepancy Theory (Higgins, 1987) concerning the psychological significance of perceived discrepancy magnitude and perceived discrepancy reduction rate. To date, however, this framework has not been widely tested. Rather, supporting evidence is largely limited to studies testing (separately) the implications of perceived discrepancy magnitude (consistent with Self-Discrepancy Theory, e.g., Kelly et al., 2015; Mason et al., 2019), or perceived discrepancy reduction rate (consistent with Control Theory, e.g., Lawrence et al., 2002; Custers & Aarts, 2005; Thürmer et al., 2019).

Such studies provide support for the psychological significance of perceived discrepancy magnitude and perceived discrepancy reduction rate in the self-regulation process (e.g., Custers & Aarts, 2005; Thürmer et al., 2019). However, direct evidence is needed concerning the key features of Boldero and Francis' (2002) framework. In particular, research is needed to evaluate whether the goal or standard function of a positive reference value moderates how perceived discrepancy magnitude and perceived discrepancy reduction rate are linked with affective, motivational, and behavioural consequences as individuals strive towards the healthier futures that they envision.

The present research

Drawing on Boldero and Francis' (2002) self-regulation framework, in the present work we report two pre-registered studies (one experimental, the other correlational) investigating individuals' beliefs about how their health is unfolding over time, in relation to affect, motivation, and behavioural intentions and choices. The primary objective was to evaluate the moderating role of viewing one's future health as a goal or a standard in terms of the psychological significance of perceived discrepancy magnitude and perceived discrepancy reduction rate in relation to affect, motivation, and health behaviour intentions. In Study 1 we manipulated whether individuals viewed their future health as a goal or as a standard (vs. a control condition). In Study 2, we evaluated individual differences in the degree to which individuals viewed their anticipated future health as a goal and as a standard.

Study 1

In Study 1, an experimental design was used to evaluate the moderating role of framing one's anticipated future health as a goal or a standard (vs. a control condition) on the predictive effects of perceived discrepancy magnitude and perceived discrepancy reduction rate on affect, motivation, and health behaviour intentions. Given that inclining subjective health trajectories are typical of younger adults (Bunda & Busseri, 2019a, b), we limited participants to those aged 18 to 29 years of age in order to focus on individuals for whom their future health would likely represent a positive reference value. We thus expected that the sample of young adults would, on average, report an inclining subjective health trajectory, regardless of experimental condition. Further, based on the proposed differences in the psychological situation created by viewing a positive reference value as a goal versus a standard (Boldero & Francis, 2002), we predicted that framing one's future health as a goal versus a standard would moderate the effects of perceived discrepancy reduction rate and perceived discrepancy magnitude. Specifically, when future health was framed as a goal, perceived discrepancy reduction rate would determine the self-regulatory outcomes (consistent with Control Theory; Carver & Scheier, 1990), such that those perceiving less progress toward their improved future health would report less positive and more negative affect, greater motivation to achieve anticipated future health, and stronger intentions to engage in health-promoting behaviours. In contrast, when future health was framed as a standard, perceived discrepancy magnitude would determine the self-regulatory outcomes (consistent with Self-Discrepancy Theory; Higgins, 1987), such that those perceiving a larger (vs. smaller) gap between their present and more positive future health would report less positive and more negative affect, greater motivation, and stronger health-promoting behaviour intentions. No predictions were made concerning the control (vs. the goal or standard) condition.

Methods

Participants

Participants were recruited through Amazon's Mechanical Turk (MTurk) and administered through CloudResearch (formerly TurkPrime; Litman et al., 2017). Individuals eligible for the study were between the ages of 18 and 29 years, fluent in English or reported English as their first language, and lived in the United States. Participants with unique IP addresses who completed the study (i.e., all manipulation materials and study measures) were paid $1.50 USD. The study took approximately 15 min. Our target sample size was 600 participants, based on an a priori goal of achieving power of 0.80 or greater to detect as statistically significant ($\alpha = 0.05$, two-tailed) a small effect size ($r = 0.10$; Funder & Ozer, 2019). Of the 967 participants who consented to the study, 830 completed a description of their future health and were randomly assigned to one of three experimental conditions. Of these individuals, 753 completed the study, of whom 747 were within the target age range. Analyses were based on these 747 participants; *M* age = 24.58, SD = 2.64; 53.7% female; 72.7% White, 11.6% Black, 10.7% Asian, 10.2% Latinx; 51.8% with at least some post-secondary education. A sensitivity analysis indicated that this sample size provided statistical power of 0.80 to detect as statistically significant ($\alpha = 0.05$, two-tailed) a correlation of 0.10 or larger (absolute magnitude).

Procedure

After providing informed consent, all participants described what their anticipated future health would be like 5 years into the future. Participants were then randomly assigned to one of three conditions: goal, standard, or control. Participants in the goal condition further described their anticipated future health as a goal that they desired to achieve in the next 5 years; participants in the standard condition further described their future health as a standard that they desired to have in the present. Participants then completed independent variable and manipulation checks, as well as the primary study measures. Upon completion, participants were provided an online debriefing form.

Independent variable check and manipulation check To ensure comprehension, participants selected one of three statements that best corresponded with how they were previ-

ously instructed to view their future health (i.e., as a goal, as a standard, or neither). Note that 97.2% in the goal condition and 94.2% in the standard condition provided the correct responses. Participants also answered two questions based on what they were thinking while they were writing about their anticipated future health: On a 7-point scale ranging from 0 (*not at all*) to 6 (*extremely*), participants rated (1) how much they were thinking of their future health as a goal that they would achieve in the next 5 years (goal rating), and (2) how much they were thinking of their future health as a standard that they desired to have right then (standard rating). Means (and *SD*s) for these two items by condition were as follows: 5.42 (0.90) and 3.27 (1.97) in the goal condition; 3.87 (1.93) and 5.07 (1.18) in the standard condition; and 4.31 (1.85) and 3.35 (1.79) in the control condition. Note also that 71.0% of participants in the goal condition had higher goal than standard ratings, and 50.4% in the standard condition had higher standard than goal ratings.

Measures

Perceived discrepancy magnitude Participants' perception of the magnitude of discrepancy between their present and anticipated future health was measured using four items modified from Busseri and Merrick (2016). Questions were rated using a 7-point scale, ranging from 0 (*not at all*) to 6 (*extremely*). Items were reverse scored as appropriate and averaged ($\omega = 0.85$; Hayes & Coutts, 2020), such that higher scores indicated greater perceived discrepancy magnitude between one's present and anticipated future health.

Perceived discrepancy reduction rate Eight questions derived from Brunstein (1993) were used to assess participants' perceived rate of progress towards their future health, compared to their expected rate of progress, each of which were rated on a 7-point scale (ratings ranged from 0 to 6). Four items referred to progress to date and four additional items referred to anticipated progress over the next 5 years. All eight ratings were averaged ($\omega = 0.89$), such that higher scores indicated a greater perceived discrepancy reduction rate (i.e., greater perceived progress toward achieving one's anticipated future health).

