Scheffer, David; Manke, Björn

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Scheffer, David und Manke, Björn

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NORDAKADEMIE
HOCHSCHULE DER WIRTSCHAFT

Köllner Chaussee 11
25337 Elmshorn
http://www.nordakademie.de

Abstract

A visual approach to measuring implicit personality systems is explored in this article. Six scales, consisting of optical stimuli ("icons"), were developed by conducting factor analyses using data from 3 studies with more than 70.000 participants. Internal consistencies and test-retest-correlations of the six scales were satisfactory. Incremental validity of the visual scales was examined in 3 studies ($N = 232$). Results from regression analyses showed that the visual scales are distinct from self-report scales and can explain additional variances in behaviorally anchored rating scales and supervisor ratings. The gain in explained variance beyond self-report measures was on average 140% in the three studies. The authors conclude that measuring personality dimensions via a visual method can make a significant contribution in explaining implicit information processing and behavior and deserves consideration in applied settings. For example, using visuals that are consistent with implicit versus explicit personality systems of the key audience may deepen our understanding of advertising effectiveness, media use and consumer behavior.

KEY WORDS: implicit, personality systems interaction, PSI-theory, visual questionnaire (ViQ), Jungian typology

A Visual Approach to Measuring Personality Systems

Many economic and psychological theories for human behavior are based on the assumptions of expected utility maximization, i.e. people are believed to consciously deliberate the balancing of the costs and benefits of different options (Camerer, Loewenstein & Prelec, 2005). Although many psychologists and economists acknowledge that in everyday life people often choose without much conscious deliberation, the "theory in use" of most scientists in the past treated people as rational utility maximizers. Humans, however, do often not behave according to the assumptions of expected utility maximization (Kahneman & Tversky, 1979; Gigerenzer & Selten, 2001). In many instances people rely on fast and frugal heuristics or "gut-feelings", which seem to be surprisingly valid and often superior even to sophisticated computations (Gigerenzer, 2001; Gigerenzer & Goldstein, 1996; Gigerenzer, 2007).

Intuitive and Affective vs. Controlled and Rational Processes

While not denying that conscious and rational choice is part of human perception and decision making, Zaltman (2003) estimates that 95% of all human decisions in daily life are actually made by intuitive and/or affective processing. He argues that people in a complex social and material world simply do not have the time to base every decision on conscious deliberation. Automatic and emotional processes help to make decisions in a complex world because they need less computational capacities compared to conscious thought, and occur with little or no awareness (Bargh et al., 1996; Bargh & Chartrand, 1999; Schneider & Shiffrin, 1977; Shiffrin & Schneider, 1977). Rather than actually guiding or controlling behavior, conscious rationality often seems to make sense of behavior *after* it is executed (Zajonc 1980, 1984, 1998).

A distinction between automatic and conscious processes was proposed by Posner and Snyder (1975) and Schneider and Shiffrin (1977). But many others have developed similar

two-system models with different labels before and since then: intuitive vs. sensing (Jung, 1923); action-oriented vs. state-oriented (Kuhl, 1983); experiential vs. rational (Epstein, Pacini, Denes-Raj, & Heier, 1996); associative vs. rule-based (Sloman, 1996); implementive vs. deliberative (Gollwitzer, Fujita & Oettingen, 2004). Conscious processes are invoked deliberately by the agent, and are often associated with a subjective feeling of effort. People can typically provide a good introspective account of controlled processes. Intuitive processes, on the other hand, are complementary to controlled processes in each of these dimensions— they operate in parallel, are not consciously accessible, and are relatively effortless. Parallelism facilitates rapid response, allows for massive multitasking, and gives the brain remarkable power in certain types of tasks, such as visual identification (Camerer et al., 2005). Parallelism also provides redundancy that decreases the brain's vulnerability to injury. When neurons are progressively destroyed in a region, the consequences are typically gradual rather than sudden ("graceful degradation"). "Connectionist" neural network models formulated by cognitive psychologists (Rumelhart & McClelland, 1986) capture these features. Because automatic processes are not accessible to consciousness, people often have surprisingly little introspective insight into why automatic choices or judgments were made. A face or piece of art is perceived as "attractive" automatically and effortlessly. It is only later that the controlled system may reflect on the judgment and attempt to substantiate it logically (Wilson, Lindsey & Schooler, 2000).

Automatic processes are the default mode of brain activity. They are active all the time, even when we dream, constituting most of the electro-chemical activity in the brain. Controlled processes occur at special moments when automatic processes become "interrupted," which happens when a person encounters unexpected events, experiences strong visceral states, or is presented with some kind of explicit challenge in the form of a novel decision or other type of problem. To the degree that controlled processes are well described by expected utility theory but parallel processes are not, one could say that many

psychological and economic models are about the "interrupt" or "override" process (Camerer et al., 2005).

Another distinction can be made between affective and rational processes. Such a distinction is pervasive in contemporary psychology (e.g., Zajonc, 1980, 1984, 1998) and neuroscience (Damasio, 1994; LeDoux, 1995; Panksepp, 1998), and has an historical lineage going back to the ancient Greeks and earlier times. Most affect probably operates below the threshold of conscious awareness (LeDoux, 1995; Winkielman & Berridge, 2004). For most affect researchers, the central feature of affect is not primarily the conscious feeling states associated with it, but its activating role in human motivation. All affects have "valence"—they are either positive or negative. Many also carry "action tendencies" (Frijda, 1986; Berkowitz, 1999)—e.g., anger motivates us to aggress, pain to take steps to ease the pain, and fear to escape or in some cases to freeze—as well as diverse other effects on sensory perception, memory, and preferences. Affective processes, according to Zajonc's (1998) definition, are those that address "go/no-go" questions— that motivate approach or avoidance behavior. In contrast, rational processes are those that answer "true/false" questions – that provide a basis for conscious goal setting.

Individual Differences in implicit vs. explicit Processing

Personality traits are determined by the relative rates of utilization of the different forms of information processing, i.e. generalized and focalized neuropsychic systems, with the capacity to render many stimuli functionally equivalent, and to initiate and guide consistent forms of adaptive and expressive behavior (Allport, 1937). While a person's preference for using intuitive and affective or controlled and rational processing constitutes a major building-block of their personality, this still remains almost entirely implicit. However, most people tend to believe that almost all of their choices are based on controlled and rational decision-making (Epstein et al., 1996; Jung, 1923; Scheffer & Kuhl, 2006). However, the degree to which extent that is actually the case remains unconscious.

Since Freud, Jung and Allport pioneered in personality research, psychologists have been struggling with the problem that simply asking people about their conscious and rational representations will give a picture about a person that is only partially valid (Asendorpf, 2007). Explicit self-reports are highly susceptible to response factors like evaluation apprehension, impression management or limitations of introspection. Only when influential stimuli are salient and highly plausible are they a valid predictor of behavior (Nisbett & Wilson, 1977). Numerous attempts have been made to overcome these limitations of self-reports. McClelland (1985) asserted that indirect techniques are necessary to measure implicit traits. However, operant tests and other measures of implicit representations were criticized, because they fail to satisfy classical psychometric criteria, especially internal consistency and test-retest reliability (e.g. Entwisle, 1972; Fineman, 1977; Tuerlinckx, De Boeck, & Lens, 2002). There have been promising refinements of these operant techniques (Kuhl, Scheffer, & Eichstaedt, 2003; Scheffer, 2005; Scheffer, Eichstaedt, Chasiotis, & Kuhl, J. (2007); Scheffer, Kuhl, & Eichstaedt, 2003) and a new surge of interest in implicit representations due to a successful adoption of response time methods from social cognition research (Greenwald, 1992; Greenwald & Banaji, 1995; Greenwald et al., 2002). The limiting factors in applying these methods remain that they are time-consuming, and for technical reasons hard to implement as unattended internet-applications.

A Visual Approach: The Royal Road to the Understanding of Implicit Personality?

Already Hermann von Helmholtz (1925) and Solomon Asch (1946) remarked that visual perception is a type of stimulus that is fully automatic and pre-rational. Its interpretation is largely untouched by explicit intentions. In other words, we are unconsciously driven to see what we want to see. Because part of this malleability of human perception is based on stable individual differences, a visual methodology can provide an easy and robust way to measure personality traits based on unconscious preferences of using intuitive and affective as well as controlled and rational processes. Observing individuals as they respond to collative,

discrepant, conflict inducing, complex, novel and arousing visual stimuli has high potential for assessing their personality as Berlyne (1966, p.30) recognized.

