Objective Personality Tests

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This chapter aims to provide an overview of current developments and research on so-called *Objective Personality Tests* (OPTs). After a short introductory overview of their history, the specifications and definitions of OPTs are discussed. We further present a system that aims to distinguish between three different categories of OPTs. We then outline the state of research on the psychometric properties of OPTs, especially with regard to findings on their reliability and validity. Finally, we make suggestions for future research and comment on the application of OPTs in practice.

A short overview of the history of OPTs in psychological assessment

The practice of obtaining information about personality from sources that go beyond self-reports by including samples of test takers' overt behavior has a history in psychological measurement as long as psychological testing itself. In fact, some initial concepts of OPTs were introduced long ago by the pioneer James McKeen Cattell as *mental tests*. In 1890, he proposed a series of 10 tests based on "experiment and measurement," thus aspiring to apply the exactness of the physical sciences. His battery contained heterogeneous tasks, including measures of personality. For example, the *Dynamometer Pressure Test* assessed a person's

maximum possible squeeze of the hand and was supposed to measure effort and volitional aspects beyond mere physiological power.

Decades later, documentation on psychological testing during the Second World War indicated the use of objective personality testing-like procedures: For example, tests of perceptual abilities were employed in the German military in order to tap aspects of "character and personality structure" (see Fitts, 1946). During that time, the Office of American Strategic Services (OSS) also reported that emotional stability and tolerance for frustration were assessed via observation in standardized problem solving tasks (OSS Assessment Staff, 1948).

The current concepts of OPTs can be traced back to a more recent history of Objective Personality Tests (OPTs) that began in the second half of the last century. These can be divided into two periods: Tests of the *first* generation were a result of Raymond Bernard Cattell's comprehensive theoretical approach that was based on the idea that a complete investigation of personality requires the inclusion of heterogeneous data based on three sources of information. In addition to self-reports (Q-Data) and biographical data (L-data; R. B. Cattell, 1946; R. B. Cattell & Kline, 1977) described tests (T-data) as one of the three sources of information in personality assessment. In order to allow for the assessment of T-data, Cattell and his collaborators developed the first generation of OPTs with the aim of designing *Cursive Miniature Situations* (R. B. Cattell, 1941, 1944) that simulate the behavioral expression of personality while meeting common standards of psychological tests. Within his prolific and decades-long period of test development, Cattell had already proposed no fewer than 500 tests by the mid-1960s. These were characterized by great variation with reference to materials and scoring methods (e.g., R. B. Cattell, 1968; Schuerger, 2008). In order to assess T-data, he included behavior samples, physical performance checks, and psychophysiological data as well as so-called projective techniques and creative design tasks.

At the beginning of his research, the variables he included were related to Eysenck's research on personality as well as Thurstone's work in the domain of intelligence and perceptual variables (see Hundleby, Pawlik, & Cattell, 1965; Schmidt, 2006). In his research, he also incorporated questionnaire-like tests that were supposed to be able to hide what was being measured. He investigated the relations between these measures as well as the common structure that supported them (R. B. Cattell, 1948). Efforts by Cattell and his colleagues also led to the publication of the well-known *Objective-Analytic Test Batteries* (R. B. Cattell & Schuerger, 1976, 1978); for an overview, see Kline and Cooper (1984) and Schuerger (2008).

Tests labeled as the *second* generation of OPTs emerged in the 1990s. They benefitted from the development of computer technologies that can provide highly flexible methods of item presentation and precise registration of a person's behavior (Ortner et al., 2007). Tests of the first generation were mostly designed in a "bottom-up" approach that aimed to provide additional information within a holistic approach and referred to personality factors after empirical analyses in line with Cattell's theoretical framework. Tests of the second generation, by contrast, addressed specific personality-related concepts, such as achievement motivation, reflexivity versus impulsivity, the ability to work under pressure, or vocational interests (for an overview, see Ortner et al., 2007). New technologies and opportunities in the measurement domain also allowed for broader varieties of task presentations, variables incorporated as scores, and interpretation. Examples include the use of tachistoscopically presented stimuli (e.g., Proyer, 2007; Proyer & Häusler, 2007), viewing times, reaction times (e.g., Proyer, 2007), reaction speed (Schmidt-Atzert, 2007), or other variables related to test performance (e.g., orientation of a figure in a maze; (Ortner, Kubinger, Schrott, Radinger, & Litzenberger, 2006). In line with these technical advances, contemporary OPTs were characterized by greater user-friendliness compared with earlier approaches. Furthermore, new OPTs overcame the criticism that examiners had to put forth enormous effort and face

certain challenges during the administration of at least some tests. This second generation of OPTs is prevalent across many European countries.

