Title:

**The role of Need for Cognition in well-being – Review and meta-analyses of associations
and potentially underlying mechanisms**

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Author Note

The authors made the following contributions. Josephine Zerna (<https://orcid.org/0000-0003-2892-884X>): Conceptualization, acquisition of literature, analysis and interpretation of literature, draft and/or revision of the article, approval of submitted version for publication. Anja Strobel (<https://orcid.org/0000-0002-0313-0615>): Conceptualization, acquisition of literature, draft and/or revision of the article, approval of submitted version for publication. Alexander Strobel (<https://orcid.org/0000-0002-9426-5397>): Conceptualization, acquisition of literature, analysis and interpretation of literature, draft and/or revision of the article, approval of submitted version for publication.

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Competing Interests

The authors declare no competing interests.

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Public Significance Statement

This meta-analytic review reveals stable small to medium associations of different well-being facets with the personality trait Need for Cognition, indicating that individuals who seek out and enjoy cognitive effort have higher well-being. Heterogeneous results in some areas are likely caused by third variables: On one hand, higher self-control in those with higher Need for Cognition heightens well-being through active coping, on the other hand it attenuates the effectiveness of interventions and influences the preference for but not the susceptibility to certain addictive behaviours.

Abstract

Need for Cognition (NFC) describes one's inclination towards and enjoyment of effortful cognitive activities and has been associated with favourable academic outcomes. Yet, recent evidence also points to beneficial outcomes regarding well-being. This review gives an overview of the literature on the role of NFC in well-being in healthy adults by combining random-effects meta-analyses and a qualitative integration of evidence. Studies investigating NFC and facets of well-being were acquired via database searches and a call for unpublished results. Higher NFC was found to be associated with lower neuroticism, anxiety, negative affect, burnout, public self-consciousness, and depression and with higher positive affect, private self-consciousness, and satisfaction ($|r| \sim .20$ with 95% confidence intervals excluding zero for all examined outcomes). While tests for publication and selection bias in the meta-analyses were negative, heterogeneity was often observed. NFC was further associated with aspects of a more stable identity and higher social confidence, while associations with addictive behaviours and physical health were inconsistent. One mechanism driving these patterns seems to be a higher perceived control in individuals with higher NFC that increases active coping, but also reduces the effectiveness of health interventions by fostering a sense of overconfidence in own resources. Thus, this review provides a leverage point for future research on NFC and well-being to improve prevention and intervention.

Keywords: mental health, personality, self-control, neuroticism, depression, satisfaction

Abstract word count: 216

1. Introduction

Need for Cognition (NFC) is a stable intrinsic motivation that describes the tendency to engage in and enjoy effortful cognitive activities (Cacioppo et al., 1996). This motivation to actively invest cognitive resources is context-independent, resulting in active, interested, and alert behaviour (Fleischhauer et al., 2010). As Cacioppo et al. (1996) noted, NFC is process- rather than goal-oriented and likely develops as a result of personal values or early experiences, in which the individual learns the superiority of reasoning to physical force or flight when dealing with challenging situations.

Each individual exhibits a certain degree of NFC that can be measured on a bipolar continuum using the Need for Cognition Scale (NCS) developed by Cacioppo and Petty (1982). The scale has been adapted for various languages such as German (Bless et al., 1994) and Chinese (Kao, 1994) and often differs in item number. The frequently used short form of the NCS consists of 18 items that have to be rated on a 5-point Likert scale, either with the labels agreement/disagreement or extremely characteristic/extremely uncharacteristic. Individuals with high NCS scores, the H-NFC individuals, are highly motivated to invest their cognitive resources and enjoy doing so. They are likely to receive positive feedback and, thus, reinforcement, and develop a sense of mastery that in turn heightens their intrinsic motivation to engage in effortful thinking (Cacioppo et al., 1996). Individuals with low NCS scores, the L-NFC individuals, “tend to act as cognitive misers” (Cacioppo et al., 1996, p. 197) and rather rely on heuristics or the judgement of others than to engage in effortful thinking themselves.

Due to its conceptualization and the focus on thinking as relevant activity, most research concentrated on academic outcomes or problem-solving, clearly indicating better performance of H-NFC individuals (e.g. Cazan & Indreica, 2014; Elias & Loomis, 2002; Grass et al., 2017; Sadowski & Gülgös, 1996). Only in recent years, the question was brought up to what extent NFC could be helpful not only in cognitive challenges but also in overcoming challenges in a

broader sense (Bye & Pushkar, 2009; Strobel et al., 2017). These challenges are important to the concept of well-being, which has been described as a state in which “individuals have the psychological, social, and physical resources they need to meet a particular psychological, social, and/or physical challenge” (Dodge et al., 2012, p. 230). If individuals either have too many resources or the challenges are too difficult or numerous, this delicate balance shifts, causing a decrease in well-being. A surplus in resources can either be interpreted as having high capabilities that are not being sufficiently challenged, or as perceiving to have high capabilities and therefore overtaxing oneself. In academic contexts, challenges are mainly cognitive and therefore suit the preference of H-NFC individuals, suggesting that their well-being is relatively stable in university and work settings. However, challenges in other areas of life are not necessarily cognitive ones, so it is not clear how this fit of resources and challenges is reflected there. Furthermore, we do not know whether or how the motivation to invest cognitive effort impacts the level of psychological, social, and physical resources, and vice versa. Are H-NFC individuals less likely to experience depression and suicidal thoughts? Do they smoke and drink less? What do their social circles look like? Are they more likely to get medical help? How do they respond to different types of interventions? And most importantly: Why? Knowing more about this interplay of person and environment would not only allow a deeper understanding of how personality is connected to well-being but provide a foundation for the improvement of prevention and intervention measures targeting well-being. Therefore, this review and meta-analyses aim to provide an overview of the literature and main findings on NFC and well-being in healthy adults, covering various aspects, such as affect, psychological disorders, social behaviours, physical health, and intervention responsiveness.