Witkin's research with the Embedded Figures Test (EFT) showed that there were differences in how people perceived discrete items visually within a surrounding field. The perception of "field-dependent" learners is strongly dominated by the prevailing field, whereas "field-independent" learners see items as more or less separate from the field (Witkin et al, 1977).

The impact of visual information on human perception and decision making can hardly be overestimated. Since humans are "visual creatures" with their eyes being the most important sensory organs, one of the most demanding tasks the human brain has had to perform has always been the processing of visual information. During the course of evolution the primary visual cortex has thus become the single largest structure in the brain with well over 200 million neurons (Palmer, 1999). More than 30 different regions have been identified that contribute to the interpretation of visual stimuli (Gegenfurtner, 2003). About half of the cortex is occupied with visual information processing (Hoffman, 1998). Even other parts of the brain, like parts of the motor cortex, mirror the retinotrope structure of the visual cortex (Barinaga, 1999). All this underlines the predominance of vision within human experience.

Implicit personality systems are mentally represented by images, not words; the neural images involved in intuitive or affective processing are not necessarily images as we usually think of them. However, since about two-thirds of all stimuli reach the brain through the visual system, we often experience images, as neuroscientists think of them, visually (Zaltman, 2003). Today the impact of visual information on human perception and decision making is tremendous, for example in elections; and that influence is to a significant extent unconscious (Frey, 1996).

Personality systems are motivational to an extent so large, that some personality researchers began to view the study of perception as the royal road to the understanding of

personality (Frey, McClelland, 1985; Murray, 1938; 1943). The perceiver's motivation is a top-down process which strongly and pre-consciously influences visual perception (Henderson & Hollingworth, 1999; Balcetics & Dunning, 2006). Motivation can, for example, lower the threshold required for the visual system to decide whether it matches an ambiguous figure to a certain favored interpretation. In other words participants tend to report seeing an interpretation of a figure that fits with their motives but at the same time they fail to recognize such self-serving biases (Balcetics & Dunning, 2006).

Empirical studies have demonstrated correlations between individual differences in visual perception and various personality traits. For example, Yovel, Revell and Mineka (2005) showed that obsessive-compulsive individuals had a strong perceptual focus on details. Foerster and Higgins (2005) found that dispositional sensitivity to negative affect was associated with local processing, and dispositional sensitivity to positive affect with global processing. Dickman (1985) explained impulsitivity in terms of individual differences in the speed, relative to accuracy, in visual information processing. Zuber & Ekehammar (1988) found that Psychoticism was negatively correlated with reactivity to a stimuli's meaningfulness.

Although these studies have been confined to self-reports to measure the personality traits, they all indicate that visual perception is influenced by personality systems.

Jungian Typology and Individual Differences in Visual Perception

Some researchers in the field of advertising have used Jung's theory and its operationalization by means of an assessment instrument, the Myers-Briggs Type Indicator (MBTI) [see Myers, 1987, for a detailed description of the personality dimensions measured by the MBTI] to systematically relate visual perception to personality (LaBarbera, Weingard, & Yorkston, 1998). For example, according to Jung's theory iNtuitives (N-types in the MBTI) see the big picture and tend to focus upon possibilities rather than the concrete. They perceive

objects as they might be and as they are in entirety, as "gestalt." Conversely, Sensors (S-types) see the "trees" rather than the "forest" and tend to prefer facts that can be collected and verified directly through the senses; a strong attention to details also characterizes these individuals (Blaylock and Rees, 1984; Myers, 1987; Schweiger, 1985). Conversely, iNtuitives consider future possibilities and make assumptions about information that may not be evident in the image. Physical aspects of a photograph (e.g., framing, composition, exposure, focus, etc.) play a more important role for sensors than for iNtuitives (Christy, 1992).

At least one other Jungian dimension seems to also relate to individual differences in perception: Thinkers (T-types in the MBTI) favor analytical stimuli while Feelers (F-types in the MBTI) will prefer stimuli that express interpersonal aspects; furthermore, emotionally appealing and organic stimuli may be more highly favored by a Feeler type (LaBarbera, Weingard, & Yorkston, 1998).

Support for the validity and usefulness of Jungian type theory in advertising and creation of visuals comes from studies which examined the reactions of consumers to a series of copy-only print advertisements (LaBarbera, Weingard, & Yorkston, 1998; Yorkston and LaBarbera, 1997). Advertising copy presenting information that was consistent with the personality type of consumers received higher ratings than copy that was inconsistent with their type preferences. In addition, a retailer that was advertised by means of copy congruent with consumers' type received higher evaluations and elicited higher purchase intentions than a retailer that was advertised via copy that was incongruent with consumers' type preferences. This shows that individuals prefer images and advertisements that are consistent with the information-processing styles that characterize their personality types. For example, images and advertisements that are perceived as realistic, concrete, and informative will be evaluated more (less) favorably by individuals with Sensor (iNtuitive) typologies as compared to advertisements that are perceived as imaginative, conceptual, and abstract.

PSI Theory and Design Elements

Advertising professionals, designers and artists have always had an intuitive understanding in grafting particular personality characteristics into their objects (visuals, products and brands). Recently, Scheffer & Loerwald (2008) attempted to explain the implicit rules that are sometimes used by practitioners. Part of the theoretical basis was provided by Jung's personality typology, which has already been applied by people in creative fields, be it in a conscious and systematic or merely an intuitive way. Another theory contributing to the theoretical basis was the neuropsychological informed theory of motivation developed on the basis of experimental research on motivation and self-regulation: *Personality Systems Interactions* theory (PSI theory, Kuhl, 2000; 2001). In light of the fact that the PSI theory has been developed in a research context far from Jung's world of thought, its convergence with Jung's typology is astounding. PSI theory extends Jung's theory of personality in two ways: Firstly, the systems described in PSI theory include functions needed to explain action (e. g., thinking becomes an auxiliary component of intention memory and Jung's archetypical "intuition" shares the implicit perceptual function with intuitive behavior control in PSI theory). Secondly, PSI elaborates both the functional properties of each system and the affect-based modulation of interactions among those systems.

In sum, PSI theory models personality as a dynamic interaction between personality systems within one person and their behavioral significance. One such interaction refers to self-facilitative behavior, which is assumed to be regulated by the joint effects of a low level "object recognition system" (ORS), which is close to sensing in Jung' s theory, and a high level "extension memory" (EM), which is close to feeling. The ORS recognizes objects as single entities in a detailed way. Object recognition entails a figure-ground sharpening mechanism which makes it rigid in the sense that it can not deal very well with degraded input. On the other hand, EM is an evaluating and decision-making system based upon high-

level intuition. It has extensive connections with a multitude of subsystems within the brain eliciting parallel intuitive-holistic network processing which draws on a broad informational base including a great number of needs, preferences, values and other self-aspects (Kuhl, 2000). Self-facilitation behavior is activated when the ORS detects discrepancies. Highly collative stimuli are initially associated with negative affect. They are transmitted to extension memory (EM), as "incongruent" or “threatening”. However, since EM is a parallel memory system that integrates the totality of personal experiences, it is able to assimilate information that the ORS cannot handle or interpret, on the basis of related experiences. Once the new (discrepant) information has been successfully assimilated, negative affect becomes *down-regulated*. However, when negative affect (i.e. arousal) is not down-regulated, which may result from individual differences in the activation of this system, negative affect persists and is translated into consciously accessible negative emotions. These, in turn, trigger avoidance behavior – specific exploration in terms of Berlyne (1966). Down-regulated negative affect elicits a positively experienced emotion, like interest or acceptance. This is not unlike the concept of negative reinforcement in classical learning theory.