Specification and definitions of Objective Personality Tests

In recent decades, several names and definitions for the group of tests addressed as OPTs have been proposed. *Objective-Analytic Tests* (R. B. Cattell, 1955) or simply *Objective Tests* (e.g., R. B. Cattell, 1946) are well known terms and were suggested in a framework that also assigned standardized ability and achievement tests to this group. *Performance Tests of Personality* (Cronbach, 1970) was also suggested as a name. More recently, Kubinger (2009) introduced the term *Experiment-Based Assessment* for measures that infer characteristics of personal style from observable behavior on "experimentally varied performance tasks." However, the term "experiment" is not meant to imply that OPTs are *experiments* in a narrow sense since the measurement procedure has to fulfill common psychometric standards.

R. B. Cattell (1968) distinguished the following two forms of objectivity in order to clarify the meaning of "objective" in OPTs: In the domain of psychological assessment, this term is used to indicate whether the result obtained by a test has been influenced by external conditions such as the setting, testing environment, testing materials, and examiners (see Pawlik, 2006). Cattell (1968) introduced a second, new "higher degree of objectivity" to specify the characteristics of OPTs:

> Observations on personality made by measuring actual behavior in a miniature situation—a test. The person reacts to a standard stimulus situation, and his behavior is

> measured in ways of which he may not be aware and with interpretations of which he will certainly not be cognizant. (p. 165)

Cattell wrote about the test taker, "[...] even when he wished to, he cannot know himself objectively enough to give a true picture" (Cattell, 1968, p. 53). In line with this reasoning, OPTs were designed to eliminate distortion through poor self-knowledge or impression management by assessing observable behavior as opposed to the self-reported behavior or attitudes assessed by questionnaires. As an additional potential benefit of OPTs, Cattell stated that a dependence on features related to language is present to a lesser extent on OPTs compared with questionnaires. "Only when experimental measurement is made in terms of behavioral response on exactly reproducible test situations can one have confidence in that replication of results, in different countries" (Cattell & Warburton, 1967, p. 4). Yet, there are no known newer studies that have compared the cultural sensitivity of scores on OPTs with the sensitivity of scores derived from questionnaires.

The common feature of OPTs is therefore the principle of deducing characteristics related to personality from observable behavior on performance tasks or other highly standardized miniature situations (Cattell & Warburton, 1967). Persons' individual characteristics are inferred from their overt behavior in such a standardized setting that lacks face validity (see Cattell, 1968; Schmidt, 1975). This is done through the application of achievement-oriented tasks or particular scoring methods (see Cattell & Kline, 1977).[1]

[1]Taking the achievement-task-based definition into account, one could argue that Implicit Association Tests (IATs; Greenwald, McGhee, & Schwartz, 1998) and some other indirect measures presented in this volume may be representative of OPTs. IATs were developed to assess individual differences in the strength of associations between cognitive representations of at least two concepts (see Perugini, this volume). Although this method has primarily been designed to measure interindividual differences in attitudes toward objects (e.g., Banse, Seise, & Zerbes, 2001), there was also a rather quick emergence of IATs that allowed the assessment of attitudes toward the self (self-esteem) as well as the self-concept of personality, such as anxiety (e.g., Egloff & Schmukle, 2002; Greenwald & Farnham, 2000). Achievement on an IAT-like reaction-time task serving as an indicator of self-

In conclusion, definitions of OPTs postulate several features: OPTs deduce information about a person's characteristics by assessing their behavior in a highly standardized miniature situation. OPT scores are not based on self-estimation or self-ratings of the construct of interest. Furthermore, the aims of OPTs are masked and, compared to self-report measures, OPTs have in fact shown a lower susceptibility to the manipulation and distortion of information, including faking and self-deception (Elliot, Lawty-Jones, & Jackson, 1996; Ziegler, Schmidt-Atzert, Bühner, & Krumm, 2007).

