# Synthetic Validity: Further Evidence of its Accuracy and Application

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THE SCIENCE OF PERSONALITY

## Session Abstract

Synthetic validation is a professionally accepted alternative validation method when traditional criterion-related validation is not possible. However, there remains resistance to using these non-traditional validation methods. This symposium provides new research on synthetic validity to show evidence of its accuracy compared to traditional methods and new examples of applications.

## Session Summary

Organizations benefit from selection methods that have been validated for the purpose of predicting performance. However, selection practitioners are often faced with inadequate data to conduct local validation studies (Hoffman & McPhail, 1998). Alternative validation methods have been established to address such validation challenges, including low statistical power due to small samples or a lack of performance data, which precludes conducting local validation. The *Principles for the Validation and Use of Personnel Selection Procedures* (SIOP, 2003) permit the use of alternative validation methods to make rational inferences about the validity of a test battery for selection purposes. Still, synthetic validation struggles to gain acceptance. Proponents of synthetic validity, however, argue its usefulness in a variety of settings (Johnson, Steel, Scherbaum, Hoffman, Jeanneret, & Foster, 2010), not just as a stand-in when local validation is impossible.

This symposium highlights the benefits of using synthetic validation. Our hope is that doing so will assuage practitioners' reluctance to adopt synthetic validation methods except in circumstances when local validation is impossible. This symposium provides evidence of the accuracy of synthetic validity methods and showcases new opportunities for its application.

The first two presentations explore the accuracy of synthetic validation methods compared to traditional criterion-related validation methods. There may be reluctance to accept that validity coefficients obtained through synthetic or other alternative methods are equivalent to those obtained through traditional validation methods. Johnson used the Job Requirements Matrix approach to synthetic validation while at the same time conducting traditional validation studies within large groups, allowing him to compare synthetic validity coefficients to traditional validity coefficients. Johnson's study provides evidence that synthetic validation techniques are as accurate as traditional criterion-related validation methods.

In a second examination of the accuracy of synthetic validity, Holland and Lambert evaluate the accuracy of synthetic validation research compared to traditional methods, but with a unique methodology. Archival job analysis data from 40 independent criterion-related validation studies were reanalyzed to conduct synthetic validation research and test transportability research, another alternative validation method. Therefore, criterion-related validation recommendations from the original 40 studies are compared to alternative validation recommendations. Holland

and Lambert discuss the situations in which cutoff scores, scale-level validity coefficients, and the prediction of on-the-job performance were the same for criterion-related approaches versus alternative validation approaches. Like Johnson, this presentation provides evidence of the accuracy of synthetically derived validation coefficients.

The next two papers discuss the application of synthetic validation methods to unique samples. In the first of these papers, a validated selection system of non-cognitive predictors was already in place to select for the job of arson investigator on a bomb squad. However, the selection system was extremely time intensive and did not address cognitive ability requirements. Using job component validity, Hoffman, Kowallis, and Tashima developed a cognitive ability test battery and cutoff score to lessen the number of candidates who qualified for the time-intensive selection system, thereby easing the burden on sergeants who served as raters. Their selection battery produced a high validity coefficient, even though the small incumbent sample size precluded conducting a traditional validation study. This paper illustrates using synthetic validity to prescreen qualified candidates for an existing selection assessment, thereby reducing time and expense.

Gerbec, Carmody, and Petronio used job component validity to validate a cognitive ability test battery for intelligence analysts. The U.S. Air Force has the challenge of selecting qualified applicants to fill the cognitively complex role of intelligence analysts. Extremely small sample sizes preclude a local validation study, so the authors used job component validity to recommend a selection test battery with a high validity coefficient that is a good predictor of performance in this role. Non-cognitive predictors were also investigated, although the sample size was too small to conduct a local validation of such predictors. Therefore, the authors used job analysis data collected to satisfy the requirements of job component validity and created rational linkages from job attributes to personality traits believed to support high performance in this job. Pilot testing on incumbent intelligence analysts supports using these supporting competencies for developmental purposes.

The final presentation highlights novel applications of synthetic validity to help practitioners make better informed selection and talent management decisions. Specifically, Nei describes three different ways synthetic validation can help drive applied research solutions, including off-the-shelf, in parallel with validity generalization studies, and in combination with local criterion validation studies. Nei also explains how the popularity of competency models and other job analysis data can be leveraged to increase the use of synthetic validity by practitioners.