Volitional facilitation behavior is also regulated by the interaction of two systems: the low level “intuitive behavior control” (IBC), which resembles intuitive perception in Jung’s theory and the high level “intention memory” (IM), which includes thinking as an auxiliary functional component. IBC has a double function. The first function is an intuitive processing of information, integrating contextual information within, and across, various modalities. The second function is to initiate action and spontaneous reaction. This dual functionality integrating implicit perceptual with intuitive motor processing is expressed in the term “sensorimotor” processing (Farrer et al., 2003). Like all intuitive systems the IBC has a rather rough, but at the same time robust, mode of operation which overlooks mistakes and incongruence. Like Piaget's motor sensory schemata, intuitive behavior control entails a form of non-conscious perception that does not involve individual objects extracted from their

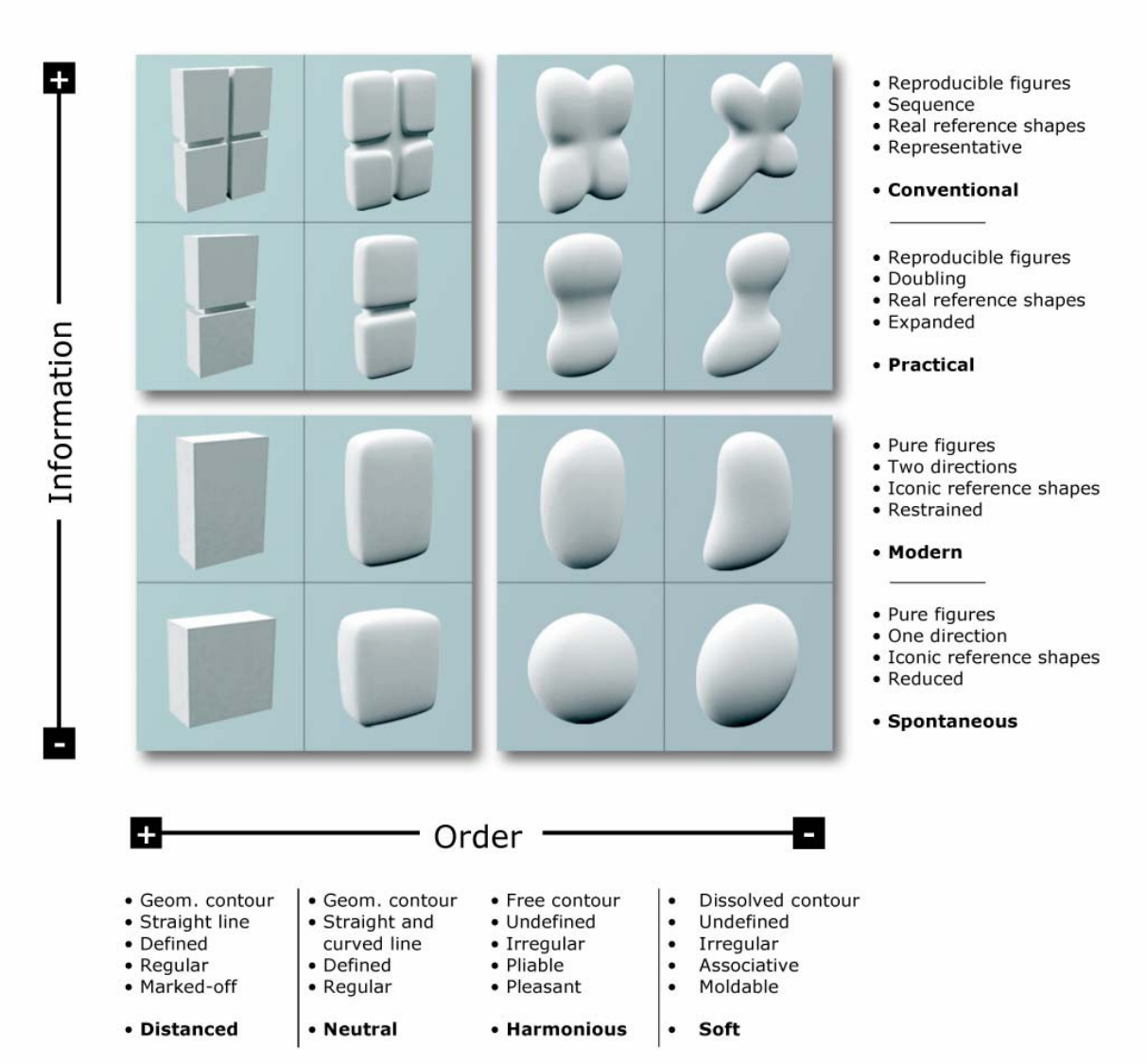
contexts. Rather, it integrates numerous stimuli within parallel networks that simultaneously support intuitive motor programs. The inter-connected architecture of the IBC leads to a fault-tolerant but somewhat sloppy interpretation of information. Thus the IBC does not interpret high-entropy stimuli as discrepant and threatening like the ORS, but rather disregards mistakes and ignores dangers. Obviously this can be disadvantageous in the face of potential threats, and so a further "top-down system," the intention memory (IM), is in place to monitor and regulate the IBC system. The IM serves to inhibit premature or “irrational” intuitive processing and delays automatic responding when difficulties arise – a process called *volitional inhibition* (Kuhl & Kazén, 1999). Intentions that cannot yet be implemented are maintained in IM, to the effect that they can be enacted later. The term *intention memory* denotes its ability to form explicit representations of intended actions. The most important role of IM is to inhibit immediate intuitive reactions so as to facilitate planning and analytical thinking which both would be blocked unless premature action is prevented.

According to PSI theory, motivation and behavior can thus be seen as a function of system interactions (or configurations), which can be inferred by reactions to a variety of stimuli. Intuitive behavior control should be a function of a stimuli preference having relative high entropy. This, in turn, should be more appropriate when the information to be processed relates to issues that are quite dynamic, collative, or complex like social interaction, for example. It should also be more efficient in the face of unexpected situations and when time is short.

Two important dimensions for explaining characteristics of objects in design and advertising are information and order (Scheffer & Loerwald, 2008). Objects which radiate a lot of information and a high degree of order are perceived as conventional, practical, distanced and neutral. They are preferred by individuals characterized by a stable interaction between the object recognition system and intention memory (i.e. a specific “system configuration”). Objects with low information content and high disorder appear, in

comparison, spontaneous, modern, harmonious and soft (cp. Figure 1). They are preferred by individuals who prefer using their intuition and extension memory.

Figure 1: Stimuli Information and Psychological Characteristics



Following Jung's theory, design elements containing a lot of information appeal to a particular personality type - namely, the so-called **S**(ensing)-types. In Kuhl's (2000; Scheffer & Kuhl, 2006) PSI-theory, this is functionally explained in that **S**ensing-types have a stronger tendency towards using the so-called object-recognition systems. These systems are responsible for the discovery of dangerous and improbable stimuli and discrepancies. Design

elements containing only little information are implicitly perceived rather than explicitly recognised and appeal to i**N**tuitive-types (known as **N**-types by Jung).

The second dimension in figure 1 concerns the need for an objective order. While the so-called **T**(hinking)-types prefer an abstract order based on general principles, **F**(eeling)-types like an emotional, tolerant, adaptable "order" based on personal values. The underlying difference can be illustrated by opportunistic versus goal-oriented planning as two distinct modes of problem-solving: Opportunistic problem-solving generates opportunities for action derived from an extended experiential network (intra- or interpersonal "feeling") whereas goal-oriented planning relies on a well-ordered sequence (algorithm) of steps toward the goal (Hayes-Roth & Hayes-Roth, 1979; Hayes-Roth, 1993). Talking about design elements, **T**(thinking)-types look for definable figures that are marked-off from each other with sharp and straight shapes whereas **F**(eeling)-types look for connecting, organic figures with diffused and soft shapes. Figure 2 points out the translation of the four types into trait characteristics.