Categories of Objective Personality Tests

As mentioned in the introduction, OPTs have been characterized by great variation from the very beginning (R. B. Cattell, 1968), and several attempts have been made to group these heterogeneous tests. Several decades ago, Hundleby (1973) proposed a categorization that differentiated between four groups of tests: (1) The assessment of *Expressive Movements* (e.g., characteristic movements of hand and body, allowing only a reduced assessment of very specific aspects of human personality); (2) *Simulated Real-Life* data (i.e., the assessment of behavior in situations that resemble a target situation as much as possible); (3) *Physiological Variables*; and (4) *Motor-Perceptual and Performance Tests* (including measures of

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esteem as one example (e.g., Rudolph, Schröder-Abé, Schütz, Gregg, & Sedikides, 2008) would fit the definition of OPTs given earlier. However, the IAT and other indirect measures that capture representations of the self are distinguished from OPTs in this chapter even if this distinction may not be very sharp: OPTs are defined as tests that do not address (implicit) representations but rather provide samples of realistic behavior. Information assessed by OPTs is not dependent on any mental representation, for example, the representation of the self as an achievement-motivated person (Pawlik, 2006), because OPTs directly assess the behavior associated with the construct of interest. Thus, objective and indirect tests will be viewed as different measurement approaches in this chapter.

preference, response styles, responses to interference when performing an assigned task, and responses to suggestion) with the last group including most of the tests during this time.

Although current and newly developed OPTs still display great variability in task concepts, materials, and scoring methods, contemporary OPTs do not represent as great a variety of approaches as proposed by Cattell (e.g., Projective Tests are considered to be distinct today). In the following section, we propose a categorization of OPTs in the light of current narrower developments and definitions.

1) *OPTs masked as achievement tasks*: In this category of tests, test takers are required to solve an achievement task as accurately and/or as quickly as possible without knowing what is actually being measured or how the instrument is being scored. As a characteristic of this group of tests, the task is not embedded in a simulated or imagined/suggested real-life context or real-life situation. Typically, test takers cannot distinguish these tests from classical (cognitive) performance tests. In most test concepts in this category, higher construct scores are associated with a more accurate or faster performance on the task. This indicates that an OPT-scoring procedure may even be independent from the task presented on the test itself. In earlier approaches, this was operationalized, for example, by asking participants to compare the lengths of 42 pairs of lines and to indicate whether (a) the one on the left or (b) the one on the right side is longer or whether (c) both are of equal length. The analysis is based on the number of comparisons made within a given time span (i.e., 30 s for Part I of the test). This is one of eight subtests for the measurement for *Exvia versus Invia* (i.e., T45 in R. B. Cattell & Schuerger, 1976, 1978).

The *Emotional Stroop Task* (e.g., Dawkins & Furnham, 1989) can be understood as an earlier example of such an OPT in this category. Test takers are instructed to name the colors in which words are printed, whereas the words vary in their relevance to potential emotional topics. The lower the interference of the emotional stimuli, the faster and more accurately the

colors will be named. Another example from this group is the *Objective Achievement Motivation Test* (OAT; (Schmidt-Atzert, 2007): Test takers are instructed to pass fields on the screen colored in either red or green. Fields are passed by quickly clicking on matching (red or green) buttons (see Figure 1). The number of fields passed in a given time serves as an indicator of achievement motivation. A further example is given by Subtest 1 of the computerized *Working Styles* battery (Kubinger & Ebenhöh, 1996). The test is based on the T62 test "Hesitancy" by Cattell and Warburton (1967). Test takers see two figures on the screen and are instructed to select the larger one; after a decision has been made, a new pair of figures appears on the screen. The figures differ by only about 10% of their total size but are rotated to different angles. The number of decisions made within a given time is interpreted as an indicator of reflexivity (or impulsivity).

Another computerized battery of six tests was designed to measure stress resistance, which occurs when performance is not impaired by typical occupational short-term stressors (BAcO; see Kubinger, 2009; Ortner, 2012; Ortner, Kubinger, et al., 2006). The tasks assess aspects of successful problem-solving behavior in (simulated) stressful situations. The "time pressure task" instructs test takers to assign letters to symbols according to a given coding scheme as quickly and accurately as possible by dragging and dropping. The time available for assigning letters displayed on the screen is gradually reduced in the second part of the test. The given time-per-task screen is displayed in the middle of the screen by a digital clock, which counts back to zero. The scores assess whether test takers increase or decrease their coding speed and accuracy (Ortner, Kubinger, et al., 2006). The potential confounding of achievement and personality components creates a challenge when the accuracy and speed scores are computed.

Some tests postulate only minor effects of ability on test scores as a result of item selection (e.g., very easy items) and/or exercise trials in order to minimize advancing certain

individuals due to preexisting experiences or ability (Schmidt-Atzert, 2007). Potential confounding can also be overcome by additionally assessing people's baseline performance, which can be included in item response theory models that are able to separate these aspects (e.g., Häusler, 2004).

2) *OPTs that aim to represent real-life simulations*: In this category of OPTs, test takers are required to solve a less or more complex task embedded in a real-life situation or setting. Tests of this kind have not been developed or presented as pure achievement tasks, although participants work toward such a goal. The trait or state measured is usually not made transparent; however, the particular behavior shown in this situation is evaluated as an indicator of the test takers' expression of a specific personality characteristic.