2. Method

2.1. Search Process

An initial literature search was carried out until March 2021. The databases Web of Science, PsycARTICLE, and Google Scholar were searched for the term “need for cognition”. In order to do justice to the multifaceted nature of well-being, we did not include any other search terms. Sources were subjected to a full-text screening if title and abstract indicated that they investigated NFC in healthy adults in the context of a health intervention, physical health, addictive behaviour, social interactions, work life, affect, emotionality, or psychological disorders that are listed in the International Classification of Diseases ICD-10 (World Health Organization, 2016) or the Diagnostic and Statistical Manual of Mental Disorders DSM-V (American Psychiatric Association, 2013). Quantitative studies in English, German, or in another language with easily comprehensible correlation tables were included, as well as studies that were referenced by those we found (snowball system). The final selection included $N = 144$ sources (Supplementary Figure S1). We later noticed that this selection included four studies investigating high school students. They are listed in Supplementary Material S2 and were removed from the literature review. After writing a qualitative review it became apparent that there were nine correlates of NFC that appeared frequently enough to be used for meta-analyses: Neuroticism, anxiety, depression, negative affect, positive affect, life satisfaction, private self-consciousness, public self-consciousness, and burnout. To gather even more comprehensive data for these meta-analyses, we repeated the literature search with each of the correlates in conjunction with NFC as search terms, included own unpublished data, and asked other researchers for unpublished data sets or correlations via the e-mail distribution list of the German Psychological Society as well as social media (Strobel, 2022). Again, we only included quantitative studies conducted with healthy adults, in English, German, or with easily comprehensible correlation tables, which used validated instruments to assess the correlate of interest. There were no temporal, geographical, or cultural restrictions. For a comprehensive reference list with all sources

that went into the review and the meta-analyses see Supplementary Material S11. The composition of each meta-analysis will be detailed in the respective results section. The findings of the studies that were not part of a meta-analysis were grouped and described based on content.

2.2. Transparency and openness

We adhered to the MARS guidelines for meta-analytic reporting (Appelbaum et al., 2018). All meta-analytic data, analysis code, and the search terms and eligible literature per database are available at <https://osf.io/8xhys/>. We used the R software for statistical computing (version 4.1.1; R Core Team, 2021) together with RStudio (version 2021.9.0.351; RStudio Team, 2021) and the R package *metafor* (version 3.0-2; Viechtbauer, 2010) for meta-analysis. This review project was not pre-registered.

2.3. Statistical Analysis

We performed random-effects meta-analysis using the Hedges estimator for the amount of heterogeneity. We employed Fisher Z transformation of correlations to yield pooled effect sizes, but report backtransformed correlations throughout the manuscript. For effect size classification, we refer to the empirical guidelines by Gignac and Szodorai (2016).

Potential publication bias was assessed by the following approaches: 1) Trim-and-Fill (Duval & Tweedie, 2000), 2) Peters' test (Peters et al., 2006), and 3) PET/PEESE (Stanley, 2017). Each approach provides an adjusted effect size. If the adjusted effect sizes did not deviate from the effect size as determined by random-effects meta-analysis by $\pm .05$, this was taken as absence of publication bias.

Potential selection bias due to different search procedures was assessed as follows: For all outcomes, the effect size based on all identified studies was compared to the effect size based on 1) studies identified via Web of Science only, 2) studies identified via Google Scholar only, 3) published studies only, and 4) reanalysed data only, i.e., data that are not publicly available, but were available for reanalysis because they were own data sets previously published with a

different focus or data that were provided by other researchers upon our call for so far unpublished data on the relation of NFC with variables pertaining to our definition of well-being. Again, if the estimates based on the respective reduced data sets did not deviate from the effect size based on all data sets by $\pm .05$, this was taken as absence of selection bias.

3. Results

The following sections present the results of the review and meta-analyses on NFC and well-being, grouped by content into six sections: (1) emotionality and satisfaction, (2) depression, suicidal tendency, and burnout, (3) social networks and sense of identity, (4) substance abuse and addiction, (5) physical health, and (6) the effectiveness of health interventions. The first three sections contain meta-analyses as well as a review of the literature, while last three sections only contain a review. Each effect that is not part of a meta-analysis is detailed in the Supplementary Material (Table S1) with information on sample size, population, NFC instrument, construct, and the effect size.

3.1. Need for Cognition and emotionality and satisfaction

Neuroticism is a personality trait that has been identified as a robust correlate and predictor of many different mental and physical disorders, particularly depression (Enns & Cox, 1997; Lahey, 2009; Ormel et al., 2013). Figure 1 provides a forest plot of the random-effects meta-analysis on the relation of NFC and Neuroticism using all identified studies ($k = 41$, $N = 21,556$). NFC and Neuroticism were significantly negatively related, $\rho = -.22$, 95% CI $[-.25, -.19]$. We observed considerable heterogeneity, $\tau^2 = 0.006$, $I^2 = 73.80\%$, $Q(40) = 197.43$, $p < .001$.

Figure 1. Forest plot of the relation of Need for Cognition and Neuroticism ($k = 41$)

Figure 2 shows the results of robustness analyses with regard to publication and selection bias. The effect size estimate remained stable regardless of the method applied to correct for publication bias or of the selection of studies entered into meta-analysis.

Figure 2. Robustness checks of the relation of Need for Cognition and Neuroticism.

(A) Effect size estimates when applying different methods to assess publication bias, RMA = random-effects meta-analysis, TAF = Trim-and-Fill method, PET = precision-effect test, PEESE = precision-effect estimate with standard errors (see methods section for details); (B) Effect size estimates when applying different selection criteria for study inclusion, WoS = Web of Science

Higher levels of neuroticism are characterized by insecurity, anxiety, negative affect, and oversensitivity to stress; aspects to which NFC also showed negative associations: H-NFC individuals had lower anxiety scores and symptoms (see Figure 3), and less anxiety regarding maths, which was the reason for their higher math ability (Maloney & Retanal, 2020). They also reported being more emotionally stable (Yazdani & Siedlecki, 2021) and worrying less about disease recurrence (Kelly et al., 2010), with no significant association to state worry (Meyer et al., 1990).

Figure 3 provides a forest plot of the random-effects meta-analysis on the relation of NFC and Anxiety – comprising measures of state and/or trait anxiety in general or social anxiety in particular – using all identified studies ($k = 22$, $N = 5.588$). NFC and Anxiety were significantly negatively related, $\rho = -.19$, 95% CI $[-.25, -.13]$. We observed considerable heterogeneity, $\tau^2 = 0.015$, $I^2 = 78.28\%$, $Q(21) = 81.35$, $p < .001$.

Figure 3. Forest plot of the relation of Need for Cognition and Anxiety ($k = 22$)

Robustness analyses (see Supplementary Figure S3) showed that overall, the effects size of the relation of NFC and Anxiety was somewhat lower when methods to correct for publication bias were applied (mean $\rho = -.14$). Concerning selection bias, the $k = 7$ studies found via Web of Science yielded a considerably lower pooled effect size, $\rho = -.17$, than the $k = 7$ studies found via Google Scholar, $\rho = -.25$.