Figure 2: Characteristics of the Four Types – A Further Extension of Figure 1

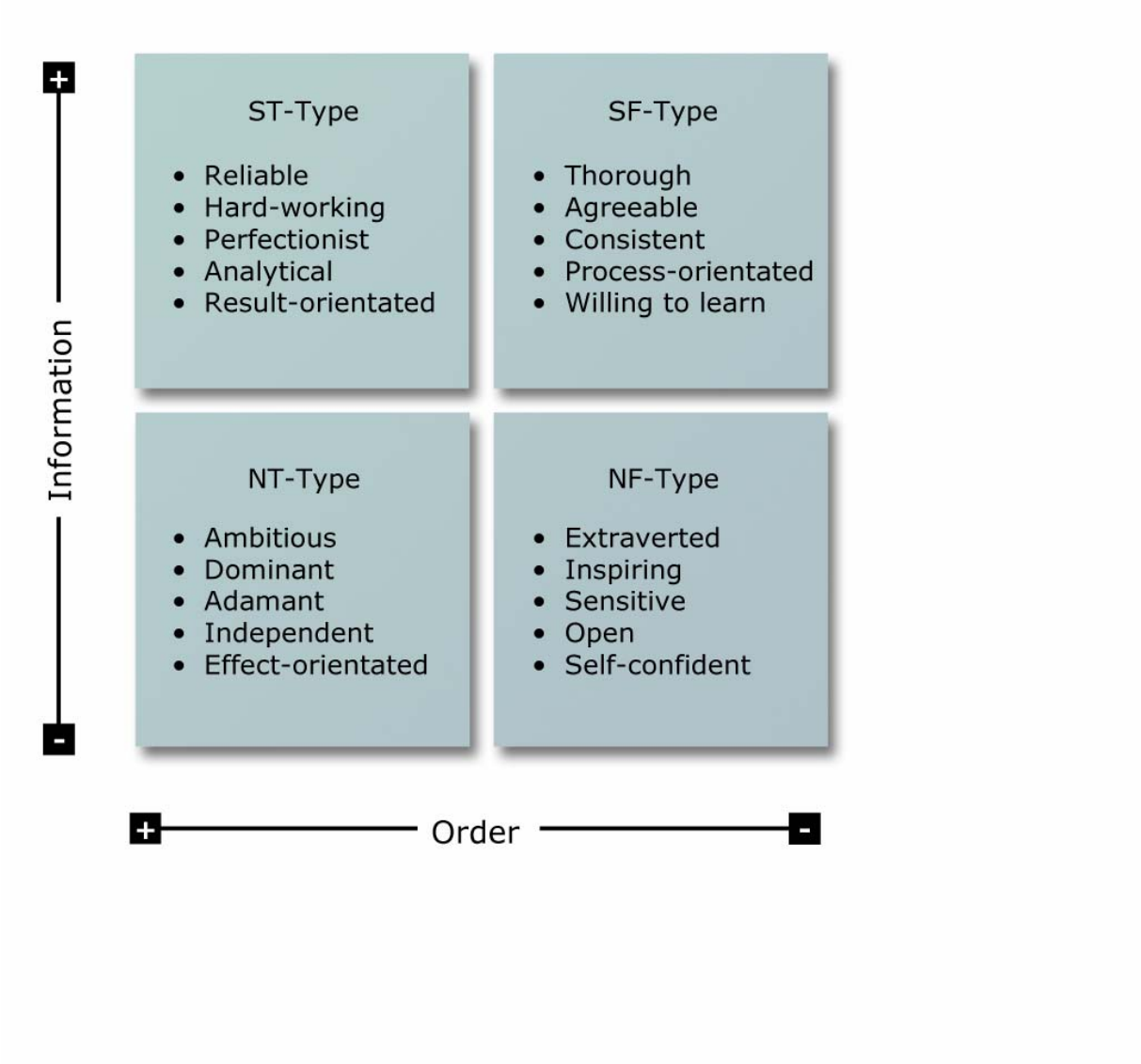


Figure 2 displays **S**ensing and i**N**tuition as well as **T**hinking and **F**eeling as complementary dimensions understood according to PSI-theory. This means that although their modus operandi is to counter each other, they are not simple opposites but rather independent dimensions. In PSI-theory terminology, **S**ensing originates from neuropsychological *object-recognition systems* activity, i**N**tuition originates from *intuitive-behavior systems* activity, **T**hinking is linked with the *intention memory* and **F**eeling is linked with the *extension memory*. Personality characteristics are understood as stable system configurations. For example SF-types are expected to initiate and guide consistent forms of self-facilitative behaviors, while NT-types are expected to show volitional facilitation consistently across situations (summarized in Scheffer & Kuhl, 2006).

In PSI-theory, the existence of two affective systems is postulated in addition to the four cognitive systems. These affective systems modulate the four above-mentioned core functions (Kuhl, 2001). In accordance with Bischof (1985), these emotional systems are equated with a high arousal motive and a high control motive, respectively (Scheffer & Heckhausen, 2007): The desire for stimulation through action represses intention memory (**T**hinking) and activates intuitive behavior control (iNtuition); the desire for security (arousal avoidance) represses the extension memory (**F**eeling) and activates the object-recognition system (**S**ensing). Therefore, the four types displayed in figure 2 are influenced, in their characteristics, through interacting with either emotional dimension. An important assumption of PSI-theory refers to the independence of all six systems, which are conceived of as partly antagonistic but nevertheless orthogonal. Another assumption refers to their implicit nature. It is predicted that especially the extent to which an individual uses intuitive behavior control will not reach consciousness.

From Theory to Test Development

Based on PSI theory we have defined six dimensions which are supposed to have significant influence on perception. Therefore it should be possible to find correlates between perceptional differences and differences in using the personality systems. This in turn wourd enable us to measure the dimensions' magnitude using a visual approach. Following this reasoning a large number of different icons were developed and then tested in groups of students, artists, designers and psychologists, who were interested in the topic. All visual items were designed on the basis of the design principles depicted in Figure 1 and psychological principles derived from Jungian and PSI theory.

As a first hint for their validity the visual items had to prove to work in small group workshops. For example, many participants of the workshops were able to give information on their MBTI-types. Despite the explicit nature of this instrument, we used this information

as a source for validating the items. Implicit and explicit measures of a personality dimension should correlate only to a low degree, but they are not strictly orthogonal. For example, the explicit achievement motive measured by a self-report and the implicit need for achievement measured by the Thematic Apperception Test are significantly positively correlated – about r = 0.10-0.20 (see for example the Meta-Analysis of Spangler, 1992). Accordingly correlations between responses to visual items and the MBTI type of the workshop participants were supposed to be in the expected direction for the item to be considered valid. Finally after 4 years of field work, 300 items were derived which seemed to measure stable individual differences in personality.

The second step in this development process was the the formal and comprehensive examination of these 300 visual items. All items had to prove stable psychometric properties on two criteria:

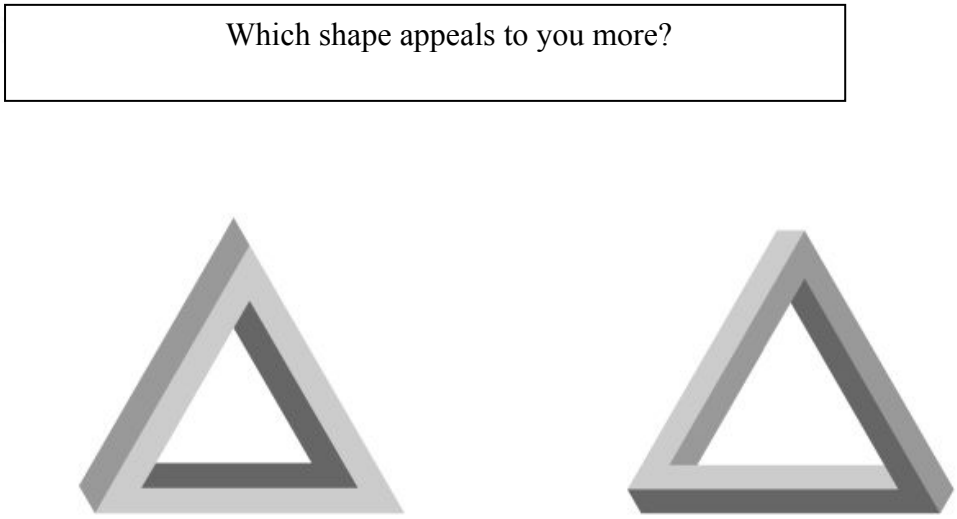
Stability: The items were examined for retest-validity over the course of 3 months in a sample of 60 participants. To pass they had to show correlations above .50.

Homogenity: The items were examined cross-culturally in a series of factor analyses for consistency with their respective dimensions. Items were kept if the absolute value of their structure coefficient in a factor analysis was greater than 0.50 for one given factor and lower than 0.30 for all other factors.

Construct Validity: The items were examined for correlations with self-report measures of the Jungian types (e.g. the MBTI). Items had to show correlations that were statistically significant and of the right direction.

Only 72 items passed all three formal criteria. For example, the icon depicted in figure 3 had to be discarded. It was chosen on theoretical grounds, because it was stable over time and correlated significantly with sensing. Moreover, in Germany this item did also load on the factor S. However, it turned out in a factor analysis across ten different countries that the item is not suited to measure S in other cultures (Scheffer & Loerwald, 2009).

Figure 3: Example for a ViQ Item measuring individual differences in specific information processing in Germany (individuals high in S tend to choose the left triangle)



To sum it up, all items used in the ViQ were selected because of a) their theoretical meaning and face validity for measuring one of the six scales, b) their basic psychometric properties, i.e. their fit to a six-dimensional factor structure across different populations and cultures, c) their adequate retest-stability of r >.50 (correlation on item level), and d) their significant (albeit low) correlations to a self-report measure of Jungian type.

