Psychological Assessment of Humility and Intellectual Humility (IH): A Review of the Literature[1]

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Abstract

The empirical study of dispositional humility as a facet of personality and of intellectual humility as an intellectual virtue has increased dramatically in just the last decade. This paper reviews the conceptualization of these constructs as well as the many assessment strategies designed to measure them. With particular focus on the practice of science and the collaborative work of labs, I conclude with the suggestion that the individualism of traditional virtue concepts elides the important role of social and communal forces in securing rationally-grounded knowledge. This would shift attention away from the virtuous character of the lone scientist to the virtuous practice of the lab group or collaborative work team that requires the collective and social display of intellectual humility as a communal norm, functioning as a regulative ideal. This calls for another type of assessment that assesses the social-relational dynamics of intellectual virtue within networks of collaborators in addition to assessment of intellectual virtue as a personal characteristic.

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I. Humility: Conception and Measurement

In 2010 an interdisciplinary meeting of theologians, philosophers, and psychologists was convened at Princeton University by the John Templeton Foundation to address the possibility of studying humility as an intellectual virtue. A consensus emerged that shared agreement on the conceptualization of intellectual humility was within reach, and that an empirical foundation was necessary to move the agenda. Indeed, it was concluded that "the absence of measurement instruments…will be the major impediment to scientific progress on humility" (Davis, Hook, & Hill, 2019, p. 52).

Here we review the emergence of the empirical study of humility and intellectual humility, and the way this research was influenced by competing definitional and methodological challenges. As we will see, the study of humility as a virtue preceded investigation of the more specific case of intellectual virtue and holds lessons for it. For example, a decade before the Princeton meeting Ashton and Lee (2001; Lee & Ashton, 2004) introduced the six-factor HEXACO model of personality structure that included Honesty-Humility (H) as a dimension (along with Emotionality, Extraversion/Emotionality, Agreeableness, Conscientiousness, and Openness to Experience). Around the same time Tangney (2000) articulated a theoretical conceptualization of humility as a target of personality research. The two approaches could not be more different.

Humility as a Personality Dimension

The six-dimensional HEXACO model takes a lexical approach to the study of personality structure (as does the Five Factor Model, or "Big 5" personality traits). Lexical studies analyze (using factor analysis) respondent ratings of familiar personality-descriptive trait adjectives of a given language (Ashton & Lee, 2005). The lexical approach assumes that personality characteristics are encoded in adjectival forms of a language, or, alternatively, that language picks out and identifies important dimensions of individual differences. "An important advantage of lexical investigations," according to Ashton, Lee and de Vries (2014), "is that the personality lexicon approximates the domain of subjectively important personality characteristics of a given language and thereby removes much of the potential for researcher bias in variable selection" (p. 140).

The Honesty-Humility (H) factor includes four facets: **Sincerity, Fairness, Greed Avoidance**, and **Modesty**, which are described further in Table 1. In general the H-factor is interpreted as the altruistic tendency to be fair and genuine, and preference for cooperation over exploitation in dealing with others (Ashton & Lee, 2007). Moreover, H has behavioral consequences. "Low H," according to Ashton and Lee (2008), "either alone or in combination with other personality dimensions, predicts a diverse array of harmful outcomes" (p. 1952), including workplace deviance, unethical business practices, sexual misconduct, need for power, materialism, among other outcomes.

Table 1. Facets of Honesty-Humility (H) in the HEXACO Model of Personality

Facet	Description
Sincerity	Tendency to be genuine in interpersonal relationships. High scorers are unwilling to manipulate others. Low scorers flatter others or pretend to like them to obtain favors.
Fairness	Tendency to avoid fraud and corruption. High scorers are unwilling to take advantage of others. Low scorers are willing to gain by cheating and stealing.
Greed Avoidance	Tendency to be uninterested in possessing lavish wealth, luxury, signs of high status. High scores are not especially motivated by monetary or social status considerations. Low scorers want to enjoy and display wealth and privilege.
Modesty	Tendency to be modest and unassuming. High scorers view themselves as ordinary people without claims to special treatment. Low scorers consider themselves superior and entitled to privilege.

Tangney's Analysis of Humility

There is, of course, very little in the lexical approach to humility that maps into epistemic concerns or tracks how the term is used in other literatures. The lack of face validity for H-items is an impediment to humility research, other good uses of HEXACO notwithstanding (Davis, Worthington & Hook, 2010).

In contrast to the lexical approach, which induces personality factors (via factor analysis) from participant ratings of trait adjectives, Tangney's (2000) conceptualization of humility was driven by philosophical, theological and psychological considerations, "top-down" as it were, from theory to definition. On her account humility involves

- Accurate perception of one's abilities, and is not, therefore, underestimation of ability. It is not defined completely by modesty. It is not low self-esteem.
- The ability to acknowledge one's imperfections, mistakes, and gaps in knowledge
- Being open to new ideas, contradictory information or advice
- Keeping one's abilities and accomplishments in perspective
- Less self-focus, a forgetting of the self, recognizing that one is part of the larger universe
- Appreciating the value of all things

Tangney (2000) noted several challenges to an empirical study of humility. For example, the inclusion of "forgetting the self" as a marker of humility would seem to complicate self-report of one's abilities, as would the very idea of touting one's humility (even narcissists do this). She had doubts about whether humility could be accurately assessed via self-report. A measure of humility with adequate discriminant validity would thus have to demonstrate that it is empirically distinct from low self-esteem, modesty, and narcissism.

