Research Report

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RESEARCH REPORT

The Malleability of Workplace-Relevant Noncognitive Constructs: Empirical Evidence From 39 Meta-Analyses and Reviews

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We reviewed the current state of the literature on the intervention-based development of interpersonal skills (e.g., teamwork, leadership) and intrapersonal skills (e.g., personality, motivation, etc.) relevant to success in workplace contexts. We adopted a multidisciplinary approach to our review, evaluating research from 39 reviews and meta-analyses from several fields such as educational psychology, industrial/organizational (I/O) psychology, medicine, and personality psychology, among others, to examine the extent to which noncognitive constructs change as a result of intervention. We discuss key findings and trends and conclude by identifying gaps in the literature and directions for future research. Overall, findings suggest optimism regarding the malleability of noncognitive constructs.

Keywords Noncognitive skills; malleability; workplace

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Researchers, organizations, and educational institutions have become increasingly interested in the malleability and development of constructs outside of traditional conceptualizations of intelligence (Heckman & Kautz, 2014; Kyllonen, 2012). One approach to identifying these constructs involves the distinction between those typically considered "cognitive" from those usually categorized as "noncognitive." Whereas cognitive ability and cognitive skills are often equated with traditional measures of intelligence and the ability to solve abstract problems (Gottfredson, 1998), noncognitive constructs are conceptualized as those that are separate from and considered largely orthogonal to cognitive ability. Scholars have defined noncognitive constructs in several ways. Klieger et al. (2015) described noncognitive constructs as "demonstrable personality, motivational, attitudinal, self-regulatory, and learning approach constructs for which there are differences among people, which standardized tests of cognitive ability are not primarily designed to measure, and the behavioral expression of which is considered useful" (p. 3). This definition overlaps with those proposed by Kyllonen (2012, pp. 7–8), Kautz et al. (2014, p. 2), and Duckworth and Yeager (2015, p. 239), suggesting a comprehensive scope of applicable constructs, such as personality traits, social skills, motivation, teamwork, and leadership skills, among others. However, it is worth noting that the line between cognitive and noncognitive constructs may be blurry (e.g., Duckworth & Yeager, 2015; Kell, 2018): Many constructs characterized as being largely noncognitive in nature actually contain cognitive elements, as all rely on the use of mental processes.

Noncognitive constructs are important predictors of a variety of workplace and economic outcomes (Barrick & Mount, 1991; Lindqvist & Vestman, 2011) and explain meaningful variability even when cognitive ability is taken into account (Schmidt & Hunter, 1998). In these contexts, noncognitive constructs are often referred to as 21st century skills or soft skills (e.g., Heckman & Kautz, 2012). Despite the importance of these constructs, employers in today's economic climate perceive a widening gap between the noncognitive constructs they expect prospective employees to possess and the level of skill actually exhibited by job candidates (Capelli, 2012; Society of Human Resource Management, 2019). Although cognitive ability remains largely stable over time and tends to be somewhat fixed (Jensen, 1998), noncognitive constructs are thought to be more malleable (Aguinis & Kraiger, 2009; Heckman & Kautz, 2012). These factors combine to generate great interest in workplace domains (e.g., Heckman & Rubinstein, 2001) in exploring the extent to which noncognitive constructs change through intervention. In 2018, organizations in the United States spent $87.6 billion on

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Table 1 Noncognitive Construct Definitions

Construct	Definition
Personality	Includes the Big Five, a dominant typology of personality traits including agreeableness, openness to experience, conscientiousness, extraversion, and emotional stability, along with personality models and traits that typically predate the Big Five
Social skills	Broad set of interpersonal skills that facilitate interaction with others
Communication	The ability to use both oral and written messages perceived as appropriate and effective in workplace settings
Leadership	The ability to persuade followers to support and execute solutions
Teamwork	Interrelated set of thoughts, behaviors, and feelings needed for a team to function as a unit
Attitudes	Internal state that influences an individual's choice of personal action
Self-concept	The manner in which individuals perceive and evaluate themselves
Emotion	Encompasses emotional state, emotional regulation, positive and negative affect, and empathy
Motivation	Intrinsic and extrinsic forces that impact work-related behavior in terms of form, direction, intensity, and duration

interventions to foster employee learning and development (Freifeld, 2018), further underscoring the need for research in this area.

In this review, using the definition of noncognitive constructs provided by Klieger et al. (2015), we systematically examine research focusing on the malleability of interpersonal skills and intrapersonal skills[1] relevant to workplace success and the mechanisms through which these constructs change (see Table 1). We focus on social skills, communication skills, leadership, and teamwork as part of our review of interpersonal skills. We consider intrapersonal skills to include personality traits, attitudes, self-concept, emotion, and motivation. Although several comprehensive and informative reviews of the workplace training literature exist (e.g., Aguinis & Kraiger, 2009; Baldwin & Ford, 1988; Bell et al., 2017; Blume et al., 2010), the organization and foci of these prior reviews differ from our approach. Prior reviews have examined training practices more generally, targeting aspects of approaches or methodologies rather than focusing on the development of particular constructs (e.g., Aguinis & Kraiger, 2009; Baldwin & Ford, 1988; Bell et al., 2017; Blume et al., 2010). Other reviews have concentrated on the enrichment of constructs that could be considered mainly cognitive (e.g., Scott et al., 2004; Shipstead et al., 2012) or primarily on job-specific skills (e.g., Salas et al., 2006; Weaver et al., 2010). We largely draw on meta-analyses and reviews conducted in a diverse constellation of fields to provide a comprehensive review of the malleability of noncognitive constructs.

We should also clarify our use of the term *malleability*. We use this term to refer to longitudinal change in constructs resulting from deliberate intervention. This definition aligns with our goal of summarizing research relevant to employers' explicit intervention efforts in service of improving workplace-relevant noncognitive constructs. Rather than direct improvements in construct scores, employers may be more interested in facilitating various desirable workplace outcomes such as increases in productivity, profits, employee retention, and employee satisfaction, among others. Regardless, because this research is intended to inform overt training and development efforts, we argue that research observing noncognitive constructs' longitudinal change in the absence of intervention (e.g., Viswesvaran & Ones, 2000) or in response to natural life events (e.g., Bleidorn et al., 2018) is not relevant. Moreover, these naturalistic studies should not be viewed as support for these constructs' amenability to effortful intervention. On the contrary, it is possible that these results highlight innate maturational processes or environmental factors that deliberate interventions must strive to overcome (see Briley & Tucker-Drob, 2014). Instead, the most significant conclusion that may be drawn from longitudinal studies that exclude effortful interventions is that they emphasize the value of non-intervention control groups in the study of deliberate interventions.

Our review aims to answer the following research questions (RQs):

1. To what extent do workplace-relevant noncognitive constructs change as a result of intervention?
2. What are the mechanisms that effectively drive change?

We organize the existing literature on the malleability of various noncognitive constructs into two broad sections—interpersonal and intrapersonal skills—within which we present evidence and evaluate research addressing each of the two RQs. We conclude each section by providing a synthesis of the literature and recommendations for future research.