A group of tests that were published during the last few years assigned to this category are experimental games, including, for example, the *Balloon Analogue Risk Task* (BART; Lejuez et al., 2002), the *Betting Dice Test*, or *Roulette Test* (see both Rubio, Hernández, Zaldivar, Marquez, & Santacreu, 2010). All of these aim to measure constructs related to risk propensity by putting test takers into a gambling situation and scoring their behavior in the simulated environment. Test takers can maximize their gains by making less or more risky choices, where more risky choices are usually associated with higher gains. Another test that is aimed at assessing risk propensity is the Crossing the Street Test (Rubio et al., 2010; Santacreu, Rubio, & Hernández, 2006), which simulates a traffic situation. Test takers are instructed to navigate a pedestrian as quickly but also as safely as possible to reach the other side of the road through different traffic situations. Test takers are asked to make a decision about the position on the street from which a pedestrian should cross from one sidewalk to another. "Safer" positions are related to more walking effort, more time, and lower scores.

A series of OPTs allowing for the assessment of vocational interests based on so-called objective interest indices proposed by Cattell (R. B. Cattell, 1950; R. B. Cattell, 1957)

were developed by Proyer and were set together in the *Multidimensional Objective Interest Battery* (Proyer, 2006; Proyer & Häusler, 2008). OPT approaches in this domain have a long tradition (Fryer, 1931; Super & Roper, 1941). One of the subtests of the MOI (Distribution of money) asks participants to imagine having the responsibility to distribute €100,000 of their company's money to various organizations, clubs, other companies, or innovative project proposals. Test takers are informed that they have the final word in deciding who will receive the money. The concept is based on the assumption that decisions are based on personal interests—each of the organizations, clubs, companies, or innovative proposals is assigned to one of the six dimensions of vocational interest proposed by Holland (1997). A total score can be computed for money assigned to each of the six dimensions, and larger amounts of assigned money are indicators of greater interest in this domain.

A challenge for test development and the application of tests in this category lies in a stronger transparency (in comparison with other OPTs) that may also depend on the test administration context. If tests are, for example, employed within an occupational selection procedure, OPTs that are aimed at representing real-life situations may not elicit typical behavior but may be expected to produce socially desirable behavior. In line with more theoretical approaches, this would especially be the case if the OPTs in question activate more controlled than spontaneous behavior (see Schmitt, this volume). However, test concepts in this domain can still be scored in a way that is not transparent. For example, a test taker who is not familiar with Holland's classification scheme will not be able to correctly recognize or assign the organizations to the interest dimensions. On the other hand, a person applying for a job as a bus driver may be able to deduce from the aptitude assessment situation that a gambling task is being presented not just as a simple game but represents a relevant situation that is related to the vocational activity at hand. The questions of whether the measurement aim can be uncovered and the test performance can be influenced in a specific direction by the

test taker also seem to depend on the test situation itself. Furthermore, the question arises as to whether simulated situations better represent and predict real-life situations and behavior.

3) *Questionnaire-type OPTs that ask for evaluations or decisions*: In this category of OPTs, test takers are instructed to answer items that are similar to questionnaire items or to make other forms of evaluative decisions. Although these tests appear to exist in the twilight zone between objective tests and questionnaires, tests included as OPTs assess—unlike classical self-report questionnaires—different constructs than suggested by the item content; and therefore, they should also lack face validity.

Examples of such OPTs are given in Cattells' OA-TB (Cattell & Schuerger, 1976, 1978). For example, the *T239 test* (Decision speed on social problems) asks test takers to solve specific problems by suggesting a solution (e.g., "You are a mile away from the nearest station when the car breaks down. What would you do? If you know, make a checkmark"). Rather than the answer, the speed with which a decision is made is scored as a sign of assertiveness and confidence. A different example is the *T261 test* (Attainability of aims), which requires test takers to estimate their probability of achieving specific unlikely aims, such as dating a famous film star. The higher the probability estimate of the occurrence of this event, the more optimistic the person is evaluated on this test. *Test T328* (Word classification) requires test takers to classify words (e.g., honesty), as personal, emotional, exciting, or neutral. The words that are included were chosen as the items that had revealed the highest variability in terms of evaluation in pilot studies. It is assumed that highly anxious persons classify fewer words as neutral (see R. B. Cattell & Warburton, 1967). A new approach in this category is the *Objective Heuristic Thinking Test* (OHTT; Jasper & Ortner, 2014) that aims to assess thinking biases. Items of the Representativeness Scale demand estimations of the probability that a described person belongs to a certain group by given base rates for the membership. The Availability Scale requires the estimation of the probability that a particular

person or a group of persons would encounter an unlikely event (e.g., plane crash). The Anchoring Scale consists of items including a short statement (e.g., ‘‘Imagine you have a bicycle with 7 gears’’) and a loosely related question (e.g., ‘‘How many grams does the bicycle’s shifter weigh?’’). Items were designed such that a reasonable answer to the question would be either much lower or much higher than the actual anchor value.