3.1.1. Positive and negative affect

Figure 4 provides a forest plot of the random-effects meta-analysis on the relation of NFC and Positive Affect, mostly measured using the Positive and Negative Affect Schedule (PANAS; Crawford and Henry, 2004). NFC and Positive Affect were significantly positively related, $\rho = .20$, 95% CI [.14, .25], $k = 15$, $N = 8.012$. Again, we observed considerable heterogeneity, $\tau^2 = 0.008$, $I^2 = 74.42\%$, $Q(14) = 38.95$, $p < .001$. The effect size estimates remained stable regardless of the method applied to correct for publication bias or of the selection of studies entered into meta-analysis (see Supplementary Figure S4).

Figure 4 Forest plot of the relation of Need for Cognition and Positive Affect ($k = 15$)

Figure 5 provides a forest plot of the random-effects meta-analysis on the relation of NFC and Negative Affect, mostly measured using the PANAS. NFC and Negative Affect were significantly negatively related, $\rho = -.14$, 95% CI [-.20, -.09], $k = 11$, $N = 7.512$. Again, we observed considerable heterogeneity, $\tau^2 = 0.005$, $I^2 = 67.60\%$, $Q(10) = 32.81$, $p < .001$.

Figure 5. Forest plot of the relation of Need for Cognition and Negative Affect ($k = 11$)

When applying methods to correct for publication bias, the effect sizes were somewhat larger, mean $\rho = -.20$. The selection of studies entered into meta-analysis did not seem to have a sizeable effect (Supplementary Figure S5).

While the meta-analyses of NFC and positive and negative affect pointed to a medium positive and small negative association, respectively, the correlation within studies was often significant for just one of the two constructs. For instance, NFC was not associated with positive affect but with its subscale measuring interest and activity, as well as with the behavioural activation system (Fleischhauer et al., 2010). Furthermore, H-NFC individuals reported more positive life events and evaluated them particularly positively, which was not the case for negative ones, suggesting a memory bias that benefits well-being (Strobel et al., 2017). On the other hand, H-NFC individuals showed more positive and negative reactions after being asked to write about an emotional experience (Green et al., 2017). The authors argue that the intense cognitive elaboration facilitated by NFC led to intense short-term reactions but likely results in a better long-term integration of experiences. H-NFC individuals showed less experiential avoidance, reacted more mindful to negative thoughts, and were more motivated and confident

in applying emotion regulation strategies (Vaughan-Johnston et al., 2020). Another study investigated male cancer patients and their partners, and found NFC to be correlated with lower stress, less negative affect, and more positive affect in partners only (Oh et al., 2007). This was attributed to the time of measurement and the partners' choice of bypassing medical information.

3.1.2. Life satisfaction and academia

When pooled over measures of life, study, and job satisfaction, NFC and satisfaction were significantly positively related, $\rho = .20$, 95% CI [.13, .27], $k = 20$, $N = 9.774$, with significant heterogeneity across studies, $\tau^2 = 0.025$, $I^2 = 90.82\%$, $Q(19) = 127.25$, $p < .001$ (Figure 6). When only considering life satisfaction (mostly measured via the Satisfaction with Life Scales; SWLS, Diener et al., 1985), the pooled effect size was very similar, $\rho = .18$, 95% CI [.08, .27], $k = 13$, $N = 8.002$, and heterogeneity persisted, $\tau^2 = 0.029$, $I^2 = 92.90\%$, $Q(12) = 76.91$, $p < .001$.

Figure 6. Forest plot of the relation of Need for Cognition and Satisfaction ($k = 20$)

In the robustness analyses with regard to publication and selection bias, the effect sizes were somewhat smaller, mean $\rho = -.14$, while the selection of studies entered into meta-analysis did not seem to affect effect size estimation (Supplementary Figure S6).

In addition to the medium positive association between NFC and satisfaction, NFC eclipsed religious doubt as a predictor of life satisfaction in religious individuals (Gauthier et al., 2006). NFC also mediated the influence of cognitive performance on life satisfaction, positive affect, and negative affect (Yazdani & Siedlecki, 2021), indicating that those who excel at cognitive tasks are only happier if they also enjoy doing so. This person-environment-fit was reflected in academic contexts. H-NFC university students not only showed more academic engagement but felt more fostered by their courses (Cole & Korkmaz, 2013) and expected to experience more desirable career events but not more personal events (Klaczynski & Fauth, 1996). H-NFC students were less motivated by the prospect of being outperformed and more motivated by the strive for personal mastery (Tan et al., 2020). This benchmarking of progress based on own past achievements requires accurate self-assessment, which has been linked to positive educational outcomes (Andrade & Valtcheva, 2009), and was also reflected in the lack of association between NFC and anger or pride regarding coursework (Karagiannopoulou et al., 2020). NFC was associated with higher psychological well-being in students (Cole & Korkmaz, 2013), higher study satisfaction, lower termination thoughts (Grass et al., 2017), less dropout (Klaczynski & Fauth, 1996), less college stress (Epstein et al., 1996), less clutter (Prohaska et al., 2018), lower anxiety regarding the coursework (Karagiannopoulou et al., 2020), higher problem solving expectancy (Heppner et al., 1983), higher self-efficacy (Kim et al., 2019; Tan et al., 2020), higher passive and active learning motivation (Liu et al., 2020), less naïve optimism, and higher self-esteem (Epstein et al., 1996). However, NFC was associated with better performance but not higher study satisfaction in teacher trainees (Grass et al., 2018). Interest-

ingly, procrastination, a common symptom of depression caused by repetitive thoughts (Constantin et al., 2018; Ozer et al., 2014), was actively done by H-NFC students (Zhou, 2019), not on everyday tasks but on decisions where they wanted to consider every possible outcome (Prohaska et al., 2018). Yet, they were not procrastinating out of fear of being wrong (M. M. Thompson & Zanna, 1995) and were able to meet deadlines (Zhou, 2019).

3.1.3. Work life

This procrastination pattern looked different in working adults with high NFC, who showed less procrastination in decision making, despite considering more alternatives (Bouckennooghe et al., 2007). H-NFC individuals were more certain about their roles at work and had higher motivation to work if they had less than four years of experience (Nowlin et al., 2017). Furthermore, H-NFC individuals felt safer at work (Pan et al., 2020), did not engage in interpersonal mistreatment, and their mood was less negatively influenced by colleagues letting off steam, even though they reported more of this behaviour being directed at them (Rosen et al., 2020). However, researchers with high NFC were not only more creative when they felt like creativity was being fostered in their workplace but also when they felt psychologically unsafe (Pan et al., 2020). Higher (malevolent) creativity under threat in H-NFC individuals was also found by Baas et al. (2019), suggesting that H-NFC individuals do not necessarily work better when unsafe but that they purposefully invest resources to improve their situation.