We include articles within a noncognitive construct section if the malleability of that construct was examined in the article, regardless of whether the construct was a specific focus of the intervention. We conclude by noting the limitations associated with our study and identifying viable directions for future research.

Methods

Literature Search

The goal of this study was to evaluate meta-analyses and narrative reviews relevant to our RQs. This type of evidence was selected because of its well-documented advantages over primary studies, which has been argued elsewhere (e.g., Card, 2012). To be as inclusive as possible, we used Google Scholar as our primary search engine. A Boolean search strategy combining three sets of search terms (Figure 2) was used. First, a set of noncognitive construct terms (e.g., *Big Five*, *leadership*) was used to define the construct of interest. Second, various dynamic process terms (e.g., *development*, *training*) were entered to identify articles discussing the malleability of these noncognitive constructs that might be transportable to the workplace. Finally, the terms *meta-analysis* and *review* were entered separately. For example, a full search string was "*Big Five"* + development + "meta-analysis." Each possible combination of the three sets of search terms was used. It is worth noting that our list of search terms may not have been exhaustive. No publication date restrictions were imposed on the search, which ended in February 2017.

Despite efforts to narrow the focus of the search using a Boolean strategy, an overwhelming amount of literature was identified. For example, the string *personality* + *training* + *meta-analysis* returned 1,100,000 results. Therefore, searches within each string were terminated after reaching (a) 30 consecutive results that were either irrelevant or already captured in another search or (b) the first 200 results, whichever occurred first. Using the default method of sorting results by relevance provided a balance of capturing a large number of the most pertinent articles while limiting the search to a manageable volume. Finally, this was augmented by a partial backward snowball search, in which the reference sections of the articles identified through the initial search are reviewed for additional articles.

Inclusion Criteria

Basic inclusion criteria required that the article must be written in English; be published in a book, dissertation, or peer-reviewed journal article; and consist of a meta-analysis or narrative review, or a relevant reply article to one of these meta-analyses or reviews. Relevance criteria required that the noncognitive constructs, participants, interventions, or outcomes included in the article could be reasonably expected to translate to the workplace. Methodological criteria required that the article evaluate effortful changes in the noncognitive construct using a longitudinal or experimental design. Therefore, meta-analyses and reviews focusing on the predictive validity of noncognitive constructs but not the effortful malleability of these constructs (e.g., Barrick & Mount, 1991) were excluded. Similarly, meta-analyses and reviews examining longitudinal stability and change of noncognitive constructs in the absence of intervention (e.g., Viswesvaran & Ones, 2000) or in response to natural life events (e.g., Bleidorn et al., 2018) were excluded. Furthermore, noncognitive construct change must be measured at the level of the individual participant as opposed to individuals who were not the target of the intervention.

Screening Process

Articles were screened by the three authors in two phases. First, each article title and abstract were reviewed to ensure they met our inclusion criteria. Next, the full text of the article was reviewed for the same criteria. Prior to each phase, 10 calibration articles were selected for each of the three authors to examine independently. Disagreements regarding the eligibility of these articles were resolved by discussion. The remaining articles were divided among the three authors. At the full-text screening stage, if a primary reviewer rejected an article, a second reviewer independently reviewed the article to confirm or reject this decision. If the secondary reviewer disagreed with the primary reviewer, the third reviewer determined the article's eligibility. Of the rejected articles, exact agreement between the first two reviewers was 88.5%.

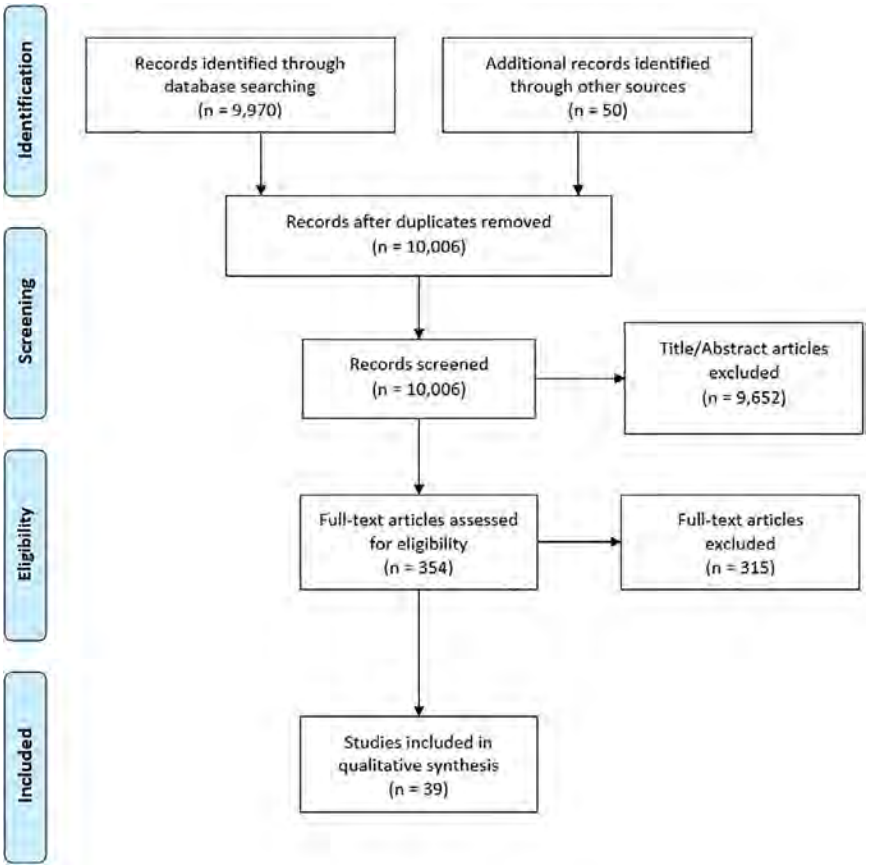

Figure 1 PRISMA diagram of literature search results.

Screening Results

After removing duplicates, 10,006 articles were identified. Of these, 354 unique articles passed the initial title and abstract screening phase, with 39 articles passing the final full-text screening phase (Figure 1; Moher et al., 2009). Common rationales for rejections included low relevance to the workforce (e.g., clinical interventions; Roberts, Hill, & Davis, 2017), failing to provide a meta-analysis or review, or a lack of discussion about the malleability of the construct(s). It should be noted that in some cases a source article pertained to more than one noncognitive construct. Publication dates ranged from 1941 to 2017, with the majority published after 2000. Meta-analytic effect sizes indexing construct malleability as a result of intervention are displayed in Table 2.