In sum, these questionnaire-type OPTs, like estimative items, are typically associated with the first generation of objective personality tests. New technologies allow for more adaptations and new variations in item material or mode of presentation than merely varying the scoring procedure. Thus, future successful developments that are based on these early Cattellian ideas should be expected (see Horn, 2006).

Validity of Objective Personality Tests

With regard to the early systematic empirical studies on the psychometric properties and construct validity of OPTs, Cattell expected to find that all three postulated sources that are necessary to build a complete picture of personality (Q-, L-, and T-Data) would point to a common underlying structure of personality represented by so-called source traits (R. B. Cattell, 1957). However, his own extensive research program did not support this assumption: The T-data and Q-data sets showed only low convergence. With respect to the construct validity of OPTs, this lack of convergence led to formulation of the “method-trait-problem.” It was concluded that different methods assess different aspects of the underlying traits and that OPTs and self-report questionnaires may thus systematically assess different aspects of personality (Hundleby et al., 1965). Similar results of nonconvergence were replicated by other authors (Häcker, Schmidt, Schwenkmezger, & Utz, 1975; Häcker, Schwenkmezger, &

Utz, 1979; Skinner & Howarth, 1973). Most certainly, it cannot be argued that low or zero correlations of an objective test with Q-data support the validity of the OPT but rather that validation strategies need to go beyond simple correlations between a newly developed OPT with a questionnaire that measures the same underlying construct (see Ortner, Proyer, & Kubinger, 2006).

At that point, systematic empirical large-scale studies to investigate the construct validity of second generation OPTs similar to the ones carried out in the early period of OPTs had not yet been conducted. In addition, most of these measures had been developed without referring explicitly to a unifying framework like the one that existed in Cattell's tradition. Furthermore, much less research has been published on OPTs in comparison with the large amount of research published in recent years on indirect measures, most notably on the Implicit Association Tests (IATs; see Perugini, this volume). Nevertheless, a large number of studies employing new OPTs also revealed low correlations or a lack of convergence with self-report measures. For example, studies using the Objective Achievement Motivation Test (Schmidt-Atzert, 2004) revealed zero correlations with the achievement striving scale of the NEO-PI-R (r = .02; Ziegler, Schmukle, Egloff, & Bühner, 2010). Analyses of composite scores for conventional (questionnaire, nonverbal test) and seven OPTs from the initial version of the MOI (Proyer, 2006; Proyer & Häusler, 2008) for the assessment of vocational interests revealed correlations between -.20 (enterprising interests) and .41 (artistic interests) with the corresponding scales (see Proyer, 2007). Dislich, Zinkernagel, Ortner, & Schmitt, (2010) revealed a lack of convergence in the risk propensity domain between the Domain-Specific Risk-Taking (DOSPERT) Scale (Blais & Weber, 2001) and the BART (r = -.17). However, at least a medium convergence was found between the self-reported frequency of using rational calculation strategies and less risky choices in the Game of Dice task (r = .45; Brand, Heinze, Labudda, & Markowitsch, 2008).

The lack of convergence with established self-report measures has currently stimulated the generation of studies including new indirect measures, such as Implicit Association Tests, as well as studies on the relation between different OPTs that are aimed at assessing the same construct (Dislich et al., 2010; Ortner et al., 2014). Thus, in line with dual-process theories (e.g., Gawronski & Bodenhausen, 2006; Strack & Deutsch, 2004), Schmitt et al. (this volume) argue that different OPTs may tap structurally more spontaneous or reflective aspects of a construct and may therefore converge better with indirect measures or questionnaires. Some OPTs may assess more associative, automatic, and spontaneous dispositions and may consequently show higher convergence with indirect measures than with direct measures (and vice versa). These considerations may serve as a way to resolve the so-called method-trait problem that troubled research in the first generation of OPTs (Pawlik, 2006). The issue of convergence may be addressed more comprehensively in combination with such new theories. In addition, the traditional *multitrait-multimethod* (MTMM; Campbell & Fiske, 1959) approach, in which several methods are employed for each trait and several tests are used to represent each group of methods (objective, indirect, direct), may represent a future approach for addressing questions of the construct validity of OPTs (see also Ortner & Schmitt, 2014).