The 43 items that survived this selection process will be further discussed in the empirical part of this article. These items can be categorized into six distinct types of design-elements. To make them into complete test-items they were combined with short and simple questions as:

- Which shape appeals to you more?
- What did you see mainly?

- How many colors did the image have?

It should be noted that all questions and items containing colors can be answered on the basis of the design elements' shades of gray. Color-blindness does not have any verifiable effect on the six dimensions of the ViQ.

The Six Dimensional Approach of the ViQ

From the theoretical background the following dimensions were derived for the test:

Specific information processing (S). This dimension is related to Sensing (Jung) and using the object-recognition system (Kuhl's PSI theory). A high value on this dimension leads to a quantitative, particularized information intake and a preference of simplicity over novelty. Collative, surprising, and complex stimuli like those Berlyne (1966) used in his pioneering work are avoided. The behavioral orientation based on specific information processing is presumably an advantage when things need to be structured, inaccuracies need to be avoided and mistakes can have highly negative effects.

Automatic information processing (A). This dimension is conceptually related to Intuition (Jung) and intuitive behavior control (Kuhl's PSI theory). A high value on this dimension marks the preference to approach and the ability to quickly recognize ambiguous, collative and complex stimuli (Bischof, 1975; 1985; Berlyne, 1966). This system encompasses automatic procedures and partly unconscious perception and action programs. Automatic information processing is measured by the precise interpretation of minimal information. A quick recognition of symbols and icons is also important for this function. The behavioral orientation based on intuition is presumably an advantage in highly complex and dynamic environments where conscious deliberation of the costs and benefits is too time-consuming.

Objective classification (O). This dimension is related to analytical thinking (Jung) and intention memory (Kuhl's PSI theory). A high value on this dimension marks the ability to quickly detect systematic and logical order in design elements (for which an objective true/false answer is possible). A high value on this dimension supports behavior affected by

foresighted planning, keeping intentions in mind over time and analytical decision-making. Presumably this is always an advantage when planning and long-term, planned, serial decisions based on facts, need to be made (for example in stable predictable environments).

Personal classification (P). This dimension is conceptually related to feeling (Jung) and extension memory (Kuhl's PSI theory). A high value on this dimension leads to an emotional and holistic way of experiencing, good access to stored experiential knowledge and high interest for social surroundings. This is always an advantage when a large variety of information has to be processed simultaneously, and partly contradicting aspects have to be integrated in a parallel way (for example in social settings with high group dynamics). It is measured by a preference for organic, connecting, episodic, and situative design elements.

Need for Stimulation (St). This dimension is related to extraversion (Jung) and sensitivity to positive affect (Kuhl's PSI theory). A high value on this dimension is associated with sensation seeking behaviors and tolerance of high degrees of ambiguity. Need for stimulation is measured by the preference for unusual and challenging stimuli and how they develop out of optical illusions.

Need for Security (Se). This dimension is related to judging (Jung) and sensitivity to negative affect (Kuhl's PSI theory). A high value on this dimension leads to an aspiration for unequivocal decisions, security, norm-orientation and an avoidance of a blurred design-element by a clear version of the same stimuli like those used by Berlyne (1966). Discrepancies like those used in many modern pieces of art are evaluated negatively. Security is established through dealing with potential causes for danger and, should the situation arise, through their elimination. Attention is focused on the problem.

Overview and Hypotheses

Our basic hypothesis was that a visual method, i.e. a test made up of visual items or icons, can be used to measure stable personality systems such as those that can be derived from

Jungian types and PSI theory. In order to show that this approach is viable two basic results concerning the reliability of the method need to be obtained empirically:

1. the factor structure needs to fit the six dimensions defined by theory, which is why we expected to find a robust six-dimensional factor structure across different samples
2. we had to prove that internal consistencies and retest-correlations of the six scales are sufficiently high and comparable to traditional self-report measures of personality (specifically: r >.70).

Although these are only necessary but not yet sufficient preconditions, we would see this as a promising result, considering the fact that the scales of the ViQ are comprised of only 4-6 visual items

Another precondition that has to be met is validity of the test. Because no implicit measure of Jungian types existed so far things were rather complicated here. We chose to compare with some of the best explored explicit measures in the field, i.e. the Big Five (measured in our studies by the German version of the NEO FFI (Borkenau, & Ostendorf, 1993)),the MBTI developed by Briggs and Briggs Myers (1995) (specifically the German Version translated by Bents and Blank) and Kuhl's (1994) measure of action-state orientation. Because of the fundamentally different approaches of explicit and implicit measures we expected to find correlations of statistical significance and the of the right direction in the low to middle range (r=.20 to r=.40). With respect to the MBTI and to the Action Control scale this is rather easy to judge, because both measures are based on the same theory. It is more difficult, however still possible, with respect to the Big Five. For example, we expected the scale S (specific information processing) of the ViQ to be positively related to conscientiousness and negatively to openness, because the object recognition system presumably underlying S is conceived to narrow perception and to focus on details in order of avoiding mistakes. Personal classification (P), on the other hand, should be positively related to openness, because extension memory, which is believed to be the neuropsychological basis

of P, by definition extends perception and opens the mind to the feelings and experiences of other people and cultures.

Finally, we expected to find significant and substantial incremental validity of all dimensions of the ViQ beyond the variance explained by self-reports. Thus, the ViQ scales should add predictive power to explicit self-reports with respect to behavior as assessed by supervisor ratings. For example, employees which were assessed being *vague* in their decision making by supervisors should usually not think of themselves to be a Sensing-type. Nevertheless, even if the MBTI-scale sensing predicted this negative assessment of supervisors we still expected to find incremental validity of the ViQ S-scale.

To sum it up, in order to demonstrate that a new visual method is viable we wanted to prove that the ViQ is reliable and valid in the sense that it can add predictive power to self-report measures.

Method

Participants. Six samples with a total of 76,818 German adults and children were used for conducting the studies which form the empirical base of this article. Out of these samples three were used for scale development and one was used to test our hypothesis that the ViQ can help to explain variance in addition to variance explained by self-reports.

Because the ViQ is confined to use via the internet all samples had to be online either at home or in computer rooms of their company or university. The first sample is comprised of 2,405 adults (917 women and 1,488 men), who were involved in various personality development programs. The average age of the participants was 32.81 years (range: 18 to 72 years, SD=10.67). The sample is fairly representative of the German white-collar working population and includes clerks, secretaries, managers, designers, sales people, army officers, architects, engineers, teachers and job-seeking unemployed. We called this sample the *white-collar workforce sample*. As discussed below, retest correlations were calculated for a smaller sub-sample where participants completed the ViQ twice with a gap of one year between

taking the tests.

The second sample is comprised of 5,650 participants (3,958 women and 1,692 men), who completed the ViQ on a website which is featuring mainly psychological topics and which is intended for people interested in exploring their personality. The average age of the participants was 25.48 years (range: 10 to 92 years, SD=10.97). 1,385 of the participants were under-aged (< 18). We called this sample the *self-exploration sample*.

68,532 participants completed the ViQ via the website of a large European TV-channel. The channel and its website reach a wide range of the German population of different socio-demographic and educational backgrounds. Because of the channel's privacy policy, it was not possible to collect information on age and sex for this sample. We called this sample the *mass-media sample.*

85 students from the NORDAKADEMIE, University of Applied Sciences (34 women and 51 men) voluntarily participated in a training assessment center in the year 2006. The average age of the participants was 23.53 years (range: 22 to 32 years, SD=1.62). This sample was called *NAK 2006 sample*.

110 students from the NORDAKADEMIE, University of Applied Sciences (32 women and 78 men) voluntarily participated in the revised training assessment center in the year 2007. The average age of the participants was 23.87 years (range: 22 to 32 years, SD=1.70). This sample was called *NAK 2007 sample*.

36 students from the NORDAKADEMIE, University of Applied Sciences (20 women and 16 men) voluntarily participated in an Outdoor-Assessment-Center organized by the Ellernhof Training Center, a provider of outdoor team training, leadership training and assessment centers near Lüneburg. The average age of the participants was 23.25 years (range: 21 to 29 years, SD=1.48) and the sample was called *Ellernhof 2006 sample*.

Measures. In the *white-collar workforce sample* participants received an individual link to the ViQ via email. They each confirmed taking the test voluntarily and agreed to a

privacy policy statement that detailed how their data were getting used for the developmental program they participated in and for scientific research. Completion of the ViQ took an average of approximately 10 minutes. After completing the ViQ, all participants received a detailed report on their test results. Depending on the target company's development program, assessment instruments and methods other than the ViQ were used and participants took part in communication training, goal setting dialogs, career counseling or other developmental measures. However, no career relevant decisions were based on the ViQ. The ViQ was always applied in the context of established tests or methods.