3.1.4. Self-control

This deliberate allocation of resources was a recurring theme in many studies. It appears that H-NFC individuals not only had higher effortful control (Kührt et al., 2021; Nishiguchi et al., 2016, 2018), i.e. more efficient executive attention, but NFC and effortful control increased each other over time (Nishiguchi et al., 2016). Similarly, H-NFC individuals often reported higher self-control, indicating they are able to regulate their thoughts, emotions, and behaviours more easily (Bertrams & Dickhäuser, 2012; Grass et al., 2018, 2019; Kührt et al., 2021;

Sevincer et al., 2017) and with respect to the necessary effort (Tan et al., 2020). Self-control mediated between NFC and self-esteem, and NFC and depressive mood (Bertrams & Dickhäuser, 2012), suggesting a strong dependency between being able to exert self-control and being motivated to do so. Self-control itself has also been negatively linked to various psychopathology measures (Tangney et al., 2004), depressive mood, stress (Finkenauer et al., 2005), and the inability to cope with negative emotions (Gailliot et al., 2006). H-NFC individuals had higher coping abilities (Bye & Pushkar, 2009) and were coping more actively and less passively (Grass et al., 2018). They found advice more helpful for coping in combination with emotional support, stating that the latter was issue relevant and facilitated the processing of the advice (Kim et al., 2019). NFC showed no association to rumination (Nishiguchi et al., 2018; Vannucci & Chiorri, 2018), a judgemental and passive type of self-focus (Trapnell & Campbell, 1999), which has been associated with being overly focussed on the past, pessimistic about the future, and having more negative thoughts (Lavender & Watkins, 2004; Nolen-Hoeksema et al., 2008). Only controlling for effortful control led to a positive association of NFC and rumination (Nishiguchi et al., 2018). Reflection on the other hand was positively associated with NFC (Nishiguchi et al., 2016, 2018) and has been described as a curious and exploring type of self-focus (Trapnell & Campbell, 1999), correlating with reduced depression, more creativity, and enhanced goal formation (Takano & Tanno, 2009; Verhaeghen et al., 2014). Indeed, H-NFC individuals directed their attention more to their own thoughts and feelings about themselves (Berzonsky & Sullivan, 1992), but not in an obsessive way (Ghorbani et al., 2004). They reported being more mindful by being more observing (Noone & Hogan, 2018), and were convinced to be in control of their own thoughts, behaviours, and life events (Bye & Pushkar, 2009; Fletcher et al., 1986; Ghorbani et al., 2004) whereas L-NFC individuals attributed these aspects more to chance or powerful others (Ghorbani et al., 2004).

3.2. Need for Cognition and depression, suicidal tendency, and burnout

Several studies on NFC investigated depressive symptoms, suicidal tendencies, and burnout symptoms, with heterogeneous results across topics and samples.

3.2.1. Depressive symptoms

Figure 7 provides a forest plot of the random-effects meta-analysis on the relation of NFC and Depression, mostly measured via the Beck Depression Inventory-II (BDI-II; Beck et al., 2011) or the Depression subscale of the Depression, Anxiety and Stress Scales (DASS; Henry and Crawford, 2005). NFC and Depression were significantly negatively related, $\rho = -.25$, 95% CI $[-.30, -.19]$, $k = 14$, $N = 4,109$. We observed considerable heterogeneity, $\tau^2 = 0.009$, $I^2 = 71.85\%$, $Q(13) = 60.45$, $p < .001$. With regard to publication and selection bias, the effect size of the relation of NFC and Depression was higher when methods to correct for publication bias were applied (mean $\rho = -.35$), whereas it remained rather stable regardless of the selection of studies (see Supplementary Figure S7).

Figure 7. Forest plot of the relation of Need for Cognition and Depression ($k = 14$)

Two studies additionally investigated the impact of depression on NFC, yielding non-significant (Maschio, 2018) or negative results (Nishiguchi et al., 2016). Assumptions regarding underlying mechanisms varied but self-control emerged in this context just like it did in influencing affect. NFC no longer negatively predicted depression when controlling for effortful control, and the negative impact of depression on effortful control was stronger for L-NFC individuals (Nishiguchi et al., 2016). NFC alone was not sufficient in predicting the course of disease in depressed individuals (Nishiguchi et al., 2016), and higher resource management abilities were only related to lower depressed mood at work for individuals high or average in NFC (V. C. Gallagher, 2012).

3.2.2. Suicidal tendencies

Neither NFC nor NFC and depression could predict suicide risk or behaviours (Cramer et al., 2016, 2019; Cramer, Franks, et al., 2020; Cramer, Langhinrichsen-Rohling, et al., 2020). A proposed interaction was the one of NFC with Need for Affect, the motivation to approach or avoid situations that induce emotions (Maio & Esses, 2001). There was no association of NFC and affect intensity (Epstein et al., 1996), NFC and Need for Affect were either positively (Maio & Esses, 2001) or non-significantly (Aquino et al., 2016) related, and H-NFC individuals reported more approach and less avoidance motivation (Cramer et al., 2016; Cramer, Franks, et al., 2020). While higher approach motivation decreased suicide risk in a military sample (Cramer, Franks, et al., 2020), it elevated suicide risk in a student sample but only in H-NFC individuals (Cramer et al., 2016). Higher avoidance motivation was consistently associated with elevated suicide risk (Cramer et al., 2019; Cramer, Franks, et al., 2020; Cramer, Langhinrichsen-Rohling, et al., 2020) and this effect was heightened by high NFC in young adults who had attempted suicide before (Cramer et al., 2019). In the same sample, increasing levels of NFC lessened the effect of anxiety on suicide risk. When it came to general cognitions about death,

H-NFC individuals were more willing to think about death and use that for personal growth (Jennings et al., 2009) rather than resorting to paranormal beliefs (P. Rogers et al., 2018).

3.2.3. Burnout

Across $k = 8$ studies with a total sample size of $N = 5.502$, NFC and Burnout (mostly measured via a variant of the Maslach Burnout Inventory; MBI, Maslach et al. (1997)) were significantly negatively related, $\rho = -.25$, 95% CI $[-.31, -.18]$ (Figure 8). There was no significant heterogeneity across studies, $\tau^2 = 0.005$, $I^2 = 65.36\%$, $Q(7) = 12.52$, $p = .085$. Applying methods to correct for publication or selection bias had no sizeable impact on effect sizes (Supplementary Figure S8).

Figure 8. Forest plot of the relation of Need for Cognition and Burnout ($k = 8$)

The findings regarding NFC and burnout pointed to a medium to large negative association, indicating that H-NFC individuals were less emotionally exhausted, less cynical towards their work, and had higher self-efficacy (Grass et al., 2018; Naderi et al., 2018). Different mechanisms of how NFC impacts burnout scores were observed in different samples: In teacher trainees, more active and less passive coping partially mediated between NFC and burnout (Grass et al., 2018), while in teachers, self-control was a partial mediator when the amount of teaching experience was being taken into account (Zerna et al., 2022), and in students, self-efficacy was found to be a partial mediator (Naderi et al., 2018).