Subjective trajectories for health Based on an adaption of the self-anchoring ladder developed by Kilpatrick and Cantril (1960) and modified by Bunda and Busseri (2019a), participants rated their health status at present, 5 years ago, and 5 years into the future, using an 11-point scale ranging from 0 (*worst health possible*) to 10 (*best health possible*).

Positive and negative affect Participants rated how much they were currently experiencing six positive and six negative emotions on a 7-point scale, ranging from 1 (*slightly or not at all*) to 7 (*extremely*; Diener et al., 2010). Ratings were averaged separately for positive and negative items ($\omega s = 0.92$ and 0.93), such that higher scores indicated greater positive and negative affect, respectively.

Motivation—confidence and commitment Participants' motivation to achieve their anticipated future health was assessed in terms of commitment and confidence, two key aspects of striving (Oettingen et al., 2005), using two measures. First, based on a six-item measure employed by Busseri and Samani (2019), responses to two items (rated on scales ranging from 0 to 100%, and 0 to 6, respectively) were standardized and averaged to provide a measure of overall confidence ($r = 0.85$), such that higher scores indicated greater overall confidence for achieving one's anticipated future health. Four additional items (rated on a 7-point scale ranging from 0, *not at all*, to 6, *extremely*) were averaged to provide an aggregated measure of commitment ($\omega = 0.93$), such that higher scores indicated greater commitment to attaining one's anticipated future health. Following this, participants listed five specific things they planned on doing that would aid them in achieving their anticipated future health. Beside each plan they rated how likely they were to do each thing over the next 5 years, using a 7-point scale ranging from 0 (*not at all likely*) to 6 (*extremely likely*). Ratings were averaged to provide an additional measure of confidence ($\omega = 0.73$), such that higher scores indicated greater confidence in accomplishing one's specific plans for the future.

Health behaviour intentions Participants rated their intentions to engage in health-related behaviours over the next 6 months using an 18-item checklist employed by Bunda and Busseri (2019a; modified from Freeman et al., 2012). Ratings ranged from 0 to 5. Items assessing health-risk behaviours were reverse scored, and all 18 ratings were averaged to provide an aggregated measure of health behaviour intentions ($\omega = 0.63$), such that higher scores indicated stronger health-promoting behaviour intentions.

Results

Descriptive statistics for the study measures are shown by condition in Table 1.

Subjective trajectories for health as a function of experimental condition

To evaluate participants' beliefs about how their health is changing over time as a function of experimental condition, a 3×3 mixed-model ANOVA was conducted, with experimental condition as a between-subjects factor (three levels: goal,

Table 1 Descriptive statistics for primary study measures, by condition – Study 1

Variable	Condition							
	Goal		Standard		Control		Full sample	
	M	SD	M	SD	M	SD	M	SD
PDM	2.99	1.24	2.90	1.27	2.57	1.23	2.82	1.26
PDRR	3.50	1.03	3.57	1.16	3.63	1.07	3.57	1.09
Health – past	5.59	2.57	5.97	2.67	5.94	2.48	5.83	2.57
Health – current	5.66	2.03	5.93	2.09	6.19	2.00	5.93	2.05
Health—future	8.47	1.68	8.25	1.79	8.04	1.87	8.25	1.79
PA	4.50	1.28	4.37	1.46	4.55	1.36	4.47	1.37
NA	2.47	1.35	2.45	1.42	2.35	1.30	2.42	1.35
OCONF	4.24	1.17	4.10	1.30	4.24	1.24	4.20	1.24
OCOMM	4.62	1.10	4.54	1.16	4.43	1.25	4.53	1.17
PCONF	4.44	0.98	4.45	0.95	4.55	0.91	4.48	0.95
HBI	3.74	0.47	3.73	0.50	3.69	0.47	3.72	0.48

$N = 747$ (full sample); $ns = 252$ (goal condition), 240 (standard condition), and 255 (control condition). *PDM* perceived discrepancy magnitude, *PDRR* perceived discrepancy reduction rate. *PA* positive affect, *NA* negative affect, *OCONF* overall confidence, *OCOMM* overall commitment, *PCONF* plans confidence, *HBI* health behaviour intentions

standard, control) and subjective temporal period (STP) as a within-subjects factor (three levels: recollected past, current health, anticipated future). The main effect of experimental condition was not statistically significant; $F(2,744) = 0.89$, $p = 0.41$, $\eta_p^2 = 0.002$. The main effect of STP was statistically significant; $F(2,1488) = 368.95$, $p < 0.001$, $\eta_p^2 = 0.33$. Further, there was a significant interaction between experimental condition and STP; $F(4,1488) = 4.58$, $p = 0.002$, $\eta_p^2 = 0.012$, suggesting that the subjective health trajectories varied by experimental condition. As shown in Fig. 1, differences between mean ratings of recollected past and current health varied by condition; however, on average, participants in each condition rated their anticipated future health more positively than their current health. Note also that across conditions, 82.5% of participants rated their anticipated future health more positively than their current health.

Moderating role of goal versus standard

Correlations among the study measures are shown in Table 2. Regression analyses were used to evaluate whether experimental condition moderated the predictive effects of

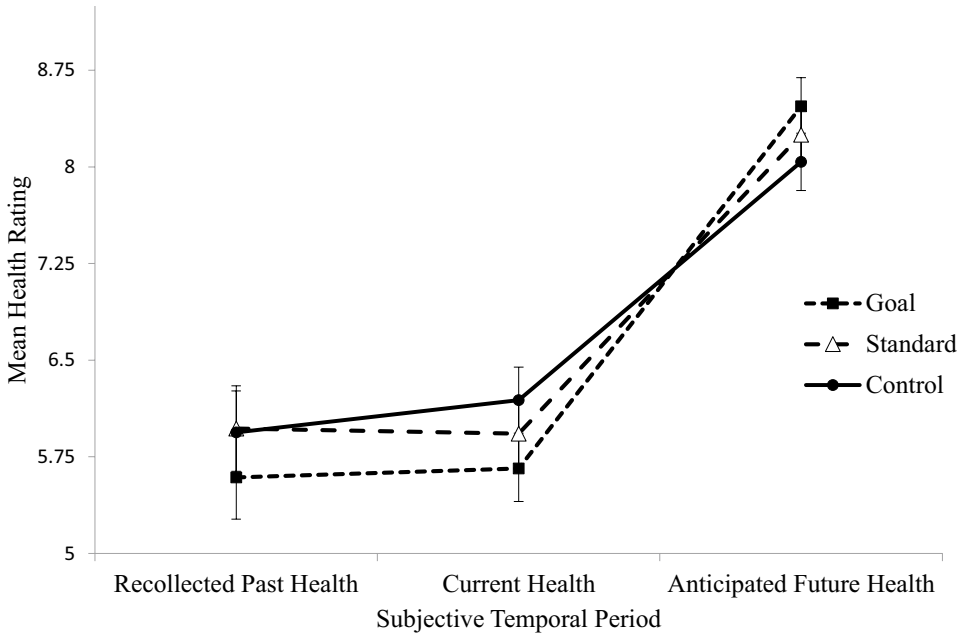

Fig. 1 Mean subjective health ratings (*y*-axis) by subjective temporal period (*x*-axis) for participants in the goal condition (dashed line, square marker), standard condition (dashed line, triangle marker), and control condition (solid line, circle marker)—Study 1. Standard error bars illustrate 95% confidence intervals