In the *self-exploration sample* and *mass- media sample* all participants were visitors of the respective websites and found the link to the ViQ browsing these sites. After completing the ViQ they received a short report with the interpretation of their ViQ results.

Participants from the *NAK 2006 sample, NAK 2007 sample* and *Ellernhof 2006 sample* were administered the ViQ with the other tests a few weeks before participating in the respective assessment center they had volunteered for. They received a link and could complete the ViQ from any PC with internet connection at a time and place of their choice. The other tests were conducted in group sessions in class rooms at the Nordakademie using paper and pencil. The students in the *NAK 2006* and *NAK 2007* samples were administered the MBTI and NEO/FFI and students in the *Ellernhof 2006 sample* the HAKEMP, a German version of J. Kuhl's Action Control Scale (ACS; Kuhl, 1994).

Also for participants of the *NAK 2007* sample, job performance was rated by their supervisors on eight rating scales that were specifically designed to measure correlates of Jungian personality traits. The scales were developed by licensed experts of the MBTI who put forward the notion that correlates of the Jungian traits should include both positive and negative (i.e. extreme or exaggerated) aspects. After a theoretical construction phase and a study of the psychometric properties of the items in the *NAK 2006* sample (Scheffer & Hickmann, 2008), the supervisor ratings were finally made on eight scales. One measuring

correlates of intuition (i.e. *complex*) and the exaggeration of complex (i.e. *vague*). The scale developed for thinking was *precise* and the scale for its exaggeration was called *pedantic.* The scale for extraversion was called *lively*, its exaggeration *hectic*. Finally, scales for judging (i.e. *firm*) and its exaggeration (i.e. *unaccommodating*) were developed. All scales showed satisfactory internal consistencies and inter-rater-agreement (Scheffer & Hickmann, 2008). Supervisor data were collected within four weeks after the test sessions.

Procedures

Scale Development

We chose the *white-collar workforce sample* described above as the basis for deriving the ViQ scales, because we deem it the most representative of our three samples. Once the model had been defined, reproductions were conducted for the *self-exploration* and the *mass-media* samples (see above).

Item Pool for the ViQ

The item pool used for the final steps in creating the ViQ consisted of the 43 items that resulted from the process described above. It was further examined and refined by means of confirmatory factor analyses, testing for internal consistencies and retest reliability.

Factor structure of the ViQ

We conducted a series of exploratory factor analyses to determine if these 43 items could be kept. In the first steps, we used principal component analysis with varimax rotation of the factors. Items were kept if the absolute value of their structure coefficient was greater than 0.50 for one given factor and lower than 0.30 for all other factors. We used Scree test and the "Eigenvalue > 1.0" criterion to select the number of factors (Cattell, 1979).

As we had hoped, six factors could be identified that met those criteria. All of these factors were well-identified, consisting of four to six items each. Robustness of the factor structure was tested by comparing the final results of the principal component analysis with a principal axis analysis that we calculated on the same data set. We also did this by conducting

further EFA using the principal component method for our two other samples. All of these replications yielded satisfactorily similar factor structures with the main difference being a different factor order for the *mass media sample* where order for factors 3 and 4 is reversed (*Table 1)*.

Table 1. Structure coefficients for the varimax-rotated factors from

a. exploratory factor analyses (white-collar workforce sample, *N*=2,405)

b. exploratory factor analysis (self-exploration sample, *N*=5,650)

c. exploratory factor analysis (mass media sample, *N*=68,532)

	Factors																	
Items	Factor 1 (ViQ *P)*			Factor 2 (ViQ *O)*			Factor 3 (ViQ *St)*			Factor 4 (ViQ *Se)*			Factor 5 (ViQ *A)*			Factor 6 (ViQ *S)*		
	Factor 2 (ViQ *O – Objective classification)*																	
	a	b	c	a	b	c	a	b	c	a	b	c	a	b	c	a	b	c
I01	-0,078	-0,043	-0,066	**0,555**	**0,534**	**0,521**	0,138	0,044	-0,029	-0,032	-0,049	0,051	0,061	0,043	0,048	0,016	0,027	0,028
I02	-0,036	-0,035	-0,009	**0,768**	**0,778**	**0,782**	-0,032	-0,004	-0,022	-0,031	0,017	-0,027	0,084	0,051	0,040	0,035	0,018	0,014
I03	-0,068	-0,051	-0,063	**0,788**	**0,771**	**0,758**	0,028	0,043	-0,032	-0,037	-0,093	0,014	0,011	0,032	0,036	0,012	0,048	0,031
I04	-0,027	-0,064	-0,059	**0,826**	**0,833**	**0,826**	0,004	-0,006	-0,023	-0,025	-0,025	-0,014	0,050	0,072	0,055	0,022	0,048	0,021
I05	0,046	0,000	0,025	**0,616**	**0,592**	**0,603**	-0,043	-0,020	-0,007	-0,004	0,035	-0,016	-0,004	0,029	0,024	0,046	0,041	0,025
	Factor 5 (ViQ *A – Automatic information processing)*																	
	a	b	c	a	b	c	a	b	c	a	b	c	a	b	c	a	b	c
I06	-0,001	-0,020	-0,007	-0,013	-0,010	-0,019	0,004	-0,006	-0,010	0,027	0,007	-0,010	**-0,809**	**-0,739**	**-0,732**	-0,043	0,009	-0,040
I07	-0,025	-0,013	-0,010	0,045	0,079	0,056	0,036	-0,003	-0,016	-0,009	-0,007	0,027	**0,839**	**0,799**	**0,805**	0,067	0,029	0,029
I08	0,102	0,064	0,061	-0,084	-0,074	-0,063	-0,077	-0,003	0,002	0,012	-0,024	-0,031	**-0,680**	**-0,694**	**-0,687**	-0,036	-0,075	-0,060
I09	0,023	0,021	-0,005	0,048	0,062	0,068	0,006	-0,030	-0,050	-0,087	-0,055	0,014	**0,690**	**0,746**	**0,754**	0,019	0,015	-0,025
	Factor 1 (ViQ *P – Personal classification)*																	
	a	b	c	a	b	c	a	b	c	a	b	c	a	b	c	a	b	c
I10	**-0,660**	**-0,689**	**-0,699**	0,013	0,048	0,027	0,003	-0,025	-0,213	-0,197	-0,207	0,005	0,038	0,015	0,022	0,227	0,275	0,257
I11	**0,762**	**0,769**	**0,776**	-0,030	-0,031	-0,042	-0,036	-0,014	0,191	0,150	0,205	-0,011	-0,009	0,003	-0,003	-0,146	-0,185	-0,185
I12	**0,696**	**0,711**	**0,715**	-0,074	-0,043	-0,044	-0,039	-0,024	0,280	0,237	0,313	-0,039	-0,021	-0,014	-0,042	-0,030	-0,039	-0,020
I13	**-0,784**	**-0,792**	**-0,797**	0,028	0,071	0,051	-0,017	0,013	-0,117	0,018	-0,089	0,010	0,018	0,002	-0,003	0,238	0,270	0,235
I14	**0,754**	**0,744**	**0,770**	-0,035	-0,061	-0,060	-0,051	-0,017	0,262	0,212	0,273	-0,031	-0,038	-0,024	-0,031	-0,040	-0,105	-0,085
	Factor 6 (ViQ *S – Specific Information processing)*																	
	a	b	c	a	b	c	a	b	c	a	b	c	a	b	c	a	b	c
I15	0,143	0,091	0,095	-0,025	-0,025	-0,027	-0,031	-0,054	0,251	0,201	0,256	-0,027	-0,055	-0,015	-0,020	**-0,589**	**-0,535**	**-0,593**
I16	-0,039	-0,070	-0,064	0,003	0,015	0,003	-0,027	-0,003	-0,213	-0,269	-0,198	0,005	0,024	0,025	0,026	**0,680**	**0,693**	**0,705**
I17	-0,113	-0,159	-0,148	0,040	0,067	0,030	0,033	0,010	-0,201	-0,185	-0,173	0,014	0,020	0,011	0,029	**0,746**	**0,734**	**0,738**
I18	-0,257	-0,234	-0,260	0,020	0,074	0,037	0,020	-0,008	-0,258	-0,290	-0,226	0,018	0,058	0,005	0,004	**0,498**	**0,573**	**0,542**
I19	-0,121	-0,152	-0,190	0,055	0,029	0,053	0,118	0,050	0,159	0,074	0,080	0,092	0,035	0,055	0,049	**0,520**	**0,459**	**0,377**
	Factor 3 (ViQ *St – Stimulation seeking)*																	
	a	b	c	a	b	c	a	b	c	a	b	c	a	b	c	a	b	c