Research on indirect measures has revealed that IAT scores and direct measures depend on the degree of conceptual correspondence between the instruments (Hofmann, Gawronski, Gschwendner, Le, & Schmitt, 2005). This information may also serve as a starting point for future analyses involving OPTs. For example, with regard to different anxiety measures, Gschwendner, Hofmann, and Schmitt (2008) demonstrated that convergence was highest for measures that captured the same anxiety content (speech, spider, general) and the same specificity level (specific anxiety, general anxiety). Systematic approaches manipulating specificity similarity and content similarity may also help us to understand the processes underlying OPTs.

Furthermore, a lack of convergence between OPTs and other measures may also be caused by different structural properties of the assessed disposition—the degree to which objective personality tests measure more situation-specific states than stable traits. To further explore this possibility, *latent state-trait theory* (LST-theory; Steyer, Schmitt, & Eid, 1999) can be employed. Recent research indicates that data obtained by using Experimental Games as OPTs show amounts of systematic person variance comparable to those of self-report measures of specific personality dispositions (Baumert et al., 2014).

Another recent approach investigated Conscientiousness OPTs and their convergence with data obtained by a questionnaire and a Single Category IAT by employing a Multi Method Latent-State-Trait (MM-LST) model proposed by Courvoisier, Nussbeck, Eid, and Cole (2008). This allowed different sources of variance to be separated: stable and momentary trait influences, stable and momentary method influences, and measurement error influences. Based on data from 367 students assessed on three different measurement occasions, results indicated generally lower convergence of the OPTs used with data obtained through other approaches. Furthermore, analyses revealed that the OPTs that were used assess stable rather than momentary components of the constructs. Substantial amounts of trait-method specificity revealed that different methods assess trait components that are not shared between OPTs and other measures (Koch, Ortner, Eid, Caspers, & Schmitt, 2014).

Initial results indicate that additional *moderators* of convergence may serve as a starting point from which to formulate more complex but also more successful hypotheses on the validity of OPTs (Dislich, Zinkernagel, Ortner, & Schmitt, 2010). Potential moderators of convergence are personality traits, situational characteristics, attributes of the construct, and attributes of the measurement procedure (see Schmitt et al., this volume). Some promising examples of criterion validity of frequently used OPTs are given in Table 1. Results on their reliability and stability are also summarized for the tests listed in the table. Results given in

the table do not represent the heterogeneity of psychometric properties of available OPTs: For example, capturing measurement precision in terms of split-half correlations or internal consistency fails when only one score or item is available on a specific test. Further problems in interpreting retest correlations occur when test takers receive information during a test trial that influences his or her attitude or expectations toward forthcoming trials (Kubinger, 2009; Ortner et al., 2007).

--insert Table 1 about here--

With regard to transparency and the opportunity to manipulate data provided by OPTs, several studies have indicated that answers are more difficult to fake on OPTs than on questionnaires. For example, this was shown on tests designed to assess impulsivity (Elliot et al., 1996; K. Hofmann & Kubinger, 2001), on a test of achievement motivation (Ziegler et al., 2010), and on a test of risk propensity in the context of driving behavior (Arendasy, Sommer, Herle, Schützhofer, & Inwanschitz, 2011). Overall, findings such as these lend support to the notion that OPTs can truly have advantages in terms of lower social desirability in comparison with questionnaires.

Concluding remarks and outlook

Reviewing the number of articles published on indirect measures within the last few years, especially with regard to the IAT, raises the question of why OPTs, especially of the second generation, have not yet garnered similar attention and popularity in research. One reason may be the large heterogeneity of tests in task concepts, scoring, and materials. In addition,

experience has shown that results obtained for a specific measure cannot be transferred to other measures within this group, which is, to a lesser extent, also the case in research on IATs (see Perugini, this volume).