Results: Quantifying Noncognitive Construct Change

Before describing specific noncognitive construct malleability research, it is necessary to clarify the means by which changes are evaluated. Rank-order consistency and mean-level differences are the two approaches used most often. Rank-order consistency (or rank-order stability) typically involves test – retest correlations between a group's noncognitive scores from an initial assessment with that same group's scores at a subsequent assessment, following a significant period of time (e.g., 1 year later). These results summarize the longitudinal stability of individuals' rank ordering on the construct of interest, such as whether the most extraverted individuals at Time 1 remain the most extraverted at Time 2, for instance. Alternatively, mean-level differences compare mean noncognitive assessment scores (a) either within the same group prior to and following an intervention, (b) postintervention scores between two groups such as an intervention and control group, or (c) pre-postintervention differences between two groups. Rank-order consistency and mean-level change may be considered complementary methods: Rank-order consistency does not evaluate the degree to which the entire sample's level of the noncognitive construct in question has changed over time, whereas mean-level changes may obscure

Term 1: Noncognitive construct		Term 2: Dynamic process	Term 3: Article type
21st century skills	Leadership	Change	Meta-analysis
Affect	Life skills	Development	Review
Attitudes	Machiavellianism	Intervention	
Beliefs	Mood	Training	
Big Five	Morals	Treatment	
Character	Motivation		
Collaboration	Narcissism		
Communication	Noncognitive skills		
Cooperation	People skills		
Dark Triad	Personality		
Disposition	Psychopathy		
Emotion	Psychosocial skills		
Esteem	Social axioms		
Ethic	Social cognition		
Five-factor Model	Social skills		
Grit	Soft skills		
Human capital	Teamwork		
Integrity	Temperament		
Interests	Trait		
Interpersonal skills	Values		

Figure 2 Literature Review Search Terms.

more nuanced results such as stability differences across subgroups. In noncognitive construct research, rank-order methods tend to be used in studies of naturally occurring change, whereas mean-level differences are more common in effortful change research. The majority of meta-analyses and reviews we describe used one of these two methods to evaluate effortful longitudinal malleability (Table 2). These effect sizes are typically interpreted using traditional effect size guidelines (i.e., Cohen, 1988).

Results: Interpersonal Skills

Social Skills

RQ1: Malleability

Cheraghi-Sohi and Bower's (2008) review of patient feedback on physicians' social skills found limited evidence that social skills can be improved through the interventions examined in their review. Conversely, separate meta-analyses have reported medium to large effect size improvements in social skills following organizational training (Arthur Jr. et al., 2003) or social skills training (Klein, 2009). Only six studies focused on social skills more broadly (see Table 2).

RQ2: Mechanisms of Change

Several sources explored the efficacy of social skills interventions (e.g., Klein, 2009; Robbins et al., 2009). Klein (2009) suggested that social skills training can occur via traditional methods including motivating and goal setting, coaching and mentoring, feedback, behavioral modeling training (BMT), multimedia and simulation-based training, and team training. Pellegrino and Hilton's (2012) review of social skills argued that deeper learning, where a person can take what was learned in one situation and can apply it to new situations, allows trainees to effectively transfer what was learned to new situations. These authors argued that deep learning interventions should provide clear and discrete learning goals and should show how learning is expected to progress. Pellegrino and Hilton also advocated for the use of problem-based learning (PBL) approaches that present learners with extended problems that can engage learners while providing helpful feedback and guidance. They argued that PBL can encourage elaboration, questioning, and self-explanation.

Table 2 Noncognitive Construct Malleability Meta-Analyses

Article	k	*N*	Years of coverage	Sample description	Design (experimental vs. longitudinal)	Intervention	Primary outcome measure	Effect size	Conclusion
Social skills									
Arthur Jr. et al., 2003*	397	33,325	1960–2000	Working adults	Experimental	Organizational training focusing on interpersonal skills	Group mean differences (*d*)	$d = 0.62$	Interpersonal skills demonstrate a medium effect size change through intervention when assessed by the Learning and Behavioral criteria, and a large effect size when evaluated by the Results criterion
Klein, 2009*	141	NR	1971–2008	Adults	Longitudinal	Interpersonal skills training (includes mentoring, behavioral modeling, feedback, goal setting, team training, simulation-based training)	Pre-post and/or group mean differences (*r*)	$r = .47$	Interpersonal skills training is moderately effective in improving general interpersonal skills
Robbins et al., 2009*	107	11,183	1975–2009	College students	Experimental	Self-management, socialization, First-Year-Experience interventions	Corrected correlation coefficient	$\bar{\rho} = .15$	College interventions yielded a small effect on social control
Communication skills									
Barth & Lannen, 2011*	13	1,137	1988–2008	Healthcare professionals working with cancer patients	Experimental	Communication skills training courses in oncology	Group mean differences	$d = 0.50$	Communication skills demonstrated moderate improvement through intervention
Leadership skills									
Avolio et al., 2009*	132	11,552	NR	Adults	Experimental	Leadership training	Group mean differences (*d*)	$d = 0.67$	Leadership training interventions showed an overall medium effect size

Table 2 Continued

Article	k	*N*	Years of coverage	Sample description	Design (experimental vs. longitudinal)	Intervention	Primary outcome measure	Effect size	Conclusion
Lacerenza et al., 2017*	335	26,573	1951–2014	Adults	Experimental	Leadership training	Pre-post mean differences (*d*)	$d = 0.73$	Leadership training is more effective than previously thought
Teamwork skills									
Salas et al., 2007*	7	695	1975–2000	Non-clinical adults	Experimental	Team training	Pre-post and/or group mean differences ($\bar{r}$)	$\bar{r} = .29$	Team training was shown to have a small to moderate, positive effect on team functioning
Salas, Diaz Granados, Klein, et al., 2008*	45	2,650	1962–2008	Non-clinical adults	Experimental	Team training	Pre-post and/or group mean differences (ρ)	$\rho = .34$	Team training was shown to have a moderate, positive effect on team functioning
Personality									
Lipsey & Wilson, 1993	156	> 1,000,000	1979–1992	Clinical and non-clinical youth and adults	Experimental	Various mental health, I/O, and educational programs	Standardized mean difference	$d = 0.47$	Collapsed across a wide range of outcomes (including personality), interventions are generally effective in changing psychological characteristics
Vanhove et al., 2016	42	16,348	1979–2014	Workplace samples	Both	Workplace programs targeting psychosocial factors	Standardized mean differences (between- or within-groups)	$d = 0.21$	The effects of resilience-building programs are small and do not endure long-term
Klein et al., 2009*	20	1,562	1950–2007	Non-clinical adults	Experimental	Team-building	Pre-post and/or group mean differences ($\bar{r}$)	$\bar{r} = .31$	Team-building interventions can have a moderate effect on team outcomes, being more effective for process and affective outcomes, and least effective for cognitive outcomes