Finally, Tangney distinguished two targets of humility assessment: *situational* and *dispositional*. Situational assessment would look for occasions that differentially summon or inhibit humility. This draws attention to the importance of situational specification of virtues, which later researchers will attempt to address by means of "state" measures of humility.

Dispositional assessment of humility is closer to the interests of personality psychology, and it opens several lines of research. Tangney nominates, for example, the study of how humility is linked to various outcomes such as well-being, interpersonal relationships and psychological health. Is there a cost to humility? Are humble individuals, for example, disadvantaged in the workplace or in competitive situations? Is it associated with development of other virtues? Is it more (or less) likely at different parts of the lifecourse? And how is it related to the quest for education and for new knowledge? This latter question moves the study of humility in the direction of intellectual humility.

Humility Assessment

The proliferation of new assessments of humility developed between 2004-2017 has been called a "embarrassment of riches" (McElroy-Heltzel, Davis, DeBlaere, Worthington & Hook, 2019), necessitating two recent critical reviews of the humility assessment (Porter et al., 2021; McElroy et al., 2019). We discuss them each in turn.

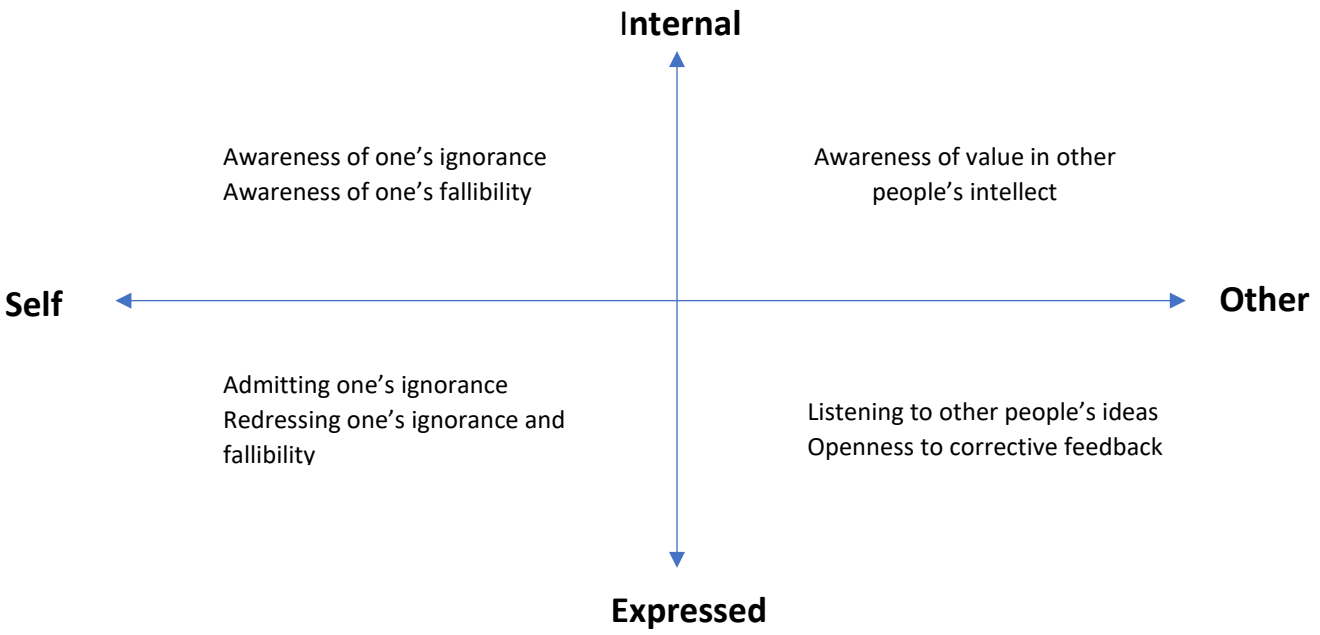
Porter and colleagues (2021). This interdisciplinary team identified 18 distinct definitions of intellectual humility in the psychological literature. They also proposed a new framework for classifying intellectual humility, and suggested three facets that should be expunged from the domain. For example, most assessments defined IH in terms of recognizing one's own intellectual limitations and a willingness to appreciate the intellectual strengths of others. This self-other distinction will be evident in their proposed classification scheme (see below). Keeping one's intellectual limitations in perspective, having a strong desire to learn, and a weak inclination for intellectual self-enhancement were also represented in psychological accounts.

These definitional preferences were reflected in the scale content of the 20 measures (including 16 questionnaires) located by the authors. For example, all of the assessments measured awareness of personal intellectual limitations, most (80%) included items that focused on the intellectual status of others. Topics much less frequently represented on scales (ranging from 20% -27% of scale items) included beliefs about disagreement ("I feel small when others disagree with me on topics that are close to one's heart'), a desire to learn, concerns about intellectual status, and exercising appropriate concern with intellectual limitations.

Porter and colleagues (2021) proposed a new framework for classifying facets of intellectual humility. Figure 1 is a graphic representation of their framework (see Porter et al., 2021, Figure 3). As Figure 1 illustrates, the facets of IH are divided into four quadrants defined by crossing two dimensions: Self-Other and Internal-Expressed. The Self-Other dimension distinguishes features of IH that are *self-focused* versus *other-focused,* depending on whose beliefs are being targeted.. The Internal-Expressed dimension describes facets of IH that are internal (e.g., thoughts, attitudes) versus those that are expressed behaviorally.