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**Summary of Hogan's Contribution**
**Using Synthetic Validation to Drive Competency Solutions**

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Synthetic validation, while not a new or novel concept, still struggles to gain acceptance in both the research and applied domains. While I/O Psychologists have tried to generate momentum around synthetic validation (e.g., Johnson, Steel, Scherbaum, Hoffman, Jeanneret, & Foster, 2010), interest appears to be waning in recent years. Conversely, competency modelling continues to enjoy popularity because organizations can relate competencies to their strategy and goals while generating buy-in among various business units and stakeholders (Campion, Fink, Ruggeberg, Carr, Phillips, & Oldman, 2011).

At the heart of synthetic validation is job analysis. Job analysis techniques typically follow one of two approaches: job-oriented or worker-oriented. Job-oriented approaches focus on work elements or job performance tasks while worker-oriented approaches describe the individual characteristics involved in performing work tasks (Veres, Locklear, Sims, & Prewett, 1996). As such, worker-oriented approaches and competency modelling share some conceptual similarity as both help to describe the ideal characteristics necessary for successful job performance. One notable difference between job analysis and competency modelling is the time focus, with job analysis traditionally being concerned with the present performance and competency modelling focusing on the future (Stevens, 2013). Used together, they provide information for organizations to design selection systems that consider both current and future performance as defined in organization-specific terms.

For organizations to effectively use competency models, subject matter experts must link constructs across measures of predictors and theoretical performance domains using both rational and empirical evidence through the process of competency mapping (Nei, Nieminen, Del Campo, & Nichols, 2014). This process is often completed by organizations at a basic level. For example, an organization may understand the need to find individuals who demonstrate detail-oriented behavior. As a result, HR might administer a measure of Conscientiousness. While basic, this process aligns with the synthetic validation process, which involves establishing validity between job or worker components and assessments of the attributes needed for those components (Mossholder & Arvey, 1984). While synthetic validation may not be popular, organizations routinely use the same principles due to the popularity of competencies. In this presentation, I will highlight three approaches I/O Psychologists can use to leverage the popularity of competency models to enhance the usage of synthetic validity in organizations, with each case study building on methods of the previous.

## Current Study

***Study 1: Off-the-Shelf Competency Solution.*** Several notable incidents, including the 2010 Deepwater Horizon explosion, highlight the importance and necessity of safe behavior on the job. Organizations that lack time and resources to locally validate a selection assessment

to predict safety competencies may opt for an off-the-shelf solution. Research has found personality, as measured with Five-Factor Model (FFM) dimensions, is related to safety behaviors in general and within the work setting (e.g., Arthur & Graziano, 1996, Cellar, Nelson, & Yorke, 2000). Although the research on personality and safety has been insightful, Clarke and Robertson (2005) have argued for an examination of the relationships between personality and safety outcomes using personality facets instead of factors. To develop a facet-level safety report, researchers identified FFM personality facets based on the Hogan Personality Inventory (HPI; R. Hogan & J. Hogan, 2007) relating to six safety-related competencies (see Table 1) using synthetic validation. First, researchers identified studies in the Hogan archive (over 250 criterion-related validity studies conducted over the last 30 years) containing criterion data relating to each of the six safety competencies. Next, researchers identified HPI subscales associated with each criterion. Finally, researchers developed and examined the predictive validity of the new facet-level safety scales for predicting aligned competency ratings using meta-analysis (see Table 2). The result of this project is an off-the-shelf competency solution based on synthetic validation evidence that any organization can use to select and develop safe employees.

***Study 2: Validity Generalization Competency Solution.*** Organizations that are interested in a locally validated competency solution but still lack the time and resources for a comprehensive criterion-related validation study may opt to use a validity generalization technique. Building on the methods used in Study 1, the second study will demonstrate how synthetic validation was used alongside traditional validity generalization techniques (e.g., job family meta-analysis, transport validity) as well as local job analysis information (i.e., focus groups, job analysis surveys) to create a screening tool for airline pilots. By combining all gathered job analysis data and validation evidence (see Table 3 for examples), researchers developed an organizationally-specific, competency-based solution to screen airline pilots using the HPI, Hogan Development Survey (HDS; R. Hogan & J. Hogan, 2009), and the Motives, Values, Preferences Inventory (MVPI; J. Hogan & R. Hogan, 2010).

***Study 3: Criterion-Validated Competency Solution.*** Organizations that have the time and resources may opt to locally validate selection inventories to maximize alignment with a competency model. Study 3 will demonstrate how the techniques described in the first two studies were combined with local criterion-related evidence to develop a competency-based screening tool based on performance outcomes for general managers of a global hospitality company. In this study, researchers collected objective performance data, supervisor overall performance ratings, and supervisor competency ratings (see Table 4 for examples). Results of this study along with data gathered in the validity generalization process resulted in a locally validated and organizationally-specific competency solution that identifies talented employees who will contribute to the long-term success of the company.