3.3. Need for Cognition and social networks and sense of identity

Social ties and interactions meet some of our most basic human needs and are therefore an essential part of well-being (Greenblatt et al., 1982; Ohrnberger et al., 2017). They also contribute to our sense of identity, a foundation of healthy development (Lecky & Taylor, 1945; C. R. Rogers, 1959) and a prerequisite for well-being (Erikson, 1994).

3.3.1. Social networks and behaviours

NFC showed a medium negative correlation with anxiety in the meta-analysis (Figure 4), which also included studies on social anxiety. Furthermore, NFC was not significantly associated with social desirability (Curşeu & De Jong, 2017), and either not significantly (Meertens & Lion, 2008; Osberg, 1987) or positively (Osberg, 1987) with self-esteem.

There was a medium relation between NFC and Private Self-Consciousness, i.e. the focus on one's own thoughts and feelings (Fenigstein et al., 1975), $\rho = .25$, 95% CI [.21, .29], $k = 14$, $N = 2.757$ (Figure 9). The test for heterogeneity was insignificant, $\tau^2 = 0.001$, $I^2 = 14.09\%$, $Q(13) = 19.45$, $p = .110$. Publication bias or study selection did not seem to affect effect size estimation (Supplementary Figure S9).

Figure 9. Forest plot of the relation of Need for Cognition and Private Self-Consciousness ($k = 14$)

Only $k = 7$ studies with a total sample size of $N = 870$ could be identified on the relation between NFC and Public Self-Consciousness, i.e. the focus on how others perceive one's appearance and behaviour (Fenigstein et al., 1975). There was a small significant relation, $\rho = -.14$, 95% CI $[-.21, -.08]$ (Figure 10). Heterogeneity across studies was insignificant, $\tau^2 = 0.000$, $I^2 = 0.00\%$, $Q(7) = 3.31$, $p = .769$. Publication bias only weakly affected effect size estimation, and there was no effect of selection bias with regard to the relation of NFC and Private Self-Consciousness (Supplementary Figure S10).

Figure 10. Forest plot of the relation of Need for Cognition and Public Self-Consciousness ($k = 7$)

In the study by Reeves et al. (1995) the private self-consciousness subscale internal state-awareness had a large correlation with NFC, while the other subscale self-reflectiveness had only a small correlation with NFC. Internal state-awareness was associated with lower depression and social anxiety, while higher self-reflectiveness showed the opposite pattern.

H-NFC individuals were less concerned about communication (Wycoff, 1992) and less appearance-conscious (Reeves et al., 1995) but there were no associations to shyness, sociability, loneliness (Osberg, 1987), or style-consciousness (Reeves et al., 1995). H-NFC individuals

reported being less prejudiced and having social networks with a higher demographic variety (Curşeu & De Jong, 2017), which might have also contributed to their higher sense of uniqueness (Pilarska, 2017). Still, they felt no particular attachment to their community or home (Prohaska et al., 2018), used networking sites less often, and were less likely to add friends to their profile (Zhong et al., 2011). Since the impact of networking sites on well-being is very complex (Baker & Algorta, 2016; Frison & Eggermont, 2016), more research is needed to clarify the role of NFC.

H-NFC individuals showed better Theory of Mind performance (Stewart & Kirkham, 2020), reported more certainty regarding cause and effect in social situations (Weary & Edwards, 1994), less vulnerable narcissism, i.e. negative emotions, entitlement, and egocentricity (Littrell et al., 2020), higher tolerance for disagreement, less verbal aggressiveness (Linville et al., 2016), and less anger when others do not apologize (R. L. Thomas & Millar, 2008). Patients with a borderline diagnosis, a mental disorder characterized by severe interpersonal dysfunction, had lower empathy but not different NFC scores than healthy controls, and lower empathy but not NFC strengthened their tendency to attribute others' behaviours to traits (Homan et al., 2017). However, other studies did not find associations of NFC to state or trait anger (Olson et al., 1984), grandiose narcissism, i.e. dominance, aggression, and immodesty (Littrell et al., 2020), or to the awareness and use of affective cues to guide communication (Booth-Butterfield & Booth-Butterfield, 1990). H-NFC individuals were less susceptible to social cues when reading news articles online (Dvir-Gvirsman, 2019), showed greater confirmation bias (Knobloch-Westerwick et al., 2020), and developed more malevolent ideas under threat but not more neutral or benevolent ideas (Baas et al., 2019). There was an association of NFC with a clear preference for competent social circles but not for emotional warmth (Aquino et al., 2016). When faced with a choice between varyingly competent and warm social groups, H-NFC individuals preferred the highly competent but emotionally colder ones and identified with them the most

(Wolf et al., 2017). Additionally, teams with higher NFC performed better on a task but did not perceive their cooperation to be better (Schei et al., 2020).

3.3.2. Sense of identity

NFC was not associated with the search for or the presence of meaning in life (Carney & Robertson, 2018), but H-NFC individuals emphasized values, goals, and hopes in their identity more than social aspects (Berzonsky & Sullivan, 1992), and reported a stronger sense of identity through various coping mechanisms (Pilarska, 2015, 2017). They were able to reflect more thoroughly on events, thoughts, and emotions, and integrate them into their sense of self (Littrell et al., 2020; Pilarska, 2015) with a greater sense of continuity, coherence, and contents (Pilarska, 2017). H-NFC individuals adapted events less to fit their sense of self and vice versa, resulting in a more defined sense of boundaries, higher perceived self-worth (Pilarska, 2017), and higher stages of identity development over time (Njus & Johnson, 2008). Sense of identity can be threatened or even lost in schizophrenic patients (Buck et al., 2013) but NFC was negatively associated with the schizotypy subfactors, indicating that H-NFC individuals were less likely to experience cognitive disorganization, emotional flatness, asocial behaviour, and unstable mood in social situations (Broyd et al., 2019; Denovan et al., 2020).

Gender differences were identified in two studies. H-NFC men had fewer sexual partners and a less secure relationship to their father, while this was not true for women (Epstein et al., 1996). H-NFC women reported lower conflict resolution and a more dismissive relationship prototype, while men did not (Epstein et al., 1996). Additionally, the influence of different coping mechanisms on sense of identity varied in men and women (Pilarska, 2017) but these relationship styles were not investigated in any other study so far.

Overall, the thorough cognitive processing associated with NFC appeared to enable the development of a strong sense of identity and the self, as well as the ability to deal with inconsistencies and contradictions. This in turn facilitated confident handling of social situations but

went along with a preference for social networks that were socially diverse, and highly competent but less emotionally warm, just like H-NFC individuals perceived themselves.