When the two dimensions are crossed the variety of IH characteristics can be located within one of four quadrants, as Figure 1 illustrates. The power of this framework is that it captures the main features of IH noted most consistently in the philosophical and psychological literature

Figure 1:Intellectual humility classification framework (Porter et al., 2021)



Both dimensions are required to render a robust conception of IH. As the authors put it,

> Recognition of one's intellectual fallibility and ignorance are necessary but not sufficient for intellectual humility because it would not be intellectually humble to realize that you are incorrect but act as though you were correct or knowledgeable. Yet, expressed awareness of one's intellectual limitations is insufficient because it would not be intellectually humble to realize that you are incorrect or ignorant…but dismiss other people's knowledge or feedback that could redress your ignorance" (no pagination)

Four aspects of IH sometimes noted in the philosophical or psychological literature did not find a place in the new framework. These included *beliefs and feelings about disagreement, drive to learn, concerns with personal intellectual status*, and *appropriate concern with intellectual limitations.*

McElroy-Heltzel and colleagues (2019). This critical review focused more the psychometric properties of 22 assessments of humility and IH. McElroy-Heltzel and colleagues (2019) grouped these measures into several categories: 10 survey measures of general humility, 6 survey measures of humility subdomains, 3 indirect measures of humility and 3 state measures of humility. The humility subdomains included assessments of intellectual humility, as well as spiritual and cultural humility. The indirect measures attempted to deflect respondent bias by avoiding questions that asked about one's own humility directly (e.g., using a version of the

implicit association test). The state measures attempt to capture situational variability in displays of humility.

Apart from whatever factor structure was reported by scale authors, McElroy-Heltzel and colleagues coded each scale for the presence of eight humility themes. These are described in Table 2 to give a sense of how McElroy-Heltzel and colleagues understand the content universe of humility.

Table 2. Content Domains in Humility Assessments (adapted from McElroy-Heltzel et al., 2019)

Humility Domain	Description
Openness/Lack of Superiority	Openminded with respect to other perspectives. Does not see self as perfect, all-knowing
Other-Oriented/Unselfish	Focus on others (vs self) in interpersonal interactions. Has qualities such as empathy, compassion, generosity. Gives others credit
Admit Mistakes/Is Teachable	Can recognize a mistake, flaw, or limitation within self. Willing to receive feedback and learn from it without being defensive
Interpersonal Modesty	Does not boast or brag or call attention to accomplishments. Shares credit fairly. Careful not to provoke envy or jealousy.
Accurate View of Self	Has desire to know the true self. Is self-aware about strengths and weaknesses
Global Humility	Scale includes items that refer explicitly to "humility"
Spiritual Humility	Recognizes one's place in relation to the Sacred. Recognizes the existence of something greater than the self. Scale includes items with spiritual content.
Regulate Need for Status	Able to regulate need for having and demonstrating social status. Not overly concerned with others recognizing their status or being impressed by them.

Across the 22 measures the themes most often represented in scale items was Openness/Lack of Superiority (31 items), Other-Oriented/Unselfish (24 items) and Admit Mistakes/Teachable (15 items). The themes least represented in scale items were Regulate Need for Status (5 items), Global Humility (6 items) and Spiritual Humility (6 items).

Not surprisingly, evidence for psychometric integrity (internal consistency, stable factor structure) and validity (criterion, convergent, construct validity) varied across measures. Table 3 summarizes our grouping of McElroy-Heltzel and colleagues' recommendations for use of the scales on the basis of the available evidence. Scales we list "above threshold" demonstrated adequate evidence of internal consistency and construct validity. Scales with "qualified support" show promising evidence of psychometric integrity and validity. Scales marked "below threshold" are of two kinds: scales whose track record is problematic, and those so recently developed that a track record is not completely available.

Taking Stock

Davis and colleagues (2019) recently identified challenges to an interdisciplinary study of intellectual humility, several of which are evident in our review to this point. One challenge concerns how to identify the core definitional features of humility. Another is how to think about

humility as a virtue, and whether humility (or any virtue) is best gauged as an intrapsychic quality, adhesive to persons, or as something correlative with interpersonal behaviors.

Table 3. Summary of Assessment Recommendations for Humility

Category	Scale	Domain	Source
Above Threshold	Expressed Humility Scale	General	Owens, Johnson & Mitchell (2013)
	Relational Humility Scale	General	Davis et al. (2011)
	Honesty-Humility (HEXACO)	General	Lee & Ashton (2004)
	Intellectual Humility Scale	Subdomain	McElroy et al., (2014)
Qualified Support	Humility/Modesty (VIA Inventory)	General	Park, Peterson & Seligman (2004)
	CEO Humility	General	Ou et al. (2004)
	Cultural Humility	Subdomain	Hook et al., (2013
	Comprehensive Intellectual Humility Scale	Subdomain	Krumrei-Mancuso & Rouse (2016)
	General Intellectual Humility Scale	Subdomain	Leary et al. (2017)
	Specific Intellectual Humility	Subdomain	Hoyle et al. (2016)
	Spiritual Humility Scale	Subdomain	Davis et al. (2010)
Below Threshold	Rosemead Humility Scale	General	Bollinger et al. (2006 Jankowski, Sandage & Hill (2013)
	Humility Semantic Differentials	General	Rowatt et al. (2006)
	Humility Inventory	General	Brown, Chopra & Schiraldi (2013)
	Healthy Humility Inventory	General	Quiros (2006)
	Humble Servant Leadership	Subdomain	van Dierendonck & Nuijten (2011)
	Dispositional Humility	Indirect	Landrum (2011)
	Implicit Association Test of Humility	Indirect	Rowatt et al. (2006)
	Humility subscale of Schwartz Values Survey	Indirect	Schwartz et al. (2012)
	Humility Related Feelings	State	Weidman, Cheng & Tracy (2016)
	State Humility	State	Kruse, Chancellor & Lyubomirsky (2017)
	Experiences of Humility	State	Davis et al. (2017)