Table 2 Continued

Article	k	*N*	Years of coverage	Sample description	Design (experimental vs. longitudinal)	Intervention	Primary outcome measure	Effect size	Conclusion
Attitudes									
Bangert-Drowns, 1988	33	NR	1968–1986	Traditional elementary through college students	Experimental	School-based substance abuse education	Group differences (*d*)	$d = 0.34$[a]	Interventions can reduce pro-alcohol- and drug-related attitudes
Bruvold & Rundall, 1988	NR	NR	1972–1984	Students	Experimental	Alcohol and tobacco intervention programs	Group differences in pre-post changes (*d*)	NR[b]	Interventions can reduce pro-alcohol attitudes
Brecklin & Forde, 2001	45	NR	1861–1999	College students	Both	Rape education programs	Group differences or pre-post changes (*d*)	$d = 0.35$	Interventions can reduce rape-supportive attitudes
Anderson & Whiston, 2005	69	18,172	1978–2002	College students	Experimental	Sexual assault education programs	Group differences (*d*)	NR[b]	Interventions can reduce rape attitudes, rape-related attitudes, and behavioral intent, but not rape empathy
Barth & Lannen, 2011	13	1,137	1988–2008	Oncology health professionals	Experimental	Communication skills training	Group differences (*d*)	$d = 0.35$	Interventions can improve attitudes toward terminally ill patients, death, and dying
Kalinoski et al., 2013	65	8,465	1977–2011	High school students, college students, and employed adults	Both	Diversity training	Group differences (δ)	$\delta = 0.33$	Overall, diversity training had positive small-to-moderate effects on affective- (e.g., attitudes), cognitive-, and skill-based outcomes
Beelmann & Heinemann, 2014	81	NR	1958–2010	Youth (< 18 years)	Experimental	Programs designed to reduce prejudice or improve intergroup attitudes	Group differences (*d*)	$d = 0.30$	Interventions can reduce prejudice and improve intergroup attitudes toward other ethnic groups, disabled individuals, and the elderly

Table 2 Continued

Article	k	*N*	Years of coverage	Sample description	Design (experimental vs. longitudinal)	Intervention	Primary outcome measure	Effect size	Conclusion
Bezrukova et al., 2016	260	29,407	1972–2013	Adults	Both	Diversity training	Group differences (*g*)	$g = 0.38$	With some exceptions, diversity training generally leads to positive outcomes, though less pronounced for attitudinal change
Jones, 2016	10	592	1993–2012	Employed adults	Both	Workplace coaching	Group differences or pre-post changes (δ)	$\delta = 0.51$	Interventions can improve work attitudes
Self-concept									
Bowen & Neill, 2013	137	NR	1960–2012	At risk, clinical, or adjudicated	Longitudinal	Adventure therapy	Pre-post differences (Hedge's *g*)	$g = 0.43$	Adventure therapy can improve self-concept
Emotion									
Augustine & Hemenover, 2009	34	2,958	1887–2007	Non-clinical adults	Longitudinal	Affect repair strategies (Behavioral or cognitive; avoidance or engagement)	Pre-post mean differences	$d = 0.45$	Affect regulation interventions can increase positive affect and decrease negative affect
Delise et al., 2010	21	1,413	1985–2008	Military; civilian	Both	Team training	Pre-post and/or group mean differences	$d = 0.85$	Affect - in the context of team effectiveness — is amenable to change through intervention
Webb et al., 2012	190	> 13,655	1977–2010	Nonclinical; mostly adults	Both	Attentional deployment, cognitive change, or response modulation	Pre-post and/or group mean differences	NR[b]	The effectiveness of emotion regulation interventions depends on the specific strategy used
Sheeran et al., 2014	208	52,976	1953–2010	Adults, students, youth	Experimental	Practices that heighten risk appraisal	Group mean differences (*d*)	$d_+ = 0.70$	Both anticipatory (e.g., fear, worry) and anticipated emotions (e.g., regret, guilt) may be increased by small effect sizes by heightening risk appraisal

Table 2 Continued

Article	k	*N*	Years of coverage	Sample description	Design (experimental vs. longitudinal)	Intervention	Primary outcome measure	Effect size	Conclusion
Teding van Berkhout & Malouff, 2016	18	1,018	1973–2014	University students; health professionals; patients; other adults; youth	Experimental	Empathy training	Group mean differences	$g = 0.53$	Empathy, which includes affective components, can be improved through intervention
Motivation									
Rummel & Feinberg, 1988	45	NR	1971–1985	Youth, students, and adults	Experimental	Extrinsic rewards	Group mean differences (*d*)	$d = 0.33$	Extrinsic rewards had a detrimental effect on intrinsic motivation
Cameron & Pierce, 1994	96	NR	1971–1991	Youth and adults	Experimental	Rewards	Group mean differences (*d*)	$d = 0.14$	Results suggest that reward does not decrease intrinsic motivation
Deci et al., 1999	101	NR	1971–1997	Youth and college students	Experimental	Reward	Free-choice intrinsic motivation; Group mean differences (*d*)	$d = -0.24$	Extrinsic rewards significantly undermined free-choice intrinsic motivation. Positive feedback improved free-choice behavior
Sitzmann & Ely, 2011	430	90,380	1989–2011	Adults	Experimental	Self-regulatory processes (Goal level, persistence, effort, self-efficacy)	Learning	NR	Self-regulation enables individuals to monitor their goal-directed activities over time; goal level, persistence, and effort have small to medium effects on learning
Jones, 2016	17	2,267	1993–2012	Adults	Experimental	Coaching	Organizational outcomes; Pre-post and/or group mean differences (δ)	$\delta = 0.36$	Workplace coaching yields a small to moderate impact on effectiveness overall

Note. * = meta-analyses; NA = not applicable; NR = not reported. Articles listed in italics do not address longitudinal change of noncognitive skills but are otherwise relevant to our research questions.
[a] Effect size is reported for attitude outcomes; authors also reported effect sizes for knowledge ($d = 0.76$) and behavior outcomes ($d = 0.12$). [b] Authors reported multiple effect sizes based on factors such as intervention type, duration, and outcome, but no omnibus estimate.

Communication Skills

RQ1: Malleability

The majority of articles on communication skills we reviewed focused on health-care professionals (see Table 1). Communication between physicians and patients is a critical part of any treatment plan. However, physicians' poor communication skills represent a common complaint for patients and undermine health-care efficacy (Hulsman et al., 1999). In a review of 14 studies of communication training for physicians, Hulsman et al. (1999) reported mixed results. Positive effects of training occurred in fewer than half of the studies, and the studies that did report positive outcomes generally used suboptimal research designs (e.g., no control group). However, this study may not be representative of the field as a whole, as other systematic reviews and meta-analyses have reported improvements in communication skills through interventions such as team training (Gillespie et al., 2010), simulated patients and roleplays (as opposed to didactic training; Lane & Rollnick, 2007), and communication skills courses (Barth & Lannen, 2011).

RQ2: Mechanisms of Change

Lane and Rollnick (2007) stated in their review of the literature that the use of simulated patients, typically actors playing the role of a patient, is a widespread, effective practice in health-care communication training. Identical patients allow for standardization, experimentation with different communication skills, repeated training, and ongoing feedback. Drawbacks include expense, the need for actor selection and training, and the risk of simulated patients going off-script. Role-play with fellow trainees is also an effective communication training intervention, as it has benefits and drawbacks similar to simulated patients. Furthermore, both of these training methods were found to be more effective than didactic training methods, such as lectures. Gillespie et al.' (2010) found that communication skills training in the context of team training improved health outcomes for patients. Interventions studied included checklists, simulations, and debriefings. However, as this study did not compare the efficacy of various team training methods for communication, the relative merits of each are still unknown. Barth and Lannen (2011) examined the effects of communication skills training courses on communication behaviors, and found that courses lasting over 36 hours outperformed courses lasting less than 24 h, although this effect was small.