I20	-0,068	-0,068	-0,061	0,094	0,037	0,036	**0,658**	**0,648**	-0,033	0,013	0,000	**0,649**	0,018	0,006	0,014	0,073	0,040	0,041
I21	-0,065	-0,004	-0,053	-0,038	0,025	0,020	**0,651**	**0,649**	0,002	0,022	-0,040	**0,667**	0,000	-0,068	-0,023	0,098	0,100	0,114
I22	0,009	0,003	-0,032	0,020	0,043	0,022	**0,721**	**0,690**	0,002	-0,062	-0,010	**0,711**	0,023	0,009	0,018	0,021	0,057	0,052
I23	0,021	0,004	0,004	-0,034	-0,024	-0,021	**0,614**	**0,554**	0,009	-0,080	-0,030	**0,611**	0,056	0,000	0,011	-0,022	-0,023	0,028
I24	0,010	0,048	0,036	-0,010	-0,038	-0,024	**0,611**	**0,631**	-0,065	-0,070	-0,039	**0,566**	-0,002	0,016	0,017	-0,013	-0,038	-0,046
I25	-0,017	-0,024	0,010	0,073	0,027	-0,002	**0,657**	**0,667**	-0,039	-0,013	0,017	**0,632**	0,022	0,011	0,043	0,034	-0,017	-0,038
	Factor 4 (ViQ *Se – Security seeking)*																	
	a	b	c	a	b	c	a	b	c	a	b	c	a	b	c	a	b	c
I26	0,113	0,080	0,099	-0,010	-0,057	-0,041	-0,013	-0,045	**0,622**	**0,587**	**0,595**	-0,040	-0,058	0,009	-0,009	-0,022	-0,065	-0,064
I27	0,031	0,164	0,158	-0,002	0,029	0,003	-0,030	0,011	**0,659**	**0,705**	**0,675**	0,002	0,021	-0,017	-0,007	-0,149	-0,128	-0,132
I28	0,169	0,223	0,223	-0,044	0,013	0,004	-0,028	-0,005	**0,594**	**0,627**	**0,590**	-0,012	-0,024	0,008	-0,017	-0,110	-0,087	-0,098
I29	0,185	0,214	0,207	-0,060	-0,048	-0,048	-0,058	-0,036	**0,643**	**0,593**	**0,649**	-0,049	-0,062	-0,038	-0,028	-0,194	-0,179	-0,191
I30	0,201	0,203	0,212	-0,026	-0,048	-0,051	-0,105	-0,040	**0,641**	**0,606**	**0,646**	-0,059	-0,023	-0,020	-0,004	-0,218	-0,204	-0,204

Internal consistencies were tested by calculating Cronbach's Alpha for each of the scales in each of the three samples and were found to be satisfactory. The lowest Alpha coefficient was .64 for the ViQ *S* scale in the *mass media sample*, the highest was .86 for the ViQ *P* scale in the *self-exploration* and in the *mass media samples* (*Table 2).*

Table 2. Cronbach's Alpha for the six ViQ scales

a. (white-collar workforce sample, N=2,405)

b. (self-exploration sample, N=5,650)

c. (mass media sample, N =68,532)

	a	**b**	**c**
ViQ *S*	.67	.65	.64
ViQ *A*	.75	.74	.74
ViQ *O*	.75	.73	.72
ViQ *P*	.83	.86	.86
ViQ *Se*	.66	.68	.69
ViQ *St*	.83	.71	.71

Despite the ViQ's stable orthogonal factor structure, some scales are substantially correlated throughout the three samples. ViQ *S* and ViQ *P* scales showed a negative correlation of approximately r = -.40; ViQ *S* and ViQ *C* showed a positive correlation of approximately r = .50, and ViQ *C* and ViQ *P* showed approximately r = -.43. All other correlations were below r = .15.

Throughout all three samples, statistically significant differences ($p < .05$) between men and women were found for most scales. Men showed higher scores than women on the ViQ *S*, ViQ *O*, and ViQ *Se* scales and lower scores on the ViQ *P* scale. No significant differences were found for the ViQ *A* and ViQ *St* scales. Effect sizes were small with the largest effect on the ViQ *P* scale, were men showed a mean value of -.12 and women a mean value of .05 after z-standardization.

All variables showed small, but significant, negative correlations with age. The largest of these correlations was found in the *self-exploration sample* for ViQ *O* (r = -.18).

Retest Reliability

ViQ dimension retest correlations within a sub-sample of the *white-collar workforce sample* (N=30) varied from r = .67 for ViQ *A* to r = .91 for ViQ *P* (*Table 3*). These figures are satisfactory considering the time span between both tests of approximately one year. The ViQ *A* scale's being less stable than the other scales may be due to a learning process in detecting and interpreting subtle patterns. As mentioned, a quick recognition of symbols and icons is the key aspect of measuring automatic processing. Another reason for the lower stability of this scale could be that intuition is expected to be relatively spontaneous and sensitive to context changes.

*Table 3***.** Correlation coefficients for retest analysis

(N=30, time between tests approx. one year)

	ViQ S_{re}	ViQ A_{re}	ViQ P_{re}	ViQ O_{re}	ViQ Se_{e}	ViQ St_{re}
ViQ *S*	**.75 ****	-.27	-.41 *	-.57 **	.47 **	-.02
ViQ *A*	.00	**.67 ****	-.06	.24	-.18	-.11
ViQ *P*	-.34	.04	**.91 ****	.19	-.66 **	-.12
ViQ *O*	-.29	.26	.07	**.67 ****	-.08	-.24
ViQ *Se*	.45 *	-.30	-.54 **	-.20	**.88 ****	.20
ViQ *St*	-.23	.13	.16	.11	.01	**.80 ****

*notes: *p<.05, **p<.01*

Incremental validity of the implicit ViQ above explicit self-reports

We conducted hierarchical regression analyses to examine whether the ViQ can explain additional variance to variance explained by self-reports in behavioral variables that were observed in the above mentioned assessment centers and job performance questionnaires. For those behavioral variables, where both a self-report and the ViQ could explain part of the variance, we entered a self-report scale in step 1 and the corresponding ViQ model in step 2. Following a recommendation by Aiken and West (1991), predictor variables were standardized before calculating their interaction term. Dependent variables were standardized as well. The results are shown below.

ViQ versus MBTI

Study 1 (NAK 2006 sample)

In this study we used data of the *NAK 2006* sample to examine the predictive powers of the MBTI and ViQ for explaining variance in observations made on Behaviorally-Anchored Rating-Scales (BARS, Smith & Kendall, 1963) by trained personnel staff. Participants' behavior during five team tasks was rated by two independent observers. The median of inter-rater agreement was r = .65; internal consistencies α = .73.

In our data we found correlations between ViQ and MBTI for four of the ViQ scales. The bipolar MBTI scales referred to below reflect scores that were integrated by subtracting the latter pole from the former like this: E/I scale means E score minus I score. A positive correlation with this scale is thus pointing to the "E" pole. The ViQ *S* scale shows correlations with the MBTI's *S/N* scale (r=.41, p<.05), the *T/F* scale (r=.28, p<.05) as well as the *J/P* scale (r=.28, p<.05). The ViQ *P* scale correlates with MBTI *S/N* scale (r=-.28, p<.05). The ViQ *O* scale correlates with MBTI *J/P* scale (r=.22, p<.05). And finally the ViQ *Se* scale shows a correlation with MBTI's *S/N* scale (r=.45, p<.05) and *J/P* scale (r=.25, p<.05).

In sum, there are significant but low correlations between the two instruments. The fact that correlations are low is in line with the notion that the visual questionnaire measures the implicit, the self-report questionnaire the explicit facets of personality, even if they are derived from the same theoretical background (e.g. Jungian typology). Nonetheless, the directions of correlations among MBTI and ViQ scales are largely consistent with theoretical expectations. Especially the scales *specific information processing* and *need for security* show moderately positive correlations with the MBTI dimensions Sensing and Judging.