This also raises a methodological challenge: if humility (or any virtue) is constitutive of persons, can it be measured directly in terms of self-reports, or are indirect methods called for. If humility has an interpersonal aspect, what methodological strategy is best suited to measure it? There is also the matter of how or whether to contextualize the assessment of humility, and whether to narrow the operational definition to account for domain specificity or situational variability (i.e., in terms of states rather than traits).

The Humility-Honesty dimension of HEXACO certainly raises a definitional challenge. None of its four facets align with philosophical conceptions of humility, with the possible exception of Modesty, but even here there is consensus among humility researchers that modesty is a presentational style that does not necessarily implicate dispositional humility (Tangney, 2000; Davis et al., 2010). Yet the HEXACO assessment of Humility yielded some of the strongest ("Above Threshold") evidence of reliability and validity.

Tangney's (2000) influential conceptualization of humility and the content domains evident in humility assessments (McElroy et al., 2019) reveal the breadth of concepts subsumed by humility. Although many of the concepts identified by these authors have clear relevance to intellectual humility (e.g., acknowledging imperfections and mistakes, accurate self-perception of strengths and weaknesses), others seem wider of the mark (e.g., appreciating the value of all things). The definitional breadth of humility also shows up when attempts are made to provide an alternative to self-report assessments.

For example, Davis and colleagues (2010) presented a model of *relational humility* that requires informants to make person-specific judgments of another's humility. This gets around the self-report problem of narcissists overreporting and humble individuals underreporting their humility. But the relational model on offer here requires informants to judge another on four qualities: 1) the person is other-oriented and not selfish; 2) the person expresses positive other-oriented emotions, such as compassion, empathy, sympathy, and love; 3) the person can regulate self-related emotions, such as pride, in socially acceptable ways; and 4) the person has an accurate view of self. Although a person described in this way is certainly admirable, it is by no means clear that humility is the first or only evaluative judgment these qualities evoke.

Finally, it is clear that humility research has wrestled with domain specificity and with the possibility that the manifestation of humility is moderated by situation and contextual factors. It is telling that the most successful domain-specific assessments of humility are of intellectual humility, a matter we take up below. It is also clear that there is more work to do with respect to indirect and state assessments of humility.

In the next section we focus on intellectual humility and its assessment. One distinctive feature of research on intellectual humility is how closely it aligns with virtue epistemology and philosophical conceptions of virtue. As we have seen, epistemic considerations are mostly absent from general psychological approaches to humility, and virtues are reduced to traits. That said, some of the methodological issues revealed in the review of general humility will surface again in the psychological study of intellectual humility: is it general or specific, unidimensional or multidimensional? Is intellectual humility personal or relational?

II. Intellectual Humility: Conception and Assessment

We noted that the study of intellectual virtue has profited from a close interdisciplinary dialogue between psychological disciplines (e.g., social-personality, educational and developmental psychology) and virtue epistemology. The central premise of virtue epistemology is that intellectual virtues, understood as individual excellences or cognitive dispositions, are

essential for addressing normative problems of knowledge and belief justification, among other epistemological issues (Greco & Turri, 2012).

Unlike traditional analytical epistemology where the chief concern is with epistemic evaluation of beliefs, and where issues of warrant and justification are primary, the chief concern of virtue epistemology is with epistemic evaluation of agents, where virtues and vices are primary considerations (Battaly, 2012). Virtue epistemologists typically see their work as parallel to the use of virtue theories in ethics. On this view, virtue theories in ethics evaluate an agent's actions in terms of moral virtues and vices while virtue theories in epistemology define or explain beliefs in terms of intellectual virtues and vices"

Of all the many intellectual virtues described in the philosophical literature intellectual humility has attracted the most sustained interest on the empirical side of moral psychology, with a profusion of new assessments reported in the last several years (Barrett, 2017). Indeed, intellectual humility has been deemed the cardinal intellectual virtue because without it none of the others (e.g., intellectual open-mindedness, courage, skepticism) could serve as a reliable guide in pursuit of epistemic goods or for resisting epistemic threats (Brown, 2019). Once again, a distinctive feature of current strategies for assessing intellectual humility is how deeply informed it is by important distinctions drawn in the philosophical literature, which highlights the value of interdisciplinary dialogue.

Hence attention is drawn to several features of IH. An intellectually humble person, for example, finds the right balance between intellectual grandiosity and servility, is open to new ideas, owns one's limitations, is not ego-threatened by disagreement or criticism, indeed, seeks out the evidentiary basis for one's beliefs with the expectation they could be wrong (Baehr, 2016; Whitcomb, Battaly, Baehr, & Howard-Snyder, 2015).