Overall, these three studies will highlight how I/O Psychologists can leverage the popularity of competencies to build predictive solutions using synthetic validity approaches. Using these examples, I will discuss how synthetic validation processes are versatile in that they can be used as a stand-alone solution (off-the-shelf) or with other validation approaches (e.g., traditional validity generalization and local criterion validation techniques) to fit a variety of situations and needs. In this symposium, I will briefly review our methods and results for the various approaches, along with limitations of each. I will conclude with lessons we learned when completing each

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Table 1

*Safety Competencies and Descriptions*

| Competency | Description |
|---|---|
| Compliant | A person's tendency to follow rules. Poor performers ignore authority and company rules. Exceptional performers willingly follow rules and guidelines. |
| Strong | A person's ability to handle stress with confidence. Poor performers tend to panic under pressure and make mistakes. Exceptional performers are steady under pressure. |
| Cheerful | A person's ability to handle pressure without emotional outbursts. Poor performers easily lose their tempers and then make mistakes. Exceptional performers control their tempers. |
| Vigilant | A person's ability to stay focused when performing monotonous tasks. Poor performers are easily distracted and then make mistakes. Exceptional performers stay focused on the task at hand. |
| Cautious | A person's tendency to avoid risk. Poor performers tend to take unnecessary risks. Exceptional performers evaluate their options before making risky decisions. |
| Trainable | A person's tendency to respond favorably to training. Poor performers overestimate their competence and are hard to train. Exceptional performers listen to advice and like to learn. |

Table 2

*Meta-analysis Estimates of Safety Scales for Predicting Aligned Safety Competency Ratings*

| Safety Scale | *k* | *N* | $R_{sw}$ | $SD_{sw}$ | ρ | $SD_p$ | % Var | 80% CV | 95% CI |
|---|---|---|---|---|---|---|---|---|---|
| Compliant | 42 | 3,782 | .16 | .09 | .22 | .13 | 100 | .16 | .12 |
| Strong | 23 | 2,305 | .20 | .08 | .29 | .11 | 100 | .20 | .16 |
| Cheerful | 46 | 4,689 | .19 | .10 | .26 | .15 | 84 | .14 | .16 |
| Vigilant | 17 | 1,674 | .15 | .10 | .22 | .14 | 98 | .15 | .11 |
| Cautious | 32 | 3,814 | .16 | .09 | .23 | .12 | 100 | .16 | .13 |
| Trainable | 23 | 1,710 | .15 | .06 | .21 | .09 | 100 | .15 | .11 |

*Note.* Results corrected for criterion unreliability. k = Number of correlations; N = Sample size; Rsw = Sample-weighted mean correlation; SDsw = Sample-weighted standard deviation; ρ = Operational validity; SDp = Standard deviation of the corrected population correlation; % Var = Percent of variance accounted for by sampling error and artifact corrections; 80% CV = lower 10% boundary of 80% Credibility interval; 95% CI = lower 2.5% boundary of 95% Confidence interval.

Table 3

*Sample HPI and HDS Correlations with Airline Pilot Competencies*

| **Competency** | ***k*** | ***N*** | **ADJ** | **AMB** | **PRU** | **EXC** | **SKE** |
|---|---|---|---|---|---|---|---|
| Handling Stress | 74 (12) | 7,854 (1,043) | .29 | .12 | .15 | -.22 | -.12 |
| Positive Attitude | 62 (8) | 6,850 (512) | .28 | .10 | .17 | -.22 | -.13 |
| Team Work | 65 (5) | 7,310 (339) | .19 | .10 | .16 | -.25 | -.21 |
| Average | | | .18 | .10 | .17 | -.13 | -.13 |

*Note*. Results presented in the table are operational validities; K = number of HPI studies (HDS); N = number of HPI participants across K studies (HDS); ADJ = Adjustment; AMB = Ambition; PRU = Prudence; EXC = Excitable; SKE = Skeptical.

Table 4

*Sample Validity Results for HPI and HDS Algorithms and Competency Ratings*

| **Competency** | ***r*** | ***p*** |
|---|---|---|
| Customer Focus | .20** | .28** |
| Collaboration | .25** | .35** |
| Critical Thinking | .21** | .29** |
| Average | .19* | .26* |

*Note*. N = 183; * = p<.05; ** = p<.01; r = Observed Correlation; p = Correlation corrected for unreliability in the criterion.

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