With regard to the first generation of OPTs, Pawlik (2006) mentioned that researchers may tend to rely on questionnaires with a clear and often replicated factor structure (e.g., De Raad, Perugini, & Szirmak, 1997; McCrae, Costa, Del Pilar, Rolland, & Parker, 1998). This may have been viewed as an advantage compared with the factor structure and very complex picture of interindividual differences obtained by including OPTs in early factor analytic work (Hundleby et al., 1965; Pawlik, 1968). In fact, as data on convergent validity indicate, there is still a need to investigate what OPTs measure and how they relate to other personality measures. As most psychological findings in the domain of psychological assessment and personality psychology are based on self-report questionnaires today, researchers working on OPTs are faced with the problem of having to surpass this "gold standard." In particular, the larger temporal stability and stronger correlations with other personality measures are mentioned as arguments for using self-report questionnaires. However, the weaknesses of self-reports are widely acknowledged and have been mentioned; for example, information obtained through self-reports can easily be distorted so that the accuracy of self-reports can be questioned. Furthermore, Cattell indicated that self-reports are bound to be incomplete. Nevertheless, as indicated by the literature, at least some newer OPTs with convincing results on their psychometric properties have been frequently integrated into research and are currently gaining popularity, such as the BART (Cazzell, Li, Lin, Patel, & Liu, 2012; Fukunaga, Brown, & Bogg, 2012; Lahat et al., 2012; Parkinson, Phiri, & Simons, 2012).

To obtain a better understanding of the psychometric properties of OPTs in general, future research should involve large-scale approaches that include different methods, and as mentioned above, moderator variables should be considered in MTMM models. Research

approaches modeling OPT data at different points in time should also provide insight into the different measures that are being used to assess latent trait and state components. These longitudinal approaches should also allow researchers to take a broader approach, such as the one provided by modern change models, which allow trait variance to be separated from both method variance and state variance (Courvoisier et al., 2008; Geiser, Eid, Nussbeck, Courvoisier, & Cole, 2010; Koch et al., 2014).

However, researchers as well as practitioners have to face the fact that not every construct can be addressed in a similar way by all methods, and in this case, by OPTs. Whereas interpersonal behavior and social variables (e.g., Extraversion) explain a considerable amount of variance in Q-data, these domains are very difficult to implement and assess by using standardized OPTs (Pawlik, 2006). It is more difficult to convert a realistic social situation into a computerized miniature situation in contrast to a task requiring Conscientiousness. Furthermore, in certain cases, social desirability or a tendency to answer in a socially desirable direction might be a part of the construct of interest. Cattell and Scheier (1963) make such an argument for the measurement of *anxiety*. They suggest that "reaction tendencies on a social desirability-undesirability continuum are […] an essential part of anxiety measurement and a questionnaire catches them well" (p. 6). Hence, in some cases, the use of a questionnaire can be helpful for uncovering such aspects—and may be further encouraged from the viewpoint of a multimethod approach in psychological assessment.

What about the use of OPTs in psychological practice? With regard to the earlier approaches, the low utilization rates of OPTs in practice has been explained by their lower usability compared to questionnaires (Schmidt & Schwenkmezger, 1994b) as well as the "enormous undertaking to develop, validate and standardize" them (Hundleby, 1973, p. 84). The extensive effort required by examiners to present and score OPTs and even to construct them are nowadays less of a problem as considerable progress has been made by the

availability of flexible software packages. Also, because OPTs of the second generation are almost exclusively administered in computerized settings, not only the administration itself but also the scoring has become much easier for the examiner.

Recent test developments have also inspired OPT use in practice (for an overview, see Ortner et al., 2007), and new developments have broadened their scope. Whereas clinical settings were one of the main fields in which OPTs were applied in earlier times (e.g., R. B. Cattell & Scheier, 1960; Kasielke, Hänsgen, & Strauss, 1985; Schmidt & Schwenkmezger, 1994a), the use of OPTs in the domains of human resources or selection seems to have gained importance in recent times (see, e.g., the examples of current uses in Ortner et al., 2006).

With regard to the use of OPTs, for example, in the domain of vocational interests in practice, Proyer (2006; Proyer & Häusler, 2008) proposed a multidimensional strategy with OPTs being one component of a larger test battery—along with a questionnaire and a nonverbal test (Proyer, 2007; Proyer, Sidler, Weber, & Ruch, 2012). Proyer argued that the application of OPTs for counseling is especially useful if (a) a person's differentiation of the profile(s) is low and/or (b) a person's vocational identity is diffuse. In these cases, nonverbal tests and OPTs were found to provide additional information beyond pure self-descriptions that may be distorted for different reasons (e.g., the expectations of others or a lack of knowledge in the domains that are covered by the conventional questionnaires for vocational interest). In the domain of vocational interests, this may help researchers to develop hypotheses about people's areas of interest that were previously hidden or less well-cultivated.

To summarize this chapter, research on OPTs has taken considerable steps forward in the past several years. There has been a transition from OPTs of the first generation to a second generation, making strong use of the possibilities offered by computerized assessment procedures. This has allowed researchers to develop new approaches in the design,

presentation, as well as the scoring of the tests. Although there are efforts to further structure the field, OPTs still remain a rather heterogeneous group of tests. Although this heterogeneity is a disadvantage in terms of structure, it may offer the field benefits by offering a broad range of creative processes and ideas and the development of new assessment techniques. Recent studies give researchers reasons to be optimistic about the future role of OPTs in the standard repertoire of psychological assessment and their usefulness in both research and practice.