Moreover, the disposition to yield to convincing evidence or stronger argument draws attention to the interpersonal dimension of IH (Porter & Schumann, 2018; Leary, Diebels, Davisson, et al., 2017). Indeed, Pritchard (2020) argued that intellectual humility is fundamentally an *other*-regarding disposition "such as being open to points of view different from one's own, being willing to change one's mind if necessary, being willing to reflect on the soundness of one's beliefs if called upon to do so" (p. 403). This recalls, of course, the "other-directedness" quality attributed to humility but this time with an epistemic bent and purpose as opposed to the focus on other-directed emotions (e.g., empathy, compassion, love). It also recalls the Self-Other dimension in the classification framework reviewed earlier (Porter et al., 2021)

Assessments

Eight assessment tools for measuring intellectual humility have been developed within the last few years, and they are of two kinds: multidimensional (with multiple subscales) and unidimensional (a single general intellectual humility factor). We review each kind in turn.

Multidimensional Assessments. One of the first assessments of IH was attempted by Hopkins, Hoyle and Toner (2014) in a study that examined the connection between IH and reactions to opinions in support or opposed to religious beliefs. They conceptualized IH as a recognition of the fallibility of one's own beliefs and an openness to change when warranted, and

around this conceptualization developed a 23-item scale that resolved into four factors that were labeled: (1) *Awareness of fallibility of beliefs, (2) Discretion in asserting beliefs, (3) Comfort keeping beliefs private* and *(4) Respect for others' beliefs.* They showed that IH moderated reaction to opinions about religious beliefs. For example, individuals with strong religious beliefs reacted more strongly to opinions (both in support and opposition) about their religious beliefs, but this much less evident if they also were high in IH.

Hopkins et al. (2014) referred to their IH scale as "ad hoc" and "domain-specific." Subsequent attempts to measure IH will focus on more dispositional and domain-general accounts of IH, although the notion that IH might be manifested in different ways depending on the domain (e.g., science, religion, politics) should not be dismissed, particularly if individuals build identity convictions more firmly in one domain than others, and particularly if dispositional traits are amenable to contextual influence.

McElroy and colleagues (2014) developed a 16-item measure of intellectual humility that resolved into two factors: Intellectual Openness ("Is open to other ideas") and Intellectual Arrogance ("Has little patience for others' beliefs"). Like the Hopkins et al (2014) measure, this one was also developed to meet a religious domain-specific objective, in this case as a way for informants to appraise the intellectual humility of religious leaders.

The McElroy et al. (2014) scale was premised on a conception of the role of humility in group leadership contexts and on the relational humility model proposed by Davis et al. (2010). In the context of a group, for example, an intellectually humble leader exhibits some of the following qualities:

- They don't always have to be "right"
- They remain open to new ideas and sources of information
- They base their beliefs on sound evidence and adjust their beliefs accordingly
- They present evidence fairly

Moreover, intellectual humility in a leader is particularly important for those occasions when group projects involve competition or negotiation of ideas. The leader is not ego-invested, gives fair hearing, is willing to yield to better ideas, defers to better judgment.

The relational model of humility, as noted earlier, is concerned with person-specific judgments about target persons, and in the present case, about how individuals will be treated by leaders (Davis et al.,2010). Indeed, relational humility regulates and repairs social bonds (Davis et al., 2013) and provides the "social oil" that facilitates frictionless group functioning (McElroy et al., 2014, p. 20). Relational humility may be particularly required to navigate leader-subordinate relationships where there are opportunities for escalating conflict, power struggle, conflicted decision-making and questions about loyalty. The imbalance of power dynamics in relationships, say, between lab director and graduate student, pastor and parishioner, manager and subordinate, is a challenge to the practice of relational intellectual humility. Another challenging situation is when "negotiation of a meaningful decision, especially when individuals disagree with one another and are both emotionally invested in the outcome" (McElroy et al., 2014).

The scale developed here is designed as an informant report measure, following the personality judgment approach favored by relational humility model. The scale appears to be psychometrically sound, with a robust factor structure and promising evidence of construct validity. For example, the scale is related to openness, agreeableness, and to the strength of social bonds. In Study 4, intellectually humble participants who experienced major betrayal by a religious leader were more likely to be forgiving and to have higher conciliatory motivations, which supports the notion that intellectual humility may serve to repair social bonds (Davis et al. 2013). This scale was judged to be "Above Threshold" in the list summarized in Table 3.

Krumrei-Mancuso and Rouse (2016) developed the Comprehensive Intellectual Humility Scale (CIHS) to operationalize several features of IH as found in virtue epistemology. This includes IH as a non-defensive awareness of one's intellectual fallibility, an openness to revising one's beliefs, not being overconfident in asserting them, respecting the viewpoints of others, and not being threatened by criticism.

Note that this conceptualization includes both interpersonal and interpersonal aspects of IH. The CIHS consists of 22 items and four factors. The factors are labeled: *(1) Independence of intellect and ego; (2) Openness to revising one's viewpoint; (3) Respect for others' viewpoints;* and (*4) Lack of intellectual overconfidence*. Data can be analyzed at the factor level, although the four factors also load onto a general IH factor.