3.4. Need for Cognition and substance abuse and addiction

Findings regarding NFC and various addiction behaviours such as drinking, smoking, gambling, and technology use were quite mixed, pointing to interaction effects once more.

3.4.1. Substance abuse and gambling

In students, NFC was not associated with disinhibition (Olson et al., 1984). Students with higher NFC reported having fewer alcohol-related problems and less heavy drinking in some studies (Bernstein et al., 2016; Blanchard et al., 2016) but not in others (Capone & Wood, 2009). Gender effects were also inconsistent, showing less heavy drinking (Hittner, 2004) and higher levels of distrust in women (Epstein et al., 1996), while in men NFC was either associated with less heavy drinking (Epstein et al., 1996) or showed no association (Blanchard et al., 2016; Hittner, 2004). In smokers, NFC was not related to the number of daily cigarettes or past quit attempts but to higher confidence in being able to quit (Haug et al., 2010). Only H-NFC smokers with high perceived vulnerability were less prone to believe in false cigarette health claims (Shadel et al., 2006).

H-NFC individuals were more likely to engage in strategic than non-strategic gambling (Mouneyrac et al., 2018) and even though they did not make more complex decisions (Zadelaar et al., 2020), their performance in a gambling task was either as good as or better than the performance of L-NFC individuals (Harman, 2011). Associations of NFC with impulsiveness or risk taking behaviour were either non-significant (Meertens & Lion, 2008; Xu & Cheng, 2021) or negative (Littrell et al., 2020; Meertens & Lion, 2008), but associations with sensation seeking (Fleischhauer et al., 2010; Shi et al., 2010) and with a preference for immediate satisfaction of needs were positive (Shim et al., 2018). However, H-NFC individuals showed higher

inhibitory (Nishiguchi et al., 2016) and self-control, even after adjusting for social desirability (Bertrams & Dickhäuser, 2012).

3.4.2. Media consumption

NFC and boredom proneness were either non-significantly (Olson et al., 1984) or negatively associated (Watt & Blanchard, 1994), and being bored actually increased H-NFC individuals' creativity (Park et al., 2019). They were less likely to watch television to pass time, reported lower motivations for viewing, watched less (Henning & Vorderer, 2001), and were less likely to aimlessly switch channels (Shim et al., 2018). NFC was not associated with attitudes towards binge watching but H-NFC individuals engaged in this behaviour more (Shim et al., 2018), especially if they were fans of a series (Shim & Kim, 2017). Additionally, NFC was associated with equal or higher identification with an interactive rather than traditional game narrative (Green & Jenkins, 2020).

H-NFC individuals were not more likely to busy themselves with multiple electronic devices at once (Zhong et al., 2011), used their smartphone less (Shim et al., 2018) and with higher perceived efficacy (Darvishi et al., 2020), which was also true for their internet use, which showed healthy usage patterns (Shi et al., 2010). Male consumers of internet pornography with higher NFC were less likely to be addicted to it, lose control of consumption, have social problems because of it, and spent less time consuming than those with lower NFC (Antons et al., 2019). Regarding the consumed content, H-NFC individuals showed equally negative attitudes towards different abuse scenarios, while attitudes of L-NFC individuals varied depending on the sexes in the scenario (Leone et al., 2019).

H-NFC individuals reported less impulse buying (Lins & Aquino, 2020) and were less susceptible to nudging (Ingendahl et al., 2020), but this was also the case in situations with beneficial nudges, e.g. ones leading to healthier products (Grandi et al., 2020).

To sum up, the associations of NFC and addiction differed a lot from behaviour to behaviour. Further investigations need to clarify the relationship of NFC and alcohol consumption, including the role of gender differences. NFC itself did not influence smoking behaviour but its interaction with vulnerability did. Internet usage patterns were less problematic in H-NFC individuals. They were drawn to activities that met their need for cognitive challenge, such as strategic gambling and binge watching.

3.5. Need for Cognition and physical health

H-NFC individuals rated their health slightly higher than (Epstein et al., 1996; Yazdani & Siedlecki, 2021) or equal to L-NFC individuals (Bye & Pushkar, 2009). They had more knowledge regarding diseases and healthy behaviours (De Pelsmacker et al., 2017; Holch & Marwood, 2020; Laws et al., 2020; Osberg et al., 2008; Riley et al., 2019; Williams-Piehot et al., 2006) and felt more confident in evaluating such information (Maki & Feeley, 2021; Vainio, 2019). H-NFC individuals consumed more fruits and vegetables (Williams-Piehot et al., 2006) and plant-based meat alternatives out of environmental and health motives (Vainio, 2019). However, they were less likely to try new foods due to lower materialism scores (Tuncdogan & Ar, 2018) and no association was found to red meat consumption (Vainio, 2019). Even though NFC was not associated with the motivation to use a fitness tracker (Attig et al., 2019) and H-NFC individuals were less active during the week, they were equally active on the weekend (McElroy et al., 2016) or even more active than L-NFC individuals (Yazdani & Siedlecki, 2021). NFC in general was associated with higher intentions to use sun protection (Occa et al., 2020) but with lower skin appearance concern in sunbathing students (McMath & Prentice-Dunn, 2005). An increase in self-rated health could predict an increase in NFC across four years, while sleep deprivation and binge drinking had the opposite effect, and smoking had no

influence (Chen & Chen, 2019). Sleep deprivation did not impact cognitive performance in H-NFC individuals (Kobbeltvedt et al., 2005).

Regarding specific diseases, associations with NFC were mixed. Healthy H-NFC individuals only had more correct assumptions about the causation of diabetes but not of colorectal cancer (Riley et al., 2019) and not more knowledge regarding the risk factors of either disease (Hay et al., 2020). NFC in healthy individuals was also not associated with hypochondriasis (Bagby et al., 1986), attitude towards vaccination (Tomljenovic et al., 2020), objective HIV risk, or intention to get HIV tested (Maki & Feeley, 2021). However, H-NFC individuals who were affected by a certain disease knew more about it and adhered more rigorously to their treatment (Hadj-Abo et al., 2020; Laws et al., 2020). Healthy H-NFC individuals were also more likely to discuss prescription medication with their doctor (Krezmien et al., 2011) but this was not true for H-NFC women who knew more about breast cancer but were still less likely to seek information, consultations, or a screening because they had lower anxiety (De Pelsmacker et al., 2017).

Overall, NFC appeared to facilitate healthy day-to-day behaviours through more health knowledge and literacy but this effect was less pronounced regarding diseases and medical measures, maybe due to a sense of overconfidence in H-NFC individuals, reflected in higher health risk taking behaviour (Zadelaar et al., 2020).