Table 2 Correlations among primary study measures–Study 1

Measure	1	2	3	4	5	6	7	8
1. PDM	–							
2. PDRR	− 0.44	–						
3. PA	− 0.30	0.54	–					
4. NA	0.19	−0.31	− 0.52	–				
5. OCONF	− 0.25	0.68	0.54	− 0.38	–			
6. OCOMM	− 0.05	0.56	0.39	− 0.23	0.69	–		
7. PCONF	− 0.10	0.48	0.36	− 0.25	0.58	0.56	–	
8. HBI	− 0.04	0.32	0.29	− 0.27	0.39	0.44	0.43	–

$N = 747$ (full sample). *PDM* perceived discrepancy magnitude, *PDRR* perceived discrepancy reduction rate, *PA* positive affect, *NA* negative affect, *OCONF* overall confidence, *OCOMM* overall commitment, *PCONF* plans confidence, *HBI* health behaviour intentions

perceived discrepancy magnitude and perceived discrepancy reduction rate on affect, motivation, and health behaviour intentions. Each of the outcomes was regressed simultaneously onto six predictors: two dummy codes representing the contrasts between experimental conditions (dummy code 1: standard vs. goal conditions; dummy code 2: standard vs. control conditions), perceived discrepancy magnitude and perceived discrepancy reduction rate; and the two hypothesized interaction effects (i.e., dummy code 1 × perceived discrepancy magnitude; dummy code 1 × perceived discrepancy reduction rate). Continuous measures were standardized prior to analysis, and interaction terms were computed based on standardized scores. Results are presented in Table 3.

None of the interactions were statistically significant, suggesting that being in the goal versus standard condition did not moderate the predictive effects of perceived discrepancy reduction rate or perceived discrepancy magnitude. Further,

Table 3 Results from regression of affect, motivation, and health behaviour intentions on experimental condition, perceived discrepancy magnitude, perceived discrepancy reduction rate, and predicted interactions—Study 1

Predictors	PA		NA		OCONF	
	b	95% CI	*b*	95% CI	*b*	95% CI
D1 (S vs. G)	0.13	[− 0.02, 0.28]	− 0.01	[− 0.18, 0.16]	0.16*	[0.03, 0.29]
D2 (S vs. C)	0.09	[− 0.06, 0.23]	− 0.05	[− 0.22, 0.12]	0.09	[− 0.04, 0.22]
PDM	− 0.06	[− 0.15, 0.02]	0.05	[− 0.04, 0.14]	0.09*	[0.02, 0.16]
PDRR	0.55*	[0.47, 0.63]	− 0.31*	[− 0.40, 0.14]	0.72*	[0.65, 0.79]
D1 × PDM	− 0.05	[− 0.19, 0.10]	0.04	[− 0.12, 0.21]	− 0.10	[− 0.23, 0.03]
D1 × PDRR	− 0.13	[− 0.28, 0.02]	0.09	[− 0.08, 0.26]	− 0.03	[− 0.16, 0.10]
Model R^2	0.30*		0.10*		0.48*	
Predictors	OCOMM		PCONF		HBI	
	b	95% CI	*b*	95% CI	*b*	95% CI
D1 (S vs. G)	0.09	[−0.05, 0.24]	0.02	[−0.14, 0.17]	0.03	[−0.14, 0.20]
D2 (S vs. C)	− 0.07	[− 0.22, 0.07]	0.12	[− 0.04, 0.27]	− 0.06	[− 0.23, 0.11]
PDM	0.25*	[0.18, 0.33]	0.15*	[0.07, 0.24]	0.12*	[0.03, 0.21]
PDRR	0.68*	[0.60, 0.75]	0.51*	[0.43, 0.59]	0.38*	[0.29, 0.47]
D1 × PDM	− 0.06	[− 0.20, 0.08]	< − 0.01	[− 0.15, 0.15]	− 0.02	[− 0.19, 0.14]
D1 × PDRR	− 0.05	[− 0.19, 0.09]	0.12	[− 0.04, 0.27]	− 0.01	[− 0.18, 0.15]
Model R^2	0.36*		0.25*		0.12*	

$N = 747$ (full sample); $ns = 252$ (goal condition), 240 (standard condition), and 255 (control condition). Results are shown by criterion (column) variable. Unstandardized regression coefficients (*b*s) are shown, along with 95% confidence intervals (CIs). *PDM* perceived discrepancy magnitude. *PDRR* perceived discrepancy reduction rate. *D1* dummy code contrast between standard (0) and goal (1) conditions. *D2* dummy code contrast between standard (0) and control (1) conditions. *PA* positive affect, *NA* negative affect, *OCONF* overall confidence, *OCOMM* overall commitment, *PCONF* plans confidence, *HBI* health behaviour intentions

* $p < 0.05$

none of the dummy codes were statistically significant, with one exception: mean confidence ratings were higher in the goal versus standard condition. In addition, perceived discrepancy magnitude was a significant unique predictor of four of the six outcomes. That is, independent of the other predictors in the regression model, individuals reporting a greater perceived gap between their current and anticipated future health reported greater confidence in and commitment to achieving their envisioned future health, greater confidence in achieving their specific health-related plans for the future, and stronger intentions to engage in health-promoting behaviours. Perceived discrepancy reduction rate was a significant unique predictor of all six outcomes. That is, independent of the other predictors, individuals reporting greater perceived progress toward their anticipated future health reported more positive and less negative affect, greater confidence in and commitment to achieving their envisioned future health, greater confidence in achieving their specific health-related plans, and stronger intentions to engage in health-promoting behaviours.

Note also that to further evaluate the relative evidence in support of our moderation hypothesis, we computed likelihood ratio tests to compare models for each outcome with and without the two interaction effects, adjusted for model complexity (using formulas provided by Glover & Dixon, 2004). In each case, the relative evidence was overwhelmingly in favour of the models assuming no interaction effects (i.e., $1/\lambda_B$ values range = 149.85 to 493.39).

Discussion

As expected, inclining current to future subjective health trajectories were typical in all three conditions. Such findings support previous research indicating that younger adults typically expect their health to improve over time (Bunda & Busseri, 2019a, b). Further, the vast majority of participants viewed their anticipated future health as more positive than their current health. This indicates that anticipated future health could serve as a positive reference value (Boldero & Francis, 2002).