There is evidence in support of the convergent, construct, discriminant, and incremental validity of the CIHS (Krumrei-Mancuso & Rouse, 2016; Krumrei-Mancuso, 2017). Intellectual humility, as measured by the CIHS, is also associated with a host of prosocial outcomes. As Krumrei-Mancuso (2017, p. 13) put it, "Characteristics of intellectual humility such as recognizing one's cognitive limits, having a non-defensive stance towards one's beliefs, and respecting others' viewpoints may put one in a unique position to experience empathy and gratitude, and by extension, a host of prosocial values." Indeed, humility may play a large role in repairing social bonds (Davis et al., 2013) and motivating generosity (Exline & Hill, 2012). Although McElroy-Heltzer and colleagues (2019) were concerned about the magnitude of the correlation of this scale with social desirability, nonetheless they concluded that "this measure has promising initial evidence supporting its internal consistency and convergent validity" (p. 399).

At least two limitations of the CIHS were noted by Leary and colleagues (2017). First, only two of the four CIHS factors seemed to map onto strongly on core features of intellectual humility. Second, the four factors contribute unevenly to the overall general IH factor. For example, the factor of most interest to Leary and colleagues ("lack of intellectual overconfidence") showed the weakest contribution to the higher-order factor.

Recently Krumrei-Mancuso and colleagues (2020) derived an 8-item two-factor scale to examine how IH relates to knowledge acquisition. One subscale was called *Not a know it all*, the second was labeled *Intellectual openness*. Neither subscale predicted GPA in Study 2 of this report, although scoring high on the know-it-all facet predicted estimates of one's problem-

solving and cognitive ability (but not actual performance) in Study 1. This 8-item IH scale has seemingly given way to the CIHS developed by this research team.

Alfano and colleagues (2017) developed a multidimensional measure of intellectual humility that purports to capture the cognitive, behavioral, and motivational components of IH as articulated in virtue epistemology. Across two studies, and on the basis of exploratory and confirmatory factor analysis and IRT analysis, four core dimensions of intellectual humility were identified: **Open-mindedness** (versus Arrogance), **Intellectual Modesty** (versus Vanity), **Corrigibility** (versus Fragility), and **Intellectual Engagement** (versus Boredom). This four-factor structure of intellectual humility was replicated in two additional English-speaking and one German-speaking sample, attesting to its robust structure and cross-cultural generalizability. The four factors are described in Table 4.

Table 4. Factor names and qualitative descriptions of 4 core factors of IH (Alfano et al., 2017)

Factor Name	Description
Open-Mindedness (vs. Intellectual Arrogance)	Acknowledges limitations of one's knowledge especially relative to others; and a desire to gain knowledge irrespective of status
Intellectual Modesty (vs. Intellectual Vanity)	Low concern for how one's intellect is perceived and for one's intellectual reputation
Intellectual Engagement (vs. Boredom)	Motivated to investigate things one does not understand particularly when encountering ideas different from one's own
Corrigibility (vs. Intellectual Fragility)	Resilience in emotional response when confronted with challenges to one's knowledge or intellectual abilities

Alfano et al. (2017) also demonstrated a pattern of predictive and discriminant validity for their multidimensional intellectual humility scale. That is, the multidimensional IH scale was "negatively related to dispositions that are intuitively opposed to intellectual humility, while positively related to adjacent constructs while not being redundant with them" (p.21). In their Study 4, for example, the IH scale was evaluated with respect to personality dimensions assessed by the Questionnaire Big 6 (QB6, Thalmayer, Saucier & Eigenhuis, 2011; Thalmayer & Saucier, 2014). The QB6 includes: **Conscientiousness**, **Honesty/Propriety**, **Resiliency vs. Internalizing Negative Emotionality**, **Agreeableness** (Kindness and Even Temper), **Extraversion** (Gregarious and Positive Emotionality) and **Originality/Intellect** (which includes perceive talent, ability and intellectual interests). Positive correlations were predicted between IH-Open-Mindedness and BQ6-Honesty; between IH Corrigibility and BQ6-Resilience; and between IH-Engagement and BQ6-Originality/Intellect.

All three predictions were supported. The authors also anticipated that IH-Engagement would be positively related to grit while IH-Open-mindedness would counter-indicate grandiose trait narcissism and the tendency to overclaim knowledge. All of these predictions were confirmed. Moreover, the IH-Open-mindedness subscale uniquely predicted over half the variance that all six QB6 personality scales combine predicted in Over-claiming Bias, suggesting

that this subscale is tapping something conceptually independent from personality as measured by the QB6.

One other feature of this work deserves mention. Recall the model of relational maturity noted earlier that calls for person-specific judgments by informants about another person's humility (or any virtue). This has been called the personality judgment approach and it is supposed to circumvent the problem of self-report bias and the modesty effect (Davis et al., 2010). This was precisely what was attempted by Alfano and colleagues in their Study 3. They obtained self-reports of intellectual humility from 1185 participants, who also submitted contact information for up to five informants who know them well.

The informant sample (N = 107) responded to the same IH items as the self-report sample, but with the target person in mind ("she/he is…"). The IH-Modesty scales had the highest correlation between self-and-informant (r = . 47), followed by IH-Open-mindedness (r = .34), IH-Corrigibility (r = .29) and IH-Engagement (r = .28). The self-informant correlation for Open-mindedness is in the range found typically for other personality variables (Connolly, Kavanagh & Viswesvaran, 2007; Kenny & West, 1994; Klonsky, Oltmanns, & Turkheimer, 2002), and the somewhat lower correlations for the self-informant ratings for the other IH factors are in the ballpark and statistically significant.