3.6. Need for Cognition and the effectiveness of health interventions

The assumption underlying NFC and health interventions is that H-NFC individuals are more receptive for cognitively stimulating materials because of their preference for cognitive challenge. Several studies found evidence for this assumption but many other studies did not.

3.6.1. Cognitively challenging interventions

Higher NFC was associated with higher risk perceptions after factual rather than emotional message frames in occasional smokers (Stevens et al., 2019; Vidrine et al., 2007) but not in daily smokers (Vidrine et al., 2007), since interventions targeting high-risk groups are generally less effective than others (Carey et al., 2007). Furthermore, NFC and health-promoting message frames did not interact to predict risk knowledge retention (Stevens et al., 2019), behavioural intentions (Maki & Feeley, 2021; Stevens et al., 2019), or actual behaviour (Latimer et al., 2007; Williams-Piehota et al., 2006). After a detailed message, the intentions of H-NFC individuals were actually lower than those of L-NFC individuals, while a non-detailed message did not differ between groups (Latimer et al., 2007). Even more so, L-NFC individuals reported more physical exercise after messages emphasizing its affective benefits than H-NFC individuals did, and neither group was impacted by messages emphasizing cognitive benefits (Conner et al., 2011). L-NFC individuals felt more persuaded by a testimonial message than a factual one, while H-NFC individuals felt equally persuaded by both because perceived transportation was not tied to persuasion for them (Braverman, 2008).

3.6.2. Other intervention types

H-NFC individuals were more responsive to loss than to gain framed messages (K. M. Gallagher & Updegraff, 2011; Lin et al., 2017; Stevens et al., 2019) and were more sensitive to opportunity costs (Yan & Otto, 2020) but these frames neither impacted content recollection nor behavioural intention (Stevens et al., 2019). Personalized messages had higher long-term impact on self-efficacy for H-NFC individuals compared to no message (Haug et al., 2010) but person-centeredness did not interact with NFC regarding helpfulness or behavioural intention (Gallivan, 2020; Rack et al., 2008). Still, a motivational one-on-one intervention had higher impact on behavioural outcomes for H-NFC than for L-NFC individuals (Capone & Wood, 2009). Similarly, verbal metaphors were perceived as more effective by H-NFC individuals than visual metaphors but they did not differ in their impact on behavioural intentions (Occa et

al., 2020). In response to high-threat messages, H-NFC individuals were less hopeless (McMath & Prentice-Dunn, 2005), had higher behavioural intentions, and more attitude change (Ruiter et al., 2004), while L-NFC individuals reported the opposite. However, high-threat messages did not differ in impact on actual behaviour depending on NFC (Ruiter et al., 2004). Still, H-NFC individuals reported higher individual and situational interest in the presented materials (C. L. Thomas & Kirby, 2020) and their beliefs after an intervention were more stable over time and more resistant to counter-persuasion (Haugtvedt & Petty, 1992). Additionally, attitudes and behavioural intentions were more strongly linked in H-NFC individuals (Horcajo et al., 2019).

3.6.3. Intervention outcomes

Following an intervention, individuals high in NFC showed higher knowledge retention (Haugtvedt & Petty, 1992; Stevens et al., 2019), lower frequency of the harmful behaviour (Haug et al., 2010), higher intervention adherence (Kelders et al., 2013), higher intention to change the harmful behaviour within the next few days (Gallivan, 2020), higher ratings of positive and lower ratings of negative emotions, a pattern that increased over the course of the intervention (Czuchry & Dansereau, 2004), and development of more correct beliefs (Kessler et al., 2019). No associations were observed regarding the development of incorrect beliefs (Kessler et al., 2019), the intention to change the harmful behaviour within the next month (Gallivan, 2020), risk perception (Stevens et al., 2019), behavioural intentions (McMath & Prentice-Dunn, 2005; Stevens et al., 2019), efficacy beliefs (Ruiter et al., 2004), perceived message effectiveness (Occa et al., 2020), and with the frequency of the desired behaviour at follow-up (Williams-Piehota et al., 2006). On the other hand, NFC was associated with lower perceived message helpfulness (Latimer et al., 2007), higher frequency of the harmful behaviour at follow-up (Bernstein et al., 2016), and higher intention regarding the harmful behaviour after the intervention (Gallivan, 2020). During the first months of the Covid-19 pandemic in 2020, H-NFC individuals reported higher compliance with mask-wearing and social distancing,

more positive attitudes towards mask-wearing (Xu & Cheng, 2021), higher optimism, and no association to panic buying behaviour or to the extent of feeling affected by the pandemic (Lins & Aquino, 2020).

NFC was associated with characteristics that are likely to benefit adherence and success, such as self-efficacy (Holch & Marwood, 2020), self-control (Xu & Cheng, 2021), persistence and self-discipline, no association with reward dependence (Fleischhauer et al., 2010), and higher intrinsic and lower extrinsic motivation (Amabile et al., 1994). Only one study found a negative association to mastery beliefs (Double & Birney, 2016), the conviction to be in control over one's life.

Ultimately, H-NFC could neither guarantee intervention effectiveness nor intervention adherence, but designing interventions with respect to the different preferences will contribute to intervention impact for both L-NFC and H-NFC individuals.

4. Discussion

The aim of this review was to provide an overview of the role of NFC in well-being. Online databases were browsed manually to identify eligible literature, purposefully keeping the concept of well-being broad in order to do justice to its multifaceted nature. Constructs that appeared frequently were subjected to a second, targeted search to collect studies for meta-analyses. The findings of the literature search were grouped based on related content, yielding sections regarding (1) emotionality and satisfaction, (2) depression, suicidal tendency, and burnout, (3) social networks and sense of identity, (4) substance abuse and addiction, (5) physical health, and (6) the effectiveness of health interventions. The type of influence NFC had, as well as the unanimity of studies, varied between these sections. The following paragraph provides a summary of the core findings.