Both tests can explain variance in observations made during the assessment center (AC). Correlations were found between four AC observations and the MBTI: *solution orientation in a negotiation role-play on even terms* correlated with the MBTI *S/N* scale

(r=.26, p<.05), *conceptual thinking in a picture interpretation exercise* with the MBTI *S/N* scale (r=.33, p<.05*) conceptual thinking in a hypothesis-building exercise* also with the MBTI *S/N* scale (r=-.27, p<.05) and finally *conceptual thinking in an oral presentation exercise* with the MBTI *J/P* scale (r=-.33, p<.05).

The relationships with the ViQ were tested employing regression analysis, because this allowed testing for interaction effects that are essential to the theoretical background of the ViQ. Our data allowed testing for two-way interactions only because higher order interactions require a larger number of cases. Significant relationships for the ViQ were found for four AC observations.

1. *Conceptual thinking in a hypothesis-building exercise* showed significant relationships with an interaction model for scales ViQ *S* and ViQ *P* (R=.33, F(3,67)=2.79, p<.05) and with a simple model for the scale ViQ *Se* (R=.25, F(1,69)=4.18, p<.05). Results indicated that individuals which did not use specific information processing and personal classification scored almost one standard deviation less than the average. A strong need for security was detrimental to conceptual thinking.

2. *Motivation in a practical teamwork exercise* was related with an interaction model for ViQ *S* and ViQ *St* (R=.43, F(3,67)=5.00, p<.01) and with simple main effect models for scales ViQ *A* (R=.24, F(1,69)=4.36, p<.05) and ViQ *St* (R=.26, F(1,69)=4.83, p<.05). Using the automatic mode of information processing and seeking for stimulation were both detrimental for this exercise, which afforded a high degree of detail orientation and planning. Using the specific mode of information processing (object recognition) combined with being low on stimulation seeking, however, substantially enhanced the observable motivation in this task about one standard deviation above the average.

3. *Solution orientation in a negotiation role-play from an inferior position* showed a relationship with an interaction model for ViQ *A* and ViQ *O* (R=.38, F(3,67)=3.81, p<.01). Individuals with a disposition to use both automatic information processing and objective

classification were far less solution oriented in this task, were participants had to negotiate a quite unfavorable position. However, the combination of using objective classification without automatic behavior control turned out to be the superior strategy.

4. *Solution orientation in a negotiation role-play on even terms* related to a simple model with the ViQ *A* scale ($R=.24$, $F(1,69)=4.26$, $p<.05$). Again, an automatic information processing style turned out to be maladaptive although this negation situation was more convenient.

To sum it up, the intuitive mode of information processing turned out to be less adaptive compared to a specific and planning-oriented mode of thinking in this simulation of different work contexts.

For two of these observations both instruments (explicit self-report and implicit visual questionnaire) can explain part of the variance and for those we examined how much variance the ViQ could contribute on top of the variance explained by the MBTI. The hierarchical regressions conducted for this purpose were set up by entering the MBTI scale that showed correlation with the AC scale in question in step 1, and then entering one of the regression models for the ViQ that showed a relationship with that scale in step 2. The significant results show an addition to the MBTI's R^2 of .040 and .165 that is an increase of 57.97% and 220.00% respectively (*Table 4)*. These percentage values should be taken with some caution as there are arguments for downscaling as well as for upscaling them a few points: First, part of the increase is of course owed simply to mathematical reasons, as any additional variable entered into a regression model leads to an increase in R^2. The ViQ gets a slight advantage from this because the ViQ's interaction models bring in three variables compared to the MBTI's single variable. Second, however, higher level interactions models for the ViQ scales might help to explain more variance, even increasing the percentages. Testing such models will require studies with larger samples and replication studies in the future.

Table 4. Hierarchical Regression of MBTI and ViQ scales on behavioral variables observed in an assessment center

		Step 1: MBTI			Step 2: ViQ		
Dependent	n	Variable entered	ΔR^2	F	Variable(s) entered	ΔR^2	F
Solution orientation	70	MBTI_S/N	.069*	5.01[a]	ViQ *A*	.040[†]	3.02[b]
Conceptional Thinking	70	MBTI_S/N	.075*	5.48[a]	ViQ *S*, ViQ *P*, ViQ *S**ViQ *P*	.165**	4.71[c]
Conceptional Thinking	70	MBTI_S/N	.075*	5.48[a]	ViQ *Se*	.019	1.40[b]

[a]*df*=1,68. [b]*df*=1,67. [c]*df*=3,65.

†*p*<.10 **p*<.05 ***p*<.01

Study 2 (NAK 2007 sample)

The focus here was to compare the predictive power of ViQ and MBTI for the eight scales of the supervisor ratings collected for the participants of this sample and we found that both tests can explain a good proportion of variance in these scales. This was expected, because the supervisor rating scales were specifically designed to measure correlates of Jungian types.

Between both tests exist significant correlations of moderate strength, namely between three of the ViQ scales with MBTI scales. Again integrated scales were used so that a positive correlation to a scale points to the former of the two letters naming the poles. The ViQ *S* scale shows correlations with the MBTI's *S/N* scale (r=.44, p<.05), the *T/F* scale (r=.21, p<.05) as well as the *J/P* scale (r=.32, p<.05). The ViQ *P* scale correlates with MBTI *E/I* scale (r=.21, p<.05), *S/N* scale (r=-.44, p<.05) and *J/P* scale (r=-.42, p<.05). And finally the ViQ *Se* scale

shows a correlation with MBTI's *S/N* scale (r=.32, p<.05) and *J/P* scale (r=.31, p<.05). Again, the correlations between both tests indicate that both measure independent aspects of personality (implicit versus explicit facets) but also show meaningful overlap.

On four of these scales we found significant correlations with the MBTI and for five scales we found relationships with the ViQ. The correlations with the MBTI are on the scales *complex* with MBTI *T/F* scale (r=.23, p<.05), *vague* with MBTI *T/F* scale (r=-.26, p<.05), *precise* with MBTI *J/P* scale (r=.21, p<.05), and *firm* with MBTI *T/F* scale (r=.28, p<.05). We used bivariate correlation analysis for this.

The relationships with the ViQ were tested in the same way as in study 1. Significant relationships for the ViQ were found on the scale *unaccommodating* with an interaction model for scales ViQ *S* and ViQ *St* (R=.29, F(3,93)=2.85, p<.01) and with an interaction model for scales ViQ *P* and ViQ *St* (R=.37, F(3,93)=4.99, p<.01). While people high on a specific information style and low on stimulation seeking were perceived as unaccommodating by their supervisors, the reverse was true for participants high on personal classification and stimulation seeking.

For the scale *vague* the same interaction models were significant; for scales ViQ *S* and ViQ *St* (R=.34, F(3,93)=4.17,p<.01) and ViQ *P* and ViQ *St* (R=.39, F(3,93)=5.61, p<.01). Participants low on *S* and high on *P* and *St* and were perceived as vague.

For the scale *hectic* we found an interaction model for the scales ViQ *S* and ViQ *St* (R=.40, F(3,93)=5.73, p<.01) and with a simple model for the scale ViQ *A* (R=.20, F(1,95)=3.98, p<.05). People with a propensity to be not specific but stimulation seeking were perceived as hectic, as well as people with a disposition to use automatic information processing.

On the scale *precise* with an interaction model for scales ViQ *A* and ViQ *O* (R=.30, F(3,93)=2.99, p<.05) and with a simple model for the scale ViQ *A* (R=.20, F(1,95)=4.01,

p<.05). An automatic information processing style makes people less precise, especially when objective classification is low.

On the scale *pedantic* with an interaction model for scales ViQ *S* and ViQ *O* (R=.35, F(3,93)=4.19, p<.01) and with an interaction model for scales ViQ *S* and ViQ *St* (R=.33, F(3,93)=3.70). People using both specific information and objective classification were perceived as pedantic, as well as people who process information specifically and do not tend to seek stimulation.

On two of the supervisor rating scales – *vague* and *precise* – both tests can explain part of the variance and for those scales we examined how much variance the ViQ could contribute on top of the variance explained by the MBTI. The hierarchical regressions conducted for this purpose were set up by entering the MBTI scale that showed correlation with the job performance scale in question in step 1, and then entering one of the regression models for the ViQ that showed a relationship with that supervisor rating scale in step 2. The results show an addition to the MBTI's R^2 of .030 to .142 that is 71.43% to 208.82% with an average of 145.18% (*Table 5)*.

Table 5. Hierarchical Regression of MBTI and ViQ scales on