Leadership

RQ1: Malleability

The three meta-analyses reviewed here provide some evidence to suggest that leadership skills are indeed amenable to change through intervention (see Table 2). Avolio et al. (2009) concluded in their meta-analysis of the development of leadership skills that leadership training interventions yielded a medium effect size in producing positive change in leadership skills. A follow-up study (Avolio et al., 2010) showed that leadership interventions yielded a wide range of return on development investment, with some estimates as high as 200%. Moreover, data from a recent meta-analysis (Lacerenza et al., 2017) supported the notion that leadership training is largely effective, resulting in medium-to-large effect size improvement gaged by reactions, learning, transfer, and results criteria (i.e., Kirkpatrick, 1996).

RQ2: Mechanisms of Change

Avolio et al. (2009) found in their meta-analysis of leadership development efforts that there was largely no difference in effectiveness between interventions using leader training and development methods and those using a different method, such as a scenario, actor or role-play, or assigned leader. They also reported that more effective interventions were based on Pygmalion theory, which posits that when leaders hold positive, high expectations for those they are leading, performance improves. These interventions yielded larger effects than those based on traditional or newer leadership theories, such as charismatic or transformational leadership theories, which produced medium effects. Lacerenza et al.'s (2017) meta-analysis concluded that leadership interventions using practice-based methods were more effective than other delivery methods and that programs incorporating multiple methods of delivery (e.g., information-based, demonstration-based) are significantly more effective. Thus, they recommended that training programs use multiple delivery methods when possible, and only practice-based delivery when only one approach may be used.

Teamwork

RQ1: Malleability

The eight teamwork skills studies we reviewed concluded that these skills are amenable to change through organizational interventions (e.g., Gordon et al., 2012; Weaver et al., 2014; see Table 2. These studies typically incorporated outcomes closely related to or demonstrations of teamwork rather than direct changes in an assessment that conceptualized teamwork as a distinct noncognitive construct. For instance, Klein et al.'s (2009) meta-analysis found that team-building interventions had a more pronounced effect for process (e.g., communication, coordination) and affective outcomes (e.g., trust) than for cognitive outcomes (e.g., knowledge). McCulloch et al. (2011) reviewed teamwork interventions specific to health care and showed that team training programs can lead to improved staff attitudes and teamwork. However, the authors concluded the effectiveness of these programs on safety culture and patient outcomes is questionable, with few studies reporting outcomes. Studies that did explore outcomes found small effects.

RQ2: Mechanisms of Change

One field that has taken particular interest in the efficacy of teamwork skills interventions is health care (e.g., Buljac-Samardzic et al., 2010). Gordon et al. (2012) conducted a literature review of nontechnical skills interventions, including teamwork, leadership, and communication, in health-care settings. They noted that interventions primarily included simulations or role-plays, with an emphasis on debriefing, feedback, and simulation fidelity. McCulloch et al. (2011) reviewed teamwork interventions for health-care staff and noted that most interventions were based on crew resource management training adapted from the aviation field. They reported that literature in this area is lacking, as little detail is provided on the specific components of training and reporting of outcome data is poor, with little statistical data provided.

In Weaver et al.'s (2014) review examining health-care team training evaluations, the authors suggested team training primarily targets communication, situational awareness, leadership, and role clarity. Training methods included information-based methods, demonstration-based methods, and practice-based methods. Salas et al. (2008) qualitatively examined team training studies and concluded that training is effective in both aviation and health care. They stressed that hands-on learning via simulations is important and suggested that when high fidelity simulators are used, it is critical that they be realistic. They also state that behavior-based feedback is important, as it helps trainees determine where and how trainees can improve.

Several other studies expanded in scope to focus on the development of teamwork skills in other domains. Klein et al.'s (2009) meta-analysis showed that team building is intended to improve interpersonal relations and social interactions, achieve results, and accomplish tasks. Team-building interventions were moderately effective regardless of strategy, but the role-clarification component of interventions was slightly more effective than goal setting, interpersonal relations, or problem solving components. Salas et al. (2007) conducted a meta-analysis of the effects of three different components of team training on the effectiveness of team-training interventions. Results demonstrated that focusing on coordination and adaptation in team training resulted in greater improvements in team effectiveness as opposed to cross-training and team self-correction training.

Summary and Recommendations: Interpersonal Skills

To summarize, evidence has suggested interpersonal skills may be improved via intervention. Programs targeting these skills are generally as effective as those targeting cognitive skills (Aguinis & Kraiger, 2009). However, not all studies concluded that training interpersonal skills results in substantial improvement. Possible strategies for honing adult interpersonal skills include motivating and goal setting, coaching and mentoring, role-plays, feedback, BMT, multimedia and simulation-based training, team training, deep learning, and PBL.

Within the social skills domain, many studies reviewed have gathered support for the effectiveness of using interventions to improve specific constructs. Communication skills interventions include debriefings, checklists, simulations, instruction, modeling, skill practice, feedback, cognitive and experiential learning, simulated patients, and role-play exercises. Although based on only three sources examining leadership interventions, the consensus across all of the meta-analytic evidence reviewed is that leaders are likely made, not born. However, Avolio et al. (2009) reported there was largely no difference in the effectiveness of different intervention methods, with the exception that interventions

based on Pygmalion theory were more effective than those based on traditional or newer leadership theories. Overall, teamwork skills appear to be amenable to moderate change through intervention. Training methods for developing teamwork skills may take the form of simulations or role-plays, information-based methods, demonstration-based methods, practice-based methods, and small-group learning.

Results: Intrapersonal Skills

Personality

RQ1: Malleability

The Big Five is the most widely adopted theoretical model of personality traits (e.g., McCrae & Costa Jr., 2008). However, longitudinal Big Five research appears to be limited to those investigating naturalistic developmental changes (e.g., McCrae & John, 1992; Roberts et al., 2006) or clinical interventions (e.g., Roberts, Luo, et al., 2017; Lipsey & Wilson, 1993). An additional meta-analysis provided relevant outcomes for resilience, a personality construct that overlaps with the Big Five (e.g., Friborg et al., 2005; John & Srivastava, 1999), although they did not explicitly use Big Five terminology. Specifically, Vanhove et al. (2016) noted only small intervention effects for resilience in response to workplace programs targeting psychosocial factors. The authors also observed diminishing effects of these programs over time.

RQ2: Mechanisms of Change

Vanhove et al.'s (2016) meta-analysis of workplace resilience-building programs included a diverse array of primary prevention methods that focus on developing psychosocial traits such as self-efficacy and optimism. Some programs also incorporated secondary or tertiary methods such as stress management, physical fitness, or meditation. Of note, these interventions are often informed by resilience theory. A central tenet of this theory is that occupational groups exposed to greater levels of work-related stress and trauma will be most informative in identifying factors and mechanisms that facilitate resilience (see review by Vanhove et al., 2016). Importantly, workplace stress is not isolated to that caused by acute traumatic experiences, as repeated milder stressors may also result in cumulative psychological damage. However, the diversity of programs precluded examination of efficacy differences across intervention types.