4.1. Summary of main findings

H-NFC individuals score lower in neuroticism and report higher positive and lower negative affect. Consequently, they report higher satisfaction, likely resulting from thoroughly processing not only the events in their life but also their own reaction to them. This is supported by the associations of NFC with higher self-control, which stand in a reciprocal relationship with NFC, enhancing one another over time. Therefore, H-NFC individuals do not exert negative self-focus but reflect on their own thoughts in a curiosity driven, observing way. They are happier and perform better in environments that foster this type of cognition, not only in academic settings but also in their social networks. The latter are preferred by H-NFC individuals to be more diverse and competent rather than emotionally warm, as they perceive to share these characteristics. NFC is not only related to being more confident and considerate in social interactions but also to being able to integrate experiences and thoughts effectively into a stable, coherent, and sophisticated sense of identity. Overall, H-NFC individuals have lower depression scores, which are often facilitated by a protective effect of effortful control, but the relationship of NFC and suicidal tendencies is more complex due to influential third variables like Need for Affect and sample characteristics. Equally dependent on sample characteristics are the mediators of lower burnout scores in H-NFC individuals, ranging from work experience to coping styles to self-efficacy. Their higher self-efficacy also makes them more confident in being able to quit smoking, even though the associations with consumption of nicotine and alcohol are often non-significant or possibly dependent on third variables like gender. Other addictive behaviours such as gambling and entertainment consumption are also not negatively associated with NFC per se, but H-NFC individuals show these behaviours in ways that met their need for cognitive challenge, e.g. by choosing strategic games or by binge watching. However, patterns of internet and media usage are healthy in H-NFC individuals, and they are not prone to developing a shopping addiction. Regarding diet and exercise, H-NFC individuals display favourable behaviour as well, and they feel more confident in evaluating health-related information. In

patients with a chronic disease, NFC is associated with better disease self-management but in healthy individuals NFC is largely unrelated to knowledge or attitudes regarding medical treatments or preventative measures. Interventions with different message frames are often able to increase such knowledge in H-NFC individuals but these interventions have little effect on attitudes or behavioural intentions and sometimes even end up changing intentions for the worse. Conversely, L-NFC individuals benefit more universally from health interventions, even though they have lower scores on characteristics that are beneficial for intervention success. Ultimately, H-NFC individuals might fall into a false sense of security, perceiving to be in control of their behaviour to such an extent that would allow them to change it anytime.

4.2. Interaction of NFC and self-control

H-NFC individuals' perception of being in control – and being able to exert control – is a recurring theme and might even explain the results of papers that did not make it a subject of discussion. The higher preference for control in H-NFC-individuals was first proposed by Cacioppo et al. (1996), who claimed that higher levels of NFC might develop as a result of a high need for structure or control in those who have the skill, ability, and inclination to do so. The origin of this proposal was the highly significant correlation of NFC and desire for control, identified by Thompson et al. (1993). Bye and Pushkar (2009) further elaborated on this, suggesting that what sets desire for control apart from NFC is the aspect of joy: Only those individuals with a high desire for control, who perceive the engagement in effortful cognitive activities as joyful, pave the way for the development of NFC. Various areas showed a conclusive picture of an improvement in well-being through higher NFC and a higher sense of control, suggesting a balance of resources and challenges as established in the definition of well-being by Dodge et al. (2012). H-NFC individuals deliberately and carefully process life events and thoughts, yielding a more stable and sophisticated sense of identity, with more concern about aspects of their identity they were actually able to influence and less concern regarding aspects

like appearance. Instead of being stuck in spirals of negative thought, H-NFC individuals direct their attention to positive events and are optimistic about such events happening in the future, especially when they involve cognitive challenge. H-NFC individuals extend their deliberate and careful processing to challenging situations, coping actively, which is reflected in lower burnout scores and better disease management in the chronically ill. As a result, they are less anxious because they feel like they were able to master the situation.

4.3. Non-positive effects of NFC on well-being

However, this low level of anxiety also increases their sense of security in situations where low anxiety levels are driving unhealthy behaviours, such as substance use and medical measures. This poses the question whether H-NFC individuals' higher reported self-control mirrors actual abilities or indicates a degree of overconfidence. The latter is highly probable, since a recent study found no association between NFC and performance in various tasks of executive functioning (Gärtner et al., 2021). This could be a potential pitfall for H-NFC individuals in situations where they reported high perceived control and self-efficacy, like smoking cessation, preventative health screenings, and health interventions with different message frames. Perceiving to be able to quit smoking anytime, to know enough about a health condition instead of consulting a physician, and to use intervention messages as a method of knowledge gain rather than to be persuaded by them, can lead to overconfidence and a false sense of security. Regardless of whether H-NFC individuals are actually able to exert the control they perceive to have, the behaviours resulting from their sense of security are not favourable, taking shape in health interventions having the opposite effect, lack of interest in medical appointments, preference for strategic gambling, and so on. Returning to the definition of well-being by Dodge et al. (2012), this overconfidence in H-NFC individuals can be interpreted as an imbalance of resources and challenges, which is caused by (the perception of) an excess of re-

sources and results in a decrease in well-being. Even if this decrease in well-being is not immediately perceived as such, it will most likely manifest over time in the form of an increase in health risks, which arise from a lack of preventative measures, screenings, and unchanged noxious behaviours. Ultimately, most of the negative impact is being outweighed by direct and indirect positive associations of NFC with a heightened sense of well-being, but health professionals should be aware of the possibility of an overconfident sense of control in H-NFC individuals.

4.4. Limitations

The exploration of the role of NFC in well-being is by no means exhausted. There are still many open questions regarding underlying mechanisms in areas where the results are particularly ambiguous, like alcohol consumption. As there are indications of reciprocal effects of NFC with other variables, more longitudinal research would shed light on how these mechanisms influence other outcomes. Furthermore, most samples are university samples, where NFC can be expected to be generally higher and narrower in range, and findings regarding suicidal tendencies show a clear dependence of results on the sample. Clinical samples are underrepresented as well, as there are hardly any investigations into NFC and mental disorders beyond depression. Healthy adults are the focus of this review, so we cannot say whether the findings and mechanisms identified here also extend to adolescents and children.

Furthermore, we observed heterogeneity in all meta-analyses. The cause of this heterogeneity can be investigated with meta-regressions to identify moderating variables, such as gender, age, sample characteristics, and the instrument used to assess NFC and its correlate. However, as this research area is quite young, there is not a lot of theoretical work to support the selection of adequate moderators. An inadequate selection would in turn lead to a type-I-error inflation. Furthermore, not all of the meta-analyses contain enough studies for a meta-regression (more than ten is recommended by the Cochrane handbook (Higgins et al., 2019)), and it

is likely that not all of the studies report every variable to the same precision. For these reasons, and given that the effect sizes are surprisingly consistent within the meta-analyses, we refrained from conducting meta-regressions. We encourage future research to investigate possible moderating and confounding variables.

4.5. Conclusion

Despite the extensive literature screening and the call for unpublished results, it is still possible that not all relevant studies were found. Moreover, the diversity of studies necessitated a split into several meta-analyses on one hand and a qualitative review on the other hand. However, this provided a quantitative framework while allowing a broad inclusion of topics and research designs. As a result, this broad overview, including research gaps, ambiguities, and underlying themes, provides a good starting point to further investigate NFC as a factor that can both reinforce and jeopardize personal well-being.

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