Our primary objective was to test the moderating role of framing one's anticipated future health as a goal or a standard. We did not find that framing one's anticipated future health as a goal versus a standard moderated the predictive effects of perceived discrepancy magnitude or perceived discrepancy reduction rate on affect, motivation, and health behaviour intentions. Such findings do not support the distinction between the psychological situations created by framing a positive reference value as a goal versus a standard, a proposed by Boldero and Francis (2002). Notably, the manipulation check items revealed that whereas most participants in the goal condition envisioned their future health more as a goal than as a standard (as intended), only half of the participants in the standard condition viewed their future health more as a standard than as a goal. Thus, it may have been particularly challenging for individuals to view their future health as a standard. Note, however, all of the study results were consistent with those reported above even when we limited the analyses to participants in the goal and standard conditions who passed both the independent and manipulation checks (see the Supplemental Information file). Consequently, with respect to one's anticipated future health functioning as a positive reference value, the distinction between a goal and a standard proposed by Boldero and Francis (2002) may be too subtle and/or was not effectively operationalized in the present study.

Nonetheless, our findings concerning the predictive effects of perceived discrepancy reduction rate are consistent with Control Theory (Carver & Scheier, 1990) in indicating the self-regulatory importance of perceptions concerning one's rate of progress towards a positive reference value. Additional insights were provided by the directions of the predictive effects. As expected (based on Carver & Scheier, 1990; Boldero & Francis, 2002), greater perceived discrepancy reduction rate predicted greater positive and less negative affect. However, contrary to these self-regulatory frameworks, a greater perceived rate was also predictive of *stronger* (rather than weaker) motivation and intentions to engage in health-promoting behaviours. That is, perceiving a rate of progress toward one's anticipated future health as better than expected appeared to bolster motivation and behaviour intentions, rather than dampen such efforts. At the other extreme, perceiving a worse rate of progress dampened motivation and behaviour intentions, rather than inspire compensatory efforts. In contrast, in support of Self-Discrepancy Theory (Higgins, 1987), the unique predictive effects of perceived discrepancy magnitude on four of the outcomes (overall confidence and commitment, confidence in specific plans, and health behaviour intentions) were positive in direction. That is, perceiving a larger gap between one's current and anticipated future health appeared to inspire motivation and behaviour intentions, consistent with the proposed compensatory effects of such perceptions (Higgins, 1987; Boldero & Francis, 2002).

This study was the first to examine Boldero and Francis' (2002) self-regulatory framework in a health-related context. Thus, replication is needed in order to determine the reliability of the present findings, including with respect to the differential importance of perceived discrepancy reduction rate and perceived discrepancy magnitude processes as proposed by Control Theory (Carver & Scheier, 1990) and Self-Discrepancy Theory (Higgins, 1987). Further, given that the predictive effects were not moderated by experimental condition, additional evidence is needed concerning the distinction between the psychological situations resulting

from viewing one's anticipated future health as a goal versus as a standard, as proposed based on Boldero and Francis (2002). Study 2 was undertaken to address these issues. Importantly, in light of the failed manipulation in Study 1, in Study 2 we employed a correlational (rather than experimental) approach to evaluate the implications of viewing one's anticipated future health as a goal and as a standard.

Study 2

In Study 2, a correlational design was used to evaluate whether viewing one's anticipated future health as a goal and as a standard moderated the predictive effects of perceived discrepancy magnitude and perceived discrepancy reduction rate. Consistent with Study 1, we expected that young adults would, on average, rate their anticipated future health as more positive than their current and recollected past health, regardless of the degree to which they viewed their future health as a goal and/or as a standard (Bunda & Busseri, 2019a). Based on Boldero and Francis (2002), the psychological relevance of perceived discrepancy magnitude and perceived discrepancy reduction rate was expected to vary depending on the degree to which individuals viewed their future health (i.e., the positive reference value) as a standard and as a goal. More specifically, among individuals who viewed their anticipated future health more (vs. less) strongly as a standard, those who perceived a larger gap between their present and anticipated future health should report less positive and more negative affective responses, greater motivation, and stronger intentions and more positive choices with respect to engaging in health-promoting behaviours. In addition, among individuals who viewed their anticipated future health more (vs. less) strongly as a goal, those who perceived worse progress toward reducing the discrepancy between current and anticipated future health would report less positive and more negative affective responses, greater motivation, and stronger intentions and more positive choices with respect to engaging in health-promoting behaviours.

Methods

Participants

Participants were recruited through MTurk and administered through CloudResearch. Individuals eligible for the study were between the ages of 18 and 29 years, fluent in English or reported English as their first language, and lived in the United States. Participants with unique IP addresses who provided a description of their anticipated future health and completed all study measures were paid $1.50 USD. The study took approximately 15 min. Our target sample size was 600 participants, based on an a priori goal of achieving power of 0.80 or greater to detect as statistically significant ($\alpha = 0.05$, two-tailed) a small effect size ($r = 0.10$; Funder & Ozer, 2019). Of the 823 participants who consented to the study, 686 provided a description of their anticipated future and 634 completed all study measures, of whom 626 were within the target age range. Of these participants, 407 indicated that they viewed their future health as a positive reference value (as described below). Analyses were based on these 407 participants; *M* age = 23.95, SD = 2.76; 54.8% female; 65.4% White, 16.4% Asian, 13.5% Black, 10.3% Latinx; 57.0% with at least some post-secondary education. A sensitivity analysis indicated that this sample size provided statistical power of 0.80 to detect as statistically significant ($\alpha = 0.05$, two-tailed) a correlation of 0.14 or larger (absolute magnitude).

Procedure

After providing informed consent, participants described what they imagined their anticipated future health would be like 5 years into the future. Following this, they completed the study measures described below. Participants were then provided with an online debriefing form.

Measures

Future health as a positive reference value To provide a direct indication of whether participants viewed their anticipated future health as a positive reference value, two questions were created (derived from Boldero & Francis, 2002), each rated on a 7-point scale ranging from 0 (*strongly disagree*) to 6 (*strongly agree*). These questions evaluated whether individuals (1) compared their present health to their anticipated future health, and (2) viewed their future health as being more positive than their present health. Consistent with the study pre-registration, given our focus on the psychological significance of viewing one's anticipated future health as a positive (as opposed to a neutral or negative) reference value, participants were removed from subsequent analysis ($n = 219$, 35%) if they did not provide affirmative responses (i.e., ratings greater than 3) on both questions.