Attitudes

RQ1: Malleability

We located 11 meta-analyses and narrative reviews examining the malleability of attitudes through deliberate intervention (see Table 2. These studies consistently demonstrated that interventions effectively reduce attitudes related to several types of counterproductive work behavior (CWB; e.g., Bangert-Drowns, 1988; Bezrukova et al., 2016; Brecklin & Forde, 2001; Kalinoski et al., 2013) and improve attitudes toward various positive job performance areas (Guskey, 1986; Jones, 2016; Lipsey & Wilson, 1993). When these changes are quantified, they are typically of small-to-moderate effect sizes (e.g., Barth & Lannen, 2011).

RQ2: Mechanisms of Change

Attitude interventions may be differentiated by their content or approach. In some instances, a wide variety of approaches exists for altering attitudes even within a specific context. Given that the attitude interventions we reviewed tended to be relevant to specific forms of CWB, they were delivered in various workplace settings. For example, Anderson and Whiston (2005) described four main categories of sexual assault education programs: informative programs discuss factual information, statistics, myths, facts, and consequences; empathy-focused interventions emphasize developing empathy for victims; socialization-focused programs examine gender-role stereotyping and societal influences; and risk-reducing interventions teach specific strategies to reduce victimization risk. For reducing rape attitudes and rape-related attitudes, empathy-focused interventions tended to be less effective than the other strategies, whereas program content was unassociated with reductions in behavioral intent. In improving intergroup attitudes (e.g., diversity and inclusion training),

Beelmann and Heinemann (2014) reported that social-cognitive training designed to promote empathy and perspective taking were most effective, whereas programs involving classification/social categorization (i.e., the cognitive process of classifying individuals based on demographics) or problem-solving skills were least effective. Otherwise, theoretical orientation (e.g., socialization/knowledge acquisition; social-cognitive development) did not impact effectiveness. Undesirable attitudes toward controlled or illegal substances have been demonstrated to be more effectively reduced when interventions employ relatively contemporary methods involving reinforcement, social norms, and developmental interventions than when simply focusing on more traditional information such as adverse health effects.

In other areas, attitude change may be observed when interventions are keenly designed for an intended context, or conversely when the attitudes in question were not the primary focus. For example, Jones (2016) concentrated on workplace coaching strategies in identifying effective methods for improving workplace attitudes. On the other hand, Barth and Lannen (2011) reported that communication skills training in health-care settings somewhat unintentionally improved attitudes toward terminally ill patients, death, and dying. A slightly different perspective was described by Guskey (1986), who used a process model to contend that improvements in teachers' attitudes toward classroom practices (e.g., curriculum changes) should first promote changes in their own classroom behaviors and in student learning outcomes rather than vice-versa. In other words, attitude change is most effective when viewed as a secondary, indirect target of intervention rather than a primary or direct one.

Self-Concept

RQ1: Malleability

We located three meta-analyses and reviews describing the effortful malleability of self-concept (see Table 2). These studies support the malleability of self-efficacy in the context of online learning (Hodges, 2008), general self-efficacy (Buljac-Samardzic et al., 2010), and general self-concept (e.g., self-control, self-efficacy; Bowen & Neill, 2013). Meta-analytic estimates of pre–post improvements in self-concept were in the small-to-moderate range (Bowen & Neill, 2013). However, these authors also noted that these changes were not maintained at long-term follow-up assessment. Unfortunately, Bowen and Neill (2013) did not describe the specific time period representing long-term effects.

RQ2: Mechanisms of Change

Strategies employed to promote effortful improvements in self-esteem and self-efficacy have varied. Successful approaches have included motivational messages (Hodges, 2008), goal-setting (Buljac-Samardzic et al., 2010), and adventure therapy (Bowen & Neill, 2013), which is an intervention focused on outdoor experiential learning that is not necessarily clinical in nature. Bowen and Neill (2013) also reported that alternative interventions to adventure therapy were not effective but did not elaborate on what types of programs were evaluated. Overall, these results suggested a diverse assortment of self-concept improvement tactics applicable to a variety of individuals, even when self-concept is not necessarily the primary target of interventions.

Emotion

RQ1: Malleability

Five articles we identified examined deliberate efforts to alter emotions or affect (see Table 2. The consensus from these reviews was that emotions are indeed malleable. These findings are consistent regardless of whether affect is defined broadly (Augustine & Hemenover, 2009; Webb et al., 2012) or using more specific examples such as empathy (Teding van Berkhout & Malouff, 2016), or in contexts such as team effectiveness (Delise et al., 2010) or risk appraisal (Sheeran et al., 2014).

RQ2: Mechanisms of Change

Regarding the specific programs used to engender deliberate affective change, our review revealed a diverse array of strategies. Augustine and Hemenover (2009) identified over 300 affect regulation or repair strategies in the literature. For their

analyses, they adopted Parkinson and Totterdell's (1999) four superordinate categories. In this model, the first distinction separates behavioral distractions—which involve some type of overt physical action such as walking away from a distressing situation—from cognitive actions, with examples including thinking about something other than the distressing situation. The second distinction categorizes strategies as engagement—in which one actively attends to the affective experience through actions such as reappraisal—versus avoidance, in which the individual behaviorally or cognitively removes themselves from the distressing situation. Augustine and Hemenover (2009) compared the efficacy of these four categories of interventions, 10 subordinate strategies that fall under these superordinate categories, and a separate taxonomy of specific strategies. The four superordinate categories demonstrated generally similar results (small-to-medium effect sizes), with behavioral strategies being slightly more effective.

Webb et al. (2012) categorized interventions using a process model of emotion regulation, in which strategies are defined based on whether they occur prior to the emotional experience (antecedent-focused) or afterward (response-focused; Gross & Thompson, 2007). One antecedent-focused example is attentional deployment, which includes distractions (i.e., either active or passive and either positive or neutral) and concentration (e.g., concentrating on feelings or on causes and implications). Cognitive change is another antecedent-focused example, with specific strategies varying based on their tendency to reappraise emotional responses, emotional stimuli, or through perspective taking. Finally, response-focused strategies involve response modulation through the suppression of the emotion-related expression, experience, or event. The authors reported that attentional deployment had no effect on emotional outcomes, response modulation approached a small effect, and cognitive change had a small-to-medium effect.

One unique example of emotion manipulation was examined by Sheeran et al. (2014). These authors studied the impact of interventions designed to increase negative affect (NA) associated with perceptions of risk or threat as strategies for decreasing various problematic behaviors. A common example includes health warnings designed to deter various self-destructive behaviors (e.g., smoking, poor diet, etc.). In this context, emotions are typically categorized based on whether they precede the target behavior (i.e., anticipatory emotions such as fear or worry) or follow it (i.e., anticipated emotions such as regret and guilt). Accordingly, the strategies designed to increase these emotions are described as heightening risk appraisal. The authors did not assess specific interventions separately, but noted that heightening risk appraisal increased anticipatory and anticipated emotions by moderate-to-large and small-to-moderate effect sizes, respectively.

The remaining reviews generally included more specific types of interventions. Perhaps the most pertinent class of interventions—empathy training—was examined by Teding van Berkhout and Malouff (2016). Empathy training tends to include elements of behavioral skills training (i.e., modeling, instructions, rehearsal, and feedback) designed to target the affective, cognitive, or behavioral components of empathy. Specific components include lectures, demonstrations, practice, games, and role-play. Interestingly, despite the fact that emotions were not necessarily the intended target of these interventions, each was effective in improving affect to varying degrees.