Across five studies, then, Alfano and colleagues (2017) document promising evidence for their multidimensional assessment of intellectual humility, and we would include it in the "Qualified Support" list in Table 3. Moreover, to its credit, we are aware of just one other attempt (see McElroy et al. 2014) to establish informant ratings for scale development of intellectual humility.

However, there are at least two cautions. First, no evidence is provided to establish convergent validity for this scale. This is an urgent topic for future research. Second, it is not clear what to make of the fact that factor-and-subscale names often invoke intellectual virtues other than intellectual humility. Open-mindedness, for example, or Modesty, even Engagement could just as well stand as distinct intellectual virtues in their own right. This is a potential problem for all multidimensional scales, and we will see it again in the scale we take up next by Haggard and colleagues (2018).

Haggard and colleagues (2018) developed a IH scale that takes seriously Aristotle's doctrine of the mean. Previous scales are criticized for focusing on the negative pole of IH by specifying what it is not: not arrogance, not modesty, and not narcissism. Moreover, extant scales may have too much overlap with open-mindedness by their focus on willingness to change viewpoints. What is needed instead is a measure that taps both IH's deficiency ("intellectual arrogance") and its excess ("intellectual servility'). Haggard and colleagues take their guidance from conceptual work (Whitcomb et al, 2015) that defines IH as "owning one's intellectual limitations while being attentive to them." One should be cognizant of one's limitations (unlike intellectual arrogance) but not be consumed with them (intellectual servility).

To this end a 3-factor "Limitations-Owning Intellectual Humility Scale" was derived (with 12 items). One factor was called *Love of learning,* (e.g., "when I don't understand

something, I try hard to figure it out"), a second was labeled *Appropriate discomfort with limitations* ("I focus on intellectual weaknesses too much"), and the third factor was labeled *Owning intellectual limitations*. Four studies document the psychometric integrity and construct validity of the scale. Of course, the factor name "love of learning" points to a separate intellectual virtue (Roberts & Wood, 2007), and so the issue of "virtue overlap" in factor-naming is as much in evidence here as with open-mindedness, modesty, and engagement.

Unidimensional Scales. Unidimensional scales attempt to measure intellectual humility as a general, single factor construct. This obviates the issue of conflating factor names and virtues. Leary and colleagues (2017) developed a brief, six-item unidimensional Intellectual Humility Scale that was deemed, across four studies, to be reliable, unidimensional, and focused on the extent to which individuals belief that their views are fallible (e.g., "I question my own opinions, positions, and viewpoints because they could be wrong").

Several interesting observations were made about the factors that might promote high and low IH (on the basis of Study 1). For example, a strong basis for IH may require the trait of openness, a high degree of epistemic curiosity and need for cognition, an ability to tolerate ambiguity, and a lack of dogmatism. They concluded that people who are dispositionally high in IH will remain generally cognizant that their beliefs are fallible. Of course, for fallibilism to work in science, as a matter of science epistemology, requires that scientists show high degrees of IH. Hence, it is on this point where science epistemology and virtue epistemology intersect.

Porter and Schumann (2018) also developed a brief (9-item), unidimensional scale that focused on the *other-directedness* feature of IH as being open to the opposing view of others (e.g., "I like to compliment others on their intellectual strengths"). What is needed, in their view, is not simply an acknowledgment of one's own fallibility but also a willingness to see intellectual merit in the view of others.

Moreover, although IH may have dispositional features, it must also be the case that personality traits (like IH) can be differentially manifested and show change; and that manifestations of IH can differ with respect to specific beliefs and with respect to how personally relevant the information is. The authors made the interesting suggestion that *growth mindset* would reduce the motivation to unduly defend one's intellectual correctness. Indeed, in Study 4 making growth mindset salient boosted intellectual humility and openness to opposing views.

One attractive feature of Porter and Schumann's (2018) conceptualization is its acknowledgement that the manifestation of IH may vary depending on the degree to which may attitude or belief in question is personally relevant. One way to think about IH is in terms of the independence of "ego and intellect." The intellectually humble are not so ego-invested in a point of view that they are insensate to countervailing evidence, criticism or opposing views nor treat criticism as an assault upon the self. On this view, IH may work best in domains where identification process are not entrenched (or not entrenched in maladaptive ways).

Taking Stock

Table 5 is a summary of the various measures of intellectual humility covered in this review. The surfeit of intellectual humility scales certainly gives researchers many options for investigating the many ways that intellectual character is implicated in epistemic work of all kinds, including the practice of science. Three general conclusions are possible. First, the value of interdisciplinary dialogue between philosophers and social scientist is no better attested than in the collaborative work on the nature of intellectual humility. In our view the scales that seem most useful are those that are guided by the rigorous definitional analyses provided by virtue epistemologists.

Second, there is still more measurement work to do, some of it empirical, some of it conceptual. Scale development and the pursuit of construct validation is an open-ended process, one that is never completely finished. Even those measures that are deemed "Above Threshold" wrestle with unaccountable findings and anomaly, or else can be extended or tested with new questions and different populations. It is worth noting that all of these scales were developed almost concurrently within a short period of time. This means that studies of convergent validity among the various scales have rarely been attempted and it is urgently needed.