Future health as a goal and as a standard To determine the extent to which individuals viewed their anticipated future health as a goal and as a standard, eight questions were created (based on Boldero & Francis, 2002), each rated on a 7-point scale ranging from 0 (*strongly disagree*) to 6 (*strongly agree*). Four questions assessed the degree to which participants viewed their future health as a goal; four additional questions assessed the degree to which participants viewed their future health as a standard. An

exploratory principle components analysis (with oblique rotation) identified two large components with eigen values > 1 and explaining 64% of the item variance. The four goal-related items loaded strongly and positively on the first component, whereas the four standard-related items loaded strongly and positively on the second component. Thus, ratings for each group of four items were averaged separately, such that higher scores indicated viewing one's future health more (vs. less) strongly as a goal (ω = 0.79) and more (vs. less) strongly as a standard (ω = 0.79).

Perceived discrepancy magnitude Perceived discrepancy magnitude between present and anticipated future health was measured using the same scale as in Study 1 (ω = 0.87).

Perceived discrepancy reduction rate Perceived discrepancy reduction rate was measured using the same scale as in Study 1 (ω = 0.89).

Subjective trajectories for health Participants rated their current, recollected past, and anticipated future health using the self-anchoring ladder employed in Study 1.

Positive and negative affect Participants completed the same measure of positive and negative affect as used in Study 1 (ωs = 0.89 and 0.91, respectively). Note that the instructions asked participants to report their feelings (at present) with respect to their anticipated future health.

Motivation—confidence and commitment Participants completed the same measures of overall confidence in (r = 0.76) and commitment to achieving their anticipated future health (ω = 0.90). Participants also completed the same measure of confidence in achieving personalized plans for the future as used in Study 1 (ω = 0.72).

Health behaviour intentions—general and personalized Participants' general intentions to engage in health-related behaviours were measured using the 18-item checklist employed in Study 1. Note that this checklist included two additional items regarding interactions with one's health care provider, based on insights provided by participants in Study 1 (ω = 0.61). In addition, to provide a more personalized measure of health behaviour intentions, when participants listed their five personalized plans for the future (as detailed above), they also rated how often they intended to engage in each plan over the next 6 months, using a 7-point scale ranging from 0 (*not at all often*) to 6 (*extremely often*). Ratings were averaged to provide a personalized measure of health behaviour intentions (ω = 0.78), such that higher scores indicated stronger intentions to engage in their personalized plans.

Health behaviour choices Participants completed a three-item behavioural choice measure (constructed from Lewandowski & Strohmetz, 2009; each scored as yes-1 or no-0). Scores were summed (ω = 0.83), such that higher scores indicated more health-promoting behaviour choices.

Additional measures The questionnaire included three additional measures of subjective change in health, affect, and impact of the pandemic. These measures were included for exploratory purposes. Results are provided in the Supplemental Information file.

Results

Descriptive statistics for the study measures are shown in Table 4.

Subjective trajectories for health as a function of goal and standard perceptions

To evaluate participants' subjective trajectories for health as a function of their perceptions concerning their future health as a goal and a standard, a mixed-model ANOVA was conducted with subjective temporal period as a within-subjects factor and the goal and standard perception scores and their interaction as between-subjects factors (continuous scores, standardized prior to analysis). The main effect of subjective temporal period was statistically significant; $F(2,806) = 269.54$, $p < 0.001$, $\eta_p^2 = 0.40$. The main effects of goal perceptions, standard perceptions, and their interaction, were not statistically significant (ps > 0.07). The interaction between subjective temporal period and goal perceptions was statistically significant; $F(2,806) = 13.14$, $p < 0.001$, $\eta_p^2 = 0.03$. The interaction between subjective temporal period and perceptions of one's future health as a standard, and the three-way interaction involving goal perceptions, were not statistically significant (ps = 0.052 and 0.87, respectively). These results indicate that participants' subjective health trajectories varied as a function of goal perceptions.

To illustrate this, participants were divided using a median split of the goal perception scores, and subjective health trajectories were plotted as a function of goal perception group (low vs. high). As shown in Fig. 2, both groups viewed their health as improving over time, however, participants in a high (vs. low) goal perceptions group anticipated even greater improvement in their health over time, particularly from their present to their anticipated future health. Note also that 88.2% of all participants rated their anticipated future health more positively than their current health.

Table 4 Descriptive statistics and correlations among primary study measures–Study 2

Measure	*M*	SD	1	2	3	4	5	6	7	8	9	10	11	12
1. Goal	5.05	0.81	–											
2. Standard	4.24	1.14	0.32	–										
3. PDM	2.64	1.25	0.27	0.10	–									
4. PDRR	3.86	0.97	0.11	0.10	− 0.48	–								
5. PA	5.53	1.05	0.29	0.10	− 0.12	0.44	–							
6. NA	1.20	1.11	− 0.19	0.09	0.01	− 0.06	− 0.36	–						
7. OCONF	4.54	0.93	0.22	0.09	− 0.22	0.58	0.57	− 0.27	–					
8. OCOMM	4.79	0.89	0.40	0.16	< − 0.01	0.45	0.56	− 0.24	0.63	–				
9. PCONF	4.92	0.80	0.24	0.06	< 0.01	0.31	0.36	− 0.27	0.39	0.46	–			
10. HBI-P	4.22	1.18	0.15	0.15	− 0.12	0.45	0.35	− 0.16	0.37	0.42	0.43	–		
11. HBI-G	3.25	0.45	0.14	− 0.01	− 0.08	0.14	0.22	− 0.35	0.22	0.33	0.32	0.31	–	
12. HBC	1.92	1.24	0.09	0.18	0.05	0.08	0.12	0.11	0.02	0.09	− 0.05	0.07	0.03	–

N = 407. *PDM* perceived discrepancy magnitude, *PDRR* perceived discrepancy reduction rate, *PA* positive affect. *NA* negative affect, *OCONF* overall confidence, *OCOMM* overall commitment, *PCONF* plans confidence, *HBI−P* health behaviour intentions, specific plans, *HBI-G* health behaviour intentions, general, *HBC* health behaviour choices