Motivation

RQ1: Malleability

The malleability of intrinsic motivation has been the source of intense debate. Cameron and Pierce (1994) argued in their controversial meta-analysis of the effects of extrinsic rewards on intrinsic motivation that extrinsic rewards do not decrease intrinsic motivation. They posited that verbal praise increases intrinsic motivation when motivation is assessed using free time and attitude measures. However, when individuals are given expected tangible rewards for completing a task, intrinsic motivation decreases when measured as free time performance in which a participant has the opportunity to work on a task when no rewards are being provided and when the presumption is that the experimenter is not monitoring the participant's activity. It is worth noting that both the number of effect sizes and size of the observed effects are small. As noted by Ryan and Deci (1996), the authors' aggregation of all reward categories into one global variable may mask significant effects at finer-grained categories. Deci et al. (1999, 2001) reiterated in later research that extrinsic rewards do indeed undermine intrinsic motivation and supported this claim with meta-analytic evidence (Deci et al., 1999; see also Rummel & Feinberg, 1988). Thus, Cameron and Pierce's findings warrant extreme caution.

RQ2: Mechanisms of Change

Jones (2016) presented an overview of the history and effectiveness of workplace coaching. Workplace coaching is described as learner-centered, collaborative, reflective, goal-focused instruction that can provide coachees with a tailored approach to understanding and applying work-based learning (Jones, 2016). According to Jones, coaching often focuses on challenges within the individual, between individuals, or a combination. Jones presented a meta-analysis of coaching effectiveness, showing that coaching has a moderately positive effect on motivation. Additionally, Sitzmann and Ely (2011) conducted a meta-analysis that suggested that goal setting results in greater learning when individuals are committed to reaching a specific goal, possess the requisite task knowledge, and are provided with feedback on their progress toward their goal or goals. They argued that specific and difficult goals that are attainable motivate performance.

Summary and Recommendations: Intrapersonal Skills

Our review suggests there is much to be learned about personality constructs' amenability to deliberate intervention. As mentioned, studies examining naturalistic, developmental changes (McCrae & John, 1992; Roberts et al., 2006) should not be interpreted as support for the Big Five's amenability to effortful intervention. However, this research may describe common life events that catalyze personality change, and may in turn inform effortful interventions. Similarly, research describing personality change in response to clinical intervention (e.g., Lipsey & Wilson, 1993) will likely possess debatable transportability to workplace settings. Further research is needed to determine if components of clinical interventions (e.g., practice exercises; self-reflection) may be relevant to workplace settings. Indeed, relevant intervention programs have already been proposed: Roberts, Luo, et al.'s (2017) Sociogenomic Trait Intervention Model (STIM) incorporates elements of behavioral activation theory, motivational theories, and developmental research as a potential strategy for stimulating changes in Big Five conscientiousness, for example. Furthermore, most workplace interventions tend to be delivered by trainers or coaches who do not hold a clinical certification. Lessons learned from successful workplace interventions targeting constructs beyond the Big Five may be useful. However, given that resilience interventions appear to possess relatively low efficacy, other noncognitive construct interventions may be more informative. Finally, even though the Big Five is considered the predominant model of personality constructs, other workplace-relevant personality constructs (e.g., those comprising the Dark Triad; Paulhus & Williams, 2002) would also benefit from further effortful malleability research.

Attitudes may be associated with virtually any topic, providing ample opportunities for empirical study. More specifically, the fact that we identified a large number of studies examining attitudes in the context of effortful change suggests that they are ideal targets for deliberate intervention. In particular, reviews involving workplace samples such as health-care professionals (Barth & Lannen, 2011), teachers (Guskey, 1986), or general workplace settings (Jones, 2016) reveal that attitudes are relevant for a variety of professions. Furthermore, the content of these interventions suggest that they are pertinent to both positive and negative job performance outcomes. The consensus among these reviews is that attitudes are amenable to change, albeit to a relatively small degree. At the same time, given that many attitudes appear to have an affective component (e.g., Beelmann & Heinemann, 2014), it is possible that emotion-focused interventions may have some value in promoting attitude change. It will also be beneficial to examine whether attitude interventions evoke behavioral change, which has been a challenge in some settings.

The fundamental importance of self-concept suggests that it is a highly salient target for workplace interventions, and there is indeed empirical evidence for its effectiveness in these settings (i.e., health-care professionals; Buljac-Samardzic et al., 2010). Nonetheless, given the variety of successful interventions, care must be taken to identify components that are particularly relevant to the workplace. For instance, at first glance, programs such as adventure therapy may appear irrelevant to workplace settings. However, several components of adventure therapy may be conducted indoors and are already employed in workplace interventions, including trust activities, initiative experiences, problem-solving scenarios, and team-based tasks (Bowen & Neill, 2013), suggesting a high degree of transportability. Additionally, the notion that program scope should match the intended content area of expertise — also referred to as the "bandwidth" issue — appears particularly relevant to self-efficacy (Hodges, 2008): interventions promoting engineering self-efficacy would be of little use to nursing professionals, for instance.

Emotion's omnipresence in daily life is reflected in the relative abundance of meta-analyses and reviews examining its malleability. This research benefits from a relatively high proportion of meta-analyses as opposed to narrative reviews, allowing for a more systematic and quantitative summary. Overall, affect appears to represent a category of noncognitive constructs susceptible to change, even when the intervention in question is not necessarily designed to target emotion per se. However, the sheer volume of interventions (see Augustine & Hemenover, 2009) may preclude the investigation of any one specific program. Nonetheless, another advantage of the interventions discussed in this section is that many of them appear transportable to the workplace, such as the distraction and engagement strategies examined by Augustine and Hemenover (2009). In fact, the emotion reviews we identified explicitly included occupations ranging from the military (Delise et al., 2010) to health care (Teding van Berkhout & Malouff, 2016). In turn, these interventions may be predominantly relevant to occupations involving frequent interpersonal interaction, with significant and frequent stressors, or where prosocial behavior is particularly valued. The results reported by Sheeran et al. (2014) suggested that increasing NA by heightening risk appraisal can be effective in reducing a variety of workplace-relevant undesirable behaviors. Although this practice is common, the ethics of this strategy may be debatable, as the experience for the individual may be negative. Furthermore, conflicting results within emotion research (Webb et al., 2012) suggest that increasing positive affect and decreasing NA are not necessarily opposite sides of the same coin and that future investigations clarifying this distinction would be welcomed.

A great deal of evidence suggests motivation in the context of discrete tasks can be improved or diminished using interventions. Interventions to improve motivation may include workplace coaching (Jones, 2016), goal setting (Sitzmann & Ely, 2011), praise, and rewards. Taken together, the findings of the studies reviewed suggest that extrinsic rewards tend to decrease intrinsic motivation (c.f. Cameron & Pierce, 1994).