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Table 1

Selected OPTs and Examples of Results of Some Psychometric Properties

	r_{α} (internal consistency)	r_{tt} (retest correlation)	Validity support
Risk Propensity			
Balloon Analogue Risk Task (BART; Lejuez et al., 2002)	.71 (Lejuez et al., 2002)	.66 -.78 (two weeks; White, Lejuez, & de Wit, 2008)	Scores were found to be positively associated with self-reported risk-related behaviors such as smoking (r = .36), gambling (r = .44), drug and alcohol consumption (both rs = .28), and risky sexual behaviors (r = .25; n = 86; Lejuez et al., 2003; Lejuez et al., 2002). Smoking undergraduates scored higher than nonsmoking undergraduates (n = 60; p < .01; Lejuez et al., 2003).
Crossing the Street Test (CtST; Santacreu, Rubio, & Hernández, 2006)	.96 (Santacreu et al., 2006)	-	Scores predicted guessing tendencies on a multiple-choice test (1,325 applicants) for an *ab initio* air-traffic control training program (Rubio et al., 2010).
Game of Dice Test (GDT; Brand et al., 2005)	.68 (Dislich et al., 2010)	-	More risky choices in patients with attention-deficit/hyperactivity disorder (ADHD) compared with a control group (n = 31; p = -.01; Matthies, Philipsen, & Svaldi, 2012). Excessive Internet gamers (n = 19) showed a reduced decision-

			making ability compared to a control group (n = 19) (Pawlikowski & Brand, 2011).
Risk Behaviour Test (RBT; Guttmann & Bauer, 2004)	-	.70 (6 weeks; Guttmann & Bauer, 2004)	Car drivers who had been conspicuous about their alcohol consumption and a parallelized sample of inconspicuous drivers (n = 214) were correctly assigned at a rate of 77% to the two groups on the basis of their RBT scores (Guttmann & Bauer, 2004).
Roulette Test (RT; Santacreu, Rubio, & Hernández, 2006)	.83 (Santacreu et al., 2006)	.43 (1 year)	Scores predicted a tendency to guess on a multiple-choice test (1,325 applicants) for an *ab initio* air-traffic control training program (Rubio et al., 2010).
The Risk Propensity Task (PTR) (Aguado, Rubio, & Lucía, 2011)	.94 (Aguado et al., 2011)	-	A significant correlation was found between the PTR and another OPT, the Betting Dice Test (Arend, Botella, Contreras, Hernández, & Santacreu, 2003; r = .31; n = 59). Scores were revealed to be positively associated with a score built by self-reported smoking behavior, drinking behavior, gambling... (-.34; Aguado et al., 2011).
Achievement Motivation			
Objective Achievement Motivation Test (OAT; Subtest	.95.-.97 (Schmidt-Atzert, 2007)	.85 (after 29 days; Schmidt-Atzert, 2007)	The OAT had relations of r = .24 with the intermediate examination grade point average (n = 59) and r = .23 with the school leaving

1; (OAT, Subtest 1; Schmidt-Atzert, 2004)			examination grade point average (n =100; Schmidt-Atzert, 2004). Furthermore, OAT scores predicted students' spontaneous willingness to agree to voluntarily work on an additional achievement test after passing a battery of personality tests and questionnaires (Ortner, Gerstenberg, Zinkernagel, & Schmitt, 2014).
Working Styles (Subtest 3; Kubinger & Ebenhöh, 1996)	-	.32 (one or two weeks; Ortner, Gerstenberg, Zinkernagel, & Schmitt, submitted)	-
Vocational Interests			
Multidimensional Objective Interest Inventory (contains three objective tests; *Distribution of Money; Distractibility; Ambiguous Pictures;* Proyer & Häusler, 2008)	.64 - .81 for *Distribution*; .87-.92 for *Distractibility* (Proyer & Häusler, 2008); .50-.78 for *Pictures* (Proyer, 2006)	-	Test scores showed correlations between .08 and .25 with a nonverbal interest test (N = 269; data from Proyer et al., 2012); correlations in the expected direction with intelligence measures (e.g., .33 between verbal intelligence and artistic interests, N = 120; Proyer, 2006); r = .18 between investigative interests and achievement motivation assessed via Working Styles Subtest 3 (Proyer, 2006).