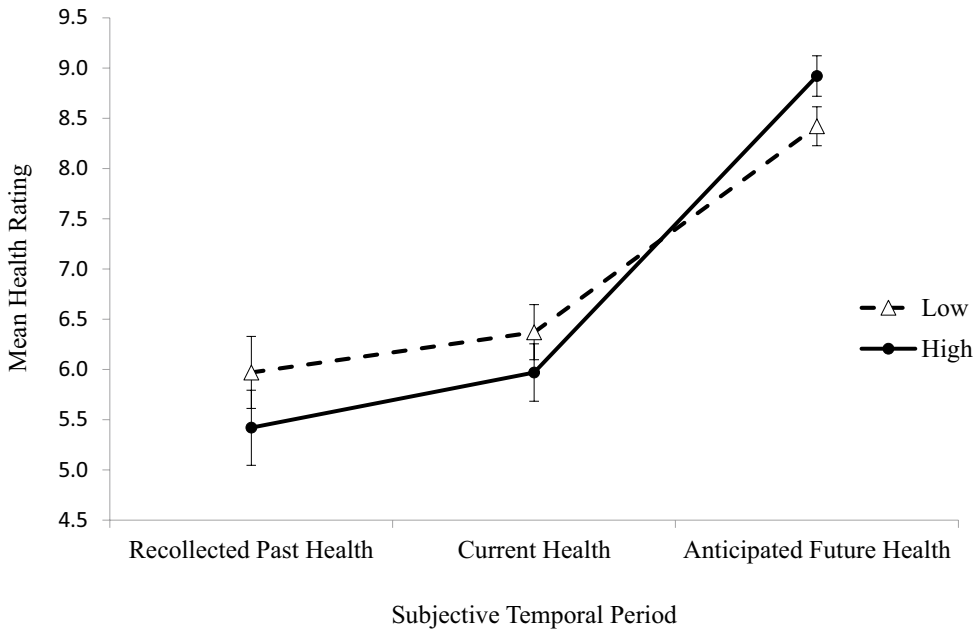

Fig. 2 Mean subjective health ratings (*y*-axis) by subjective temporal period (*x*-axis) by goal perception group: high (solid line, circle marker) versus low (dashed line, triangle marker)—Study 2. Standard error bars display 95% confidence intervals

Moderating role of goal and standard

Correlations among the study measures are shown in Table 4. Regression analyses were used to determine whether goal perceptions moderated the predictive effects of perceived discrepancy reduction rate, and standard perceptions moderated the predictive effects of perceived discrepancy magnitude, on affect, motivation, health behaviour intentions, and health behaviour choices. Each of the outcomes was regressed simultaneously onto six predictors: the goal and standard perception scores; perceived discrepancy magnitude and perceived discrepancy reduction rate; and the two hypothesized interaction effects (i.e., goal perceptions x perceived discrepancy reduction rate, and standard perceptions × perceived discrepancy magnitude). Continuous measures were standardized prior to analysis, and interaction terms were computed based on standardized scores. Results are presented in Table 5.

Across the interactions tested, three interaction effects, each involving standard perceptions and perceived discrepancy magnitude, were statistically significant. That is, among individuals with higher (vs. lower) standard perceptions scores, the predictive effect of perceived discrepancy magnitude on positive affect was more positive,

Table 5 Results from regression of affect, motivation, health behaviour intentions, and health behaviour choices on perceptions of goals and standards, perceived discrepancy magnitude, perceived discrepancy reduction rate, and predicted interactions—Study 2

Predictors	PA		NA		OCONF		OCOMM	
	b	95% CI	*b*	95% CI	*b*	95% CI	*b*	95% CI
Goal	0.26*	[0.16, 0.36]	− 0.27*	[− 0.37, 0.16]	0.17*	[0.08, 0.26]	0.32*	[0.23, 0.41]
Standard	− 0.03	[− 0.12, 0.06]	0.17*	[0.07, 0.26]	− 0.02	[− 0.10, 0.07]	< 0.01	[− 0.08, 0.09]
PDM	0.01	[− 0.09, 0.12]	0.08	[− 0.04, 0.19]	0.01	[− 0.09, 0.11]	0.14*	[0.04, 0.24]
PDRR	0.42*	[0.32, 0.53]	− 0.01	[− 0.12, 0.11]	0.58*	[0.48, 0.61]	0.49*	[0.39, 0.58]
Goal × PDRR	− 0.04	[− 0.12, 0.05]	− 0.06	[− 0.16, 0.03]	− 0.03	[− 0.11, 0.05]	− 0.03	[− 0.11, 0.05]
Standard × PDM	0.11*	[0.03, 0.19]	− 0.15*	[− 0.24, − 0.06]	0.09*	[0.01, 0.16]	0.05	[− 0.02, 0.13]
Model R^2	0.27*		0.09*		0.38*		0.35*	
Predictors	PCONF		HBI-P		HBI-G		HBC	
	b	95% CI	*b*	95% CI	*b*	95% CI	*b*	95% CI
Goal	0.17*	[0.07, 0.28]	0.06	[− 0.04, 0.16]	0.19*	[0.08, 0.29]	< 0.01	[− 0.10, 0.11]
Standard	− 0.04	[− 0.14, 0.06]	0.08	[− 0.01, 0.17]	− 0.07	[− 0.17, 0.03]	0.16*	[0.05, 0.26]
PDM	0.13*	[0.02, 0.24]	0.08	[− 0.03, 0.19]	− 0.08	[− 0.20, 0.03]	0.09	[− 0.03, 0.21]
PDRR	0.35*	[0.24, 0.46]	0.48*	[0.37, 0.58]	0.09	[− 0.02, 0.21]	0.10	[− 0.01, 0.22]
Goal × PDRR	0.07	[− 0.02, 0.16]	0.05	[− 0.03, 0.14]	< 0.01	[− 0.09, 0.10]	− 0.02	[− 0.12, 0.07]
Standard × PDM	− 0.05	[− 0.13, 0.04]	0.08	[− 0.01, 0.16]	0.09	[− 0.01, 0.17]	− 0.04	[− 0.13, 0.05]
Model R^2	0.16*		0.24*		0.05*		0.04*	

$N = 407$. Results are shown by criterion (column) variable. Unstandardized regression coefficients (*b*s) are shown, along with 95% confidence intervals (CIs). *PDM* perceived discrepancy magnitude. *PDRR* perceived discrepancy reduction rate, *PA* positive affect. *NA* negative affect, *OCONF* overall confidence, *OCOMM* overall commitment, *PCONF* plans confidence, *HBI− P* health behaviour intentions for specific plans, *HBI-G* health behaviour intentions, general, *HBC* health behaviour choices

* $p < 0.05$

the predictive effect of perceived discrepancy magnitude on negative affect was less positive, and the predictive effect of perceived discrepancy magnitude on overall confidence was more positive. In addition, independent of the other predictors in the regression model, viewing one's future health more (vs. less) strongly as a goal predicted greater positive affect, less negative affect, greater confidence in and commitment to obtaining one's anticipated future health, greater confidence in achieving one's plans for the future, and stronger intentions to engage in health-promoting behaviours in general. In contrast, viewing one's future health more (vs. less) strongly as a standard predicted greater negative affect and a greater number of positive health choices. Further, individuals reporting a greater perceived gap between their current and anticipated future health reported greater commitment to achieving their envisioned future health and greater confidence in achieving their personalized health-related plans for the future. Individuals reporting greater perceived progress toward their anticipated future health reported more positive affect, greater confidence in and commitment to achieving their envisioned future health, greater confidence in achieving their personalized health-related plans, and stronger intentions to engage in their personalized health-promoting behaviours.

Note also that to further evaluate the relative evidence in support of our moderation hypothesis, we computed likelihood ratio tests to compare models for each outcome with and without the two interaction effects, adjusted for model complexity. The relative evidence was overwhelmingly in favour of the models assuming no interaction effects for each outcome (i.e., $1/\lambda_B$ values range = 5.09 to 266.24), with one exception: in the model predicting negative affect, the relative evidence was equivocal ($1/\lambda_B = 1.66$).