Discussion

This review aimed to summarize and evaluate the current state of the literature on the intervention-based development of two broad categories of noncognitive constructs germane to workplace success: interpersonal and intrapersonal skills. Our multidisciplinary approach drew from meta-analyses and reviews spanning a diverse set of domains to provide a thorough review of the malleability of noncognitive constructs. More broadly, this review contributes to a growing interest in applied arenas in the promotion and development of noncognitive constructs that have been shown to be critical in supporting workplace success. Overall, recognizing a few exceptions and gaps in the literature, findings suggest optimism regarding the malleability of noncognitive constructs, and provide a preliminary blueprint for the optimal design, implementation, and evaluation of intervention programs.

RQ1: Noncognitive Construct Malleability

Among the appealing features of noncognitive constructs are that they predict workplace success to a degree similar to traditional factors such as cognitive skills yet are potentially more malleable (e.g., Roberts, Hill, & Davis, 2017; Roberts, Luo, et al., 2017). Our review supported the malleability of several distinct noncognitive constructs. The majority of meta-analytic estimates are of small to moderate effect sizes (e.g., $d \approx 0.20 - 0.50$), though occasionally interventions produce smaller or larger effects. For instance, communication skills, leadership skills, and emotion tend to consistently produce the strongest results supporting malleability, typically higher than Cohen's (1988) guideline for a moderate effect size (e.g., $d \approx \pm 0.50$). Conversely, effect sizes for personality, interpersonal skills, teamwork, attitudes, self-concept, and motivation tend to be smaller or more inconsistent. At the same time, the amount of meta-analytic research varies widely across constructs: We were only able to locate one relevant meta-analysis each for personality, communication skills, and self-concept, compared to 11 attitudes meta-analyses. Effortful malleability meta-analyses were absent altogether for several workplace-relevant constructs including the Big Five, Dark Triad, and emotional intelligence.

This trend suggests that research investigating the longitudinal dynamics of noncognitive constructs lags behind that of predictive validity research. After identifying noncognitive constructs based on their established links to job performance, malleability research serves a critical supplementary role in that it clarifies the subset of constructs with an evidence-based rationale for intervention. Moreover, this distinction provides essential practical guidance for employers: Constructs — noncognitive or otherwise — that are relatively fixed may be more relevant to personnel selection decisions, whereas training decisions may be informed by identifying constructs that are more malleable.

RQ2: Measurement and Mechanisms of Noncognitive Construct Change

The vast majority of malleability research quantified changes using rank-order stability or mean-level changes. As previously mentioned, these strategies are often considered complementary, recognizing their respective strengths and weaknesses. It is likely that the field would benefit from additional research involving more sophisticated statistical approaches, including latent variable modeling, growth curve analyses, structural continuity, ipsative continuity, and coherence (e.g., Caspi & Roberts, 2001; Curran et al., 2010; McArdle, 2009). Importantly, these methods permit the assessment of changes across more than two time points, which is a prerequisite for evaluating nonlinear longitudinal trends. Similarly, techniques such as mediation analyses, repeated measures ANOVA, and structural equation modeling provide opportunities to examine the causal impact of interventions (e.g., Cole & Maxwell, 2003; Pearl, 2009). These advances may coincide with increased usage of nontraditional noncognitive construct assessments, including forced-choice, game-based, and performance-based measures.

The diversity of disciplines included in our review gives way to an even more abundant array of strategies for effortful noncognitive construct change. The list of intervention approaches that have been used frequently enough to merit meta-analytic study or narrative review is extremely diverse. Examples include modeling, goal-setting, character education, sports participation, adventure therapy, role-playing, and reward-based programs. The specific exercises embedded within these programs both aids in explaining their efficacy and may inform the development of new programs. Additionally, it would be prudent to consider change catalysts observed in clinical interventions or naturalistic developmental, as a subset of these features may be transportable to workplace settings. However, appropriate parameters must be applied to ensure that interventions are appropriate for organizational trainers and coaches who do not have a clinical background and for employees who may engage with programs offered in a self-directed capacity.

Limitations and Future Directions

Our review is not without limitations, many of which surround our search strategy. First, we chose to review only source articles that could be characterized as meta-analyses or reviews. Consequently, very recent research and some primary studies may not have been captured by the selection of source material reviewed and would thus have been excluded from this investigation. It should also be noted that, although meta-analyses have been widely accepted as a vital tool for aggregating primary research, some authors remain skeptical of their value (e.g., Costa Jr. & McCrae, 2006). Second, the use of Google Scholar as opposed to more traditional databases such as PsycINFO as our primary search engine could be a potential limitation, based on the criticisms of some researchers (e.g., Boeker et al., 2013; Giustini & Boulos, 2013). Conversely, other authors have praised Google Scholar as "an invaluable tool for conducting literature research" (de Winter et al., 2014, p. 1562), and have supported it as the first and potentially sole search engine for reviews and meta-analyses (e.g., Gehanno et al., 2013). Nonetheless, we supplemented our Google Scholar search with various additional strategies.

Other limitations concern the nature of the meta-analyses and reviews that arose from our search. Most notably, there is a paucity of studies examining the malleability of some noncognitive constructs (e.g., leadership skills). Meta-analyses or systematic reviews for other constructs such as grit, emotional intelligence, interests, the Dark Triad of personality, and integrity were either too few to be included in our review or were not located in our search. This issue is exacerbated by the fact that there does not appear to be a universal, broadly accepted, exhaustive list of noncognitive constructs, given that this research is constantly expanding and that some variability exists regarding the definition of noncognitive (see Duckworth & Yeager, 2015; Heckman & Kautz, 2014; Kell, 2018). In other instances, outcomes were often measured at the group level rather than the individual participant level (e.g., teamwork). The expansion of research to specific occupational fields beyond the somewhat narrow subset located in our review (e.g., health care) would also be beneficial. Although we restricted our review to studies that focused on adult participants, studies for some constructs (e.g., emotion) included both youth and adults. Methodologically, another caveat worth noting concerns the inclusion of research examining rank-order consistency as opposed to mean-level change or vice-versa. Studies employed different approaches for examining change and both methods have drawbacks, especially compared to more contemporary analytical techniques and their associated methodological designs (e.g., Biesanz et al., 2003; McArdle, 2009). Moreover, even in studies that examine within-person change pre- and postintervention, natural regression

to the mean may be confounded with change as a result of intervention. Additionally, traditional effect size interpretation guidelines (e.g., Cohen, 1988) could be supplemented with data-driven benchmarks specifically derived from noncognitive construct malleability research, a strategy that has been examined in other research fields (e.g., e.g., Bosco et al., 2015; Gignac & Szodorai, 2016; Paterson et al., 2015). Each of these issues represents appropriate targets for future research.

Concluding Comments

Empirical support for the effortful malleability of workplace-relevant noncognitive constructs abounds, though many areas of research remain open. Meta-analyses and reviews provide data-driven guidance to stakeholders regarding effective selection and training of employees in terms of skills whose value is both recognized by employers and supported by research. At the same time, additional research regarding understudied noncognitive constructs, specific interventions, and underused methodologies and statistical approaches will undoubtedly advance the field. Ideally, this research will facilitate the development of a workforce whose technical expertise and cognitive skills are complemented by important noncognitive assets.

Note

1 Some components of personality may be considered interpersonal (e.g., Big Five Agreeableness), though we include them with their intrapersonal counterparts to maintain discussion of the Big Five within one self-contained section.

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