We noted earlier some of the conceptual work that is still required when we considered the frequent disjunction between how subscales are named in empirical factor analysis and how distinctive virtues are discussed in the philosophical literature. For example, not a few measures of intellectual humility have "open-mindedness" as a factor, but this is also treated philosophically as a separate intellectual virtue, a problem noted by Haggard and colleagues. Other-directedness is said to be a feature of humility but it is not always clear whether this refers to an emotional or epistemic stance towards the other. The Engagement subscale in the Alfano et al measure looks a lot like intellectual curiosity. Love of learning in the Limitations Owning Intellectual Virtues Scale is flagged as a separate intellectual virtue by Roberts and Wood (2007). Modesty shows up as a factor in some scales, but even Tangney (2000) had doubts about its necessary relation to humility (see also, Davis et al., 2016).

Should any of this matter? Perhaps the conflation of factors and virtues is simply an empirical reflection of the unity-of-virtues. At some point, however, there will be interest in empirical investigation of intellectual virtues other than intellectual humility, and the requirement to demonstrate discriminant validity in their evaluation will certainly pose interpretive challenges.

IH and the Practice of Science

The third observation concerns the implication of this literature for the practice of science and for science education. One tension noted by Tangney (2000) concerned the dispositional or situational features of virtue traits; and certainly there is interest in the contextual specification of humility and on domain specificity. We have seen the development of scales, for example, that focus on cultural and spiritual humility, and on its personal and relational aspects (Porter et al, 2021). This latter distinction opens up new questions for how intellectual virtues might play out in the practice of science.

Table 5. Summary of Intellectual Humility Assessment Options

Scale	Items	Source
Domain Specific Intellectual Humility	23	Hopkins, Hoyle & Toner (2014)
Awareness of fallibility of beliefs		
Discretion in asserting beliefs		
Careful keeping beliefs private		
Respect for others' beliefs		
Intellectual Humility Scale	16	McElroy et al. (2014)
Intellectual Openness		
Intellectual Arrogance		
Comprehensive Intellectual Humility Scale	22	Krumrei-Mancuso & Rouse (2016)
Independence of ego and intellect		
Openness to revising one's viewpoint		
Respect for others' viewpoints		
Lack of intellectual overconfidence		
Intellectual Humility Scale	8	Krumrei et al. (2020)
Not a know-it-all		
Intellectual openness		
Multidimensional Intellectual Humility Scale	23	Alfano et al., 2017
Open-mindedness (vs. Arrogance)		
Modesty (vs.Vanity)		
Engagement (vs. Boredom)		
Corrigibility (vs. Fragility)		
Limitations-Owning Intellectual Humility Scale	12	Haggard et al. (2018)
Love of learning		
Appropriate dissatisfaction with limitations		
Owning intellectual limitations		
Intellectual Humility Scale	6	Leary et al. (2017)
Intellectual Humility Scale	9	Porter & Schumann (2018)

It is indeed traditional to think of intellectual virtues (and all virtues) as qualities adhesive to persons. Virtues are located within individuals as part of their intellectual character. Virtues are constitutive of persons and yield distinctive marks of excellence on those who possess them. Moreover an uncontroversial case can be made that scientists should exhibit intellectual virtues and that science education should form them (Lapsley & Chaloner, 2020). Indeed, the Next Generation Science Standards insists that certain science virtues, understood as *habits of mind*, be made the target of instruction at the middle school level.

But the individualism of traditional virtue concepts is one-sided and ignores the important role of social and communal forces in securing rationally-grounded knowledge (Longino, 2002). Indeed, in a recent paper Alfano and Sullivan (in press) argue that the evaluative character of what they call *h-traits* (modesty, humility, intellectual humility, open-mindedness) "depends on the social networks in which agents find themselves" (p. 3), with the implication that h-traits "may fail to qualify as virtues" (p. 3) if it entrenches *ourside bias* at the expense of outgroups. Hence, "humbly conciliating about what one believes or accepts as epistemically rational with one's ingroup is liable to lead to even starker epistemic conflicts with outgroups" (p. 3).

What if the outgroups were members of other research labs, other research traditions, adherents of rival paradigms and communities of practice? It is still an open question how the social structure of inquiry interfaces with the dispositional qualities of inquirers (Burbeles, 2019). This is a particularly crucial question for the practice of science which is more typically conducted as part of lab teams and groups of Big Science collaborations. As such the thinking that goes on within the practice of science is not strictly a solitary affair but is a joint construction of dialogical interaction with scientific peers. As Kuhn (2015, p. 50) put it,

> as dialog demands the other's position be attended to, the other holds one's own position to the light. This scrutiny on the part of the other contributes to one's coming to recognize one's own position as contestable and thus need to be justified in a framework of alternatives and evidence.

What Kuhn (2015) is describing (without saying so) is how the discourse of peers "thinking together" requires intellectual virtue. But what her analysis has in mind is the benefit of dialogic tasks in K12 science education. Peer discourse, in her view, and as research shows, "comes to incorporate joint 'meta-talk' about standards and evidence" (p. 50). But there is no reason why dialogic discourse among working scientists should not also induce meta-talk of standards and evidence, and no reason why this should not also require intellectual virtue to get there.

But should this not shift our attention away somewhat from the virtuous character of the lone scientist to the virtuous practice of the lab group or collaborative team? Do lab teams have intellectual virtues as well as individuals and, if so, how is it constituted? Put differently, does the practice of science require the collective and social display of intellectual humility as a communal norm, functioning as a regulative ideal? If so, then yet another type of assessment strategy would seem to be necessary, one that assesses the social and relational dynamics of intellectual virtue within networks of collaborators in addition to assessment of intellectual humility as a personal characteristic.

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