Discussion

As anticipated, inclining subjective health trajectories were typical. Such findings support previous research, including the results from Study 1, in indicating that younger adults typically expect their health to improve in the future (Bunda & Busseri, 2019a, b). Again, the vast majority of participants viewed their anticipated future health as more positive than their current health, providing further indication that young adults' anticipated future health can serve as a positive reference value (Boldero & Francis, 2002).

Our main objective was to test the moderating role of viewing one's anticipated future health as a goal and as a standard on the predictive effects of perceived discrepancy

magnitude and perceived discrepancy reduction rate. We found that individuals' perceptions of their anticipated future health as a standard moderated some of these predictive effects. That is, perceived discrepancy magnitude was a stronger predictor of three outcomes (positive affect, negative affect, overall confidence) among individuals who viewed their future health more (vs. less) strongly as a standard. However, only the interaction predicting overall confidence was in the predicted direction (based on Higgins, 1987; Boldero & Francis, 2002). Such findings thus provide some support for the distinction between positive reference values serving as goals and standards, as proposed by Boldero and Francis (2002). Notably, however, significant interactions between perceived discrepancy magnitude and standard perceptions were not found for the various other outcomes examined, nor were any significant interactions found involving perceived discrepancy reduction rate and goal perceptions. Further, the likelihood ratio tests indicated that the relative evidence was in favor of a model that assumed no interaction effects. Taken together, therefore, results from Study 2 provide minimal support for the hypothesized moderating role of a positive reference value (i.e., one's anticipated future health) functioning as a goal and a standard.

Findings do provide additional support for Control Theory (Carver & Scheier, 1990) with respect to importance of perceptions concerning one's rate of progress towards a positive reference value. Furthermore, with respect to the direction of these predictive effects, as expected (based on Carver & Scheier, 1990; Boldero & Francis, 2002), greater perceived discrepancy reduction rate was predictive of greater positive affect. However, contrary to these self-regulatory frameworks, greater perceived discrepancy reduction rate appeared to bolster motivation and behaviour intentions, rather than dampen such plans. In contrast, in support of Self-Discrepancy Theory (Higgins, 1987), greater perceived discrepancy magnitude appeared to inspire motivation (specifically, overall commitment and confidence in one's plans), consistent with the proposed compensatory effects of such perceptions (Boldero & Francis, 2002).

Further, independent of the other predictors, stronger goal perceptions significantly predicted several self-regulatory outcomes, including more positive (and less negative) affective reactions, stronger motivation (including greater confidence and commitment), and stronger health behaviour intentions. In contrast, stronger standard perceptions significantly predicted greater negative affect and more positive health behaviour choices. As health behaviour choices was uniquely predicted by only the standard perceptions score, it may be that viewing one's future health more strongly as a standard may prompt *more immediate* healthy behaviour choices. However, it is possible that individuals experiencing stronger emotional reactions indicated greater willingness to engage in a greater number of health behaviours offered to them, even if such spontaneous endorsement was not based on their expectancies and commitment—a potentially ineffective self-regulatory response that has been discussed as 'fantasizing' (e.g., Oettingen et al., 2001). Together, our findings provide evidence of a distinction between a positive reference value functioning as a goal and a standard beyond the moderating role proposed by Boldero and Francis (2002). That is, viewing one's anticipated future health more strongly as a goal predicted more adaptive emotional and motivational outcomes than viewing one's anticipated future health as a standard.

We note that roughly one third of the participants were removed from the main analyses because they did not view their future as a positive reference value. This approach allowed us to test our predictions concerning the psychological significance of viewing one's anticipated future health as a positive reference value and as either a goal and/or a standard. However, this approach also limits the generalizability of the findings from Study 2 to those individuals who viewed their anticipated future health more positively than their current health. Consequently, future research is needed to determine the implications of viewing one's anticipated future health as worse than the present, and thus as a negative reference value.

In summary, results from Study 2 provide some support for the anticipated distinctions between the psychological situations resulting from viewing one's anticipated future health as a goal and a standard. Study 2 thus provided new insights concerning Boldero and Francis' (2002) self-regulatory framework. Furthermore, Study 2 provided valuable evidence concerning the roles of perceived discrepancy reduction rate and perceived discrepancy magnitude (as proposed by Control Theory (Carver & Scheier, 1982) and Self-Discrepancy Theory (Higgins, 1987), respectively), based on an individual differences approach.

General discussion

The moderating role of viewing one's future health as a goal and/or a standard

The robust nature of the belief that 'my health gets better and better over time' observed in both of the present studies provides evidence that individuals' anticipated future health can serve as a positive reference value. According to Boldero and Francis (2002), there is an important distinction between a positive reference value functioning as a goal versus a standard, particularly with respect to the psychological situations associated with each function, and the resulting self-regulatory processes and outcomes. However, we did not find that viewing one's anticipated future health as a goal

or as a standard created different psychological situations with respect to moderating the key self-regulatory processes and outcomes. Further, of the small number of observed interaction effects, only one was consistent with our hypotheses based on Boldero and Francis (2002). In future studies, a different type of manipulation may be more effective in creating a stronger focus on one's positive anticipated health as a standard (vs. a goal), for example, a social comparison (e.g., one's current health vs. a healthier individual), rather than the temporal comparison we employed (e.g., one's current vs. one's anticipated future health; Zell & Strickhouser, 2020). If so, future studies may provide more compelling evidence of the moderating effects proposed by Boldero and Francis (2002).

At present, however, it is unclear whether a positive reference value functioning as a goal or a standard creates a different psychological situation with respect to the key self-regulatory processes and outcomes. Nonetheless, as discuss below, both studies provide new information concerning the predictive roles of goals and standards, as well as perceived discrepancy magnitude and perceived discrepancy reduction rate.

Goals and standards

Perceiving one's anticipated future health more (vs. less) strongly as a goal predicted more positive outcomes, with respect to affect, motivation, and behavioural intentions. In contrast, perceiving one's anticipated future health more (vs. less) strongly as a standard uniquely predicted only a subset of these outcomes, including greater negative affect and greater health behaviour choices. Although evaluating the relative predictive effects of these two functions of reference values was not the focus on the present work, such findings suggest that, of these two types, goals may be more productive than standards with respect to successful self-regulation in a health context (Locke & Latham, 1990; Locke, 1991; Boldero & Francis, 2002).

Findings from both studies also demonstrated that many individuals tended to perceive their anticipated future health more strongly as a goal than as a standard; nonetheless, in Study 2 the goal and standard perceptions scores were positively correlated. Together, these findings are informative with respect to the distinctions proposed by Boldero and Francis (2002) in indicating that goals and standards may be separate, but not necessarily opposing, states or functions. Further research is needed to better understand the implications of such findings, for example with respect to affect, motivation, and health behaviour intentions among individuals characterized by different combinations of goal/standard perceptions (e.g., opposing, co-occurring, balanced).

Perceived discrepancy magnitude and perceived discrepancy reduction rate

Inconsistent with Self-Discrepancy Theory (Higgins, 1987), we found that the magnitude of the perceived discrepancy between one's current and anticipated future health did not uniquely predict affective reactions (positive or negative). However, greater perceived discrepancy magnitude did uniquely predict greater overall commitment (Study 1, Study 2), greater confidence in one's plans (Study 1, Study 2), and stronger health behaviour intentions (Study 1). Together, these findings provide some support for Self-Discrepancy Theory, particularly with respect to the motivational implications associated with perceived discrepancy magnitude. Notably, however, such predictive effects were inconsistent across outcomes and studies.

Consistent with Control Theory (Carver & Scheier, 1990), in both studies we found that perceiving a worse than expected discrepancy reduction rate predicted less positive affect (Study 1, Study 2) and greater negative affect (Study 1). We also found that worse perceived discrepancy reduction rate uniquely predicted less motivation, including lower overall confidence (Study 1, Study 2) and commitment (Study 1, Study 2), less confidence in one's plans (Study 1, Study 2), as well as weaker health behaviour intentions (Study 1, general intentions; Study 2, personalized intentions). The present findings thus support Control Theory with respect to the proposed psychological significance of perceived discrepancy reduction rate.

However, whereas the predictive effects of perceived discrepancy reduction rate on positive and negative affect were in the hypothesized directions, the predictive effects on motivation and intentions were in the opposite direction. That is, inconsistent with Control Theory (Carver & Scheier, 1990), in both studies a worse perceived discrepancy reduction rate was predictive of less (rather than more) motivation, and weaker (rather than stronger) intentions to engage in health-promoting behaviours. Rather than inspiring compensatory efforts aimed at improving one's rate of progress toward a positive reference value, therefore, it appears that worse than expected progress may dampen individuals' motivation and health behaviour intentions. In part, the direction of the predictive effects of discrepancy reduction rate on motivation and behaviour may depend on other factors—including the presence of competing, conflicting, or superordinate goals—that may require a trade-off with respect to investing time and effort in any given goal (Carver & Scheier, 1982, 1988, 1990). Future studies are needed to further examine such notions with respect to successful self-regulation concerning one's anticipated future health.

Applied implications

The present work was not designed to evaluate specific interventions or practices aimed at helping individuals achieve their goals for better future health. However, we speculate that results concerning the consistent predictive role of perceived discrepancy reduction rate could be useful to developing health-promotion programs. For example, young adults might be encouraged to develop concrete and achievable goals for healthy living and track their progress toward achieving such goals. The feedback that participants are provided about such progress could also be manipulated (e.g., positive, neutral, negative) in order to gauge the causal impact of perceived discrepancy reduction rate on changes in health behaviour engagement over time.

Limitations and future directions

In addition to the various caveats and limitations discussed above, we note that participants in both of the present studies were recruited from MTurk. MTurk is a cost-efficient method of data collection, and MTurk participants are typically more diverse and geographically representative of the United States than undergraduate samples (Buhrmester et al., 2011). However, the generalizability of results from MTurk samples may be limited with respect to some demographic characteristics, including less racial diversity (Paolacci & Chandler, 2014), higher levels of education, and lower levels of religiosity than the general population (Berinsky et al., 2012; Goodman et al., 2013; Shapiro et al., 2013).

Participants were also limited to younger adults and thus it is unclear whether the present findings would generalize to individuals from other life stages. During middle-age (e.g., 45 to 64 years) and older adulthood (e.g., 65 years and older), for example, anticipated future health is typically expected to be worse than current health (Bunda & Busseri, 2019b; Busseri & Mise, 2019), and may thus represent an undesired state to be avoided or prevented (i.e., a negative reference value; Higgins, 1987; Ogilvie, 1987) and may also be less likely to function as a goal (Boldero & Francis, 2002). Future studies could employ a lifespan approach to better understand how middle-aged and older adults might productively make use of their beliefs about a less healthy anticipated future.

Moreover, we did not examine our findings in relation to participant characteristics such as chronic or acute health conditions (Cott et al., 1999) and/or perceived control over one's health (Bunda & Busseri, 2019a), both of which may impact or moderate the predictive effects we examined. Further, in both studies we relied primarily on self-report, rather than objective indicators of health or behaviour. The present work also assessed behavioural intentions rather than current engagement in health-related behaviours; consequently, it is unclear whether our findings concerning participants' intentions for the future reflected anticipated change (e.g., improvement) or consistency. Thus, in future studies it would be valuable to incorporate objective measures of health (physiological and biological markers) along with observations of health behaviour over time (e.g., daily logs, experiencing sampling, physical activity trackers).

It would also be valuable to directly test the causal effects of perceived discrepancy magnitude and perceived discrepancy reduction rate using an experimental approach in which such perceptions are manipulated. In addition, longitudinal or time series designs would provide valuable new insights concerning temporal dynamics as individual strive to achieve their anticipated healthier futures (Seo & Patall, 2020). Employing such an approach would also provide a direct test of the dynamics proposed by Boldero and Francis (2002), in which a larger discrepancy from a positive reference value results in negative emotional reactions, which motivates compensatory behaviour aimed at reducing the perceived discrepancy.

Conclusion

Drawing on the integrative framework proposed by Boldero and Francis (2002), in two studies we examined whether viewing one's anticipated future health as a goal or as a standard moderated the predictive effects of perceived discrepancy magnitude and perceived discrepancy reduction rate on affect, motivation, behavioural intentions, and health-related choices. Our findings confirm a wide-spread belief among younger adults that one's health will improve in the future, and suggest that one's future health can serve as a positive reference value. Notably, however, whether anticipated future health functioned as a goal or as a standard did not moderate the predictive effects of perceived discrepancy magnitude and perceived discrepancy reduction rate. Nonetheless, viewing one's anticipated future health more strongly as a goal, and greater perceived progress towards one's anticipated future health, were linked with more positive and less negative affect, as well as stronger motivation and health behaviour intentions.

In conclusion, the present work thus provides important new information concerning self-regulation of health based on the framework proposed by Boldero and Francis (2002), with implications for both Self-Discrepancy Theory (Higgins, 1987) and Control Theory (Carver & Scheier, 1982). This research may help to better understand how young adults can use their thoughts about their future health in order to achieve the positive future health that they commonly envision. That is, in seeking a healthier future life, it may be most productive to view one's anticipated future

health more strongly as a goal and to perceive greater progress towards one's anticipated future health.

Supplementary Information The online version of this article (https://doi.org/10.1007/s11031-021-09893-3) contains supplementary material, which is available to authorized users.

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Declarations

Conflict of interest The authors declare no conflicts of interest (financial or non-financial).

Ethical approval Both studies received ethics review and clearance by the Research Ethics Board at Brock University.

Informed consent All participants gave informed consent to participate in the studies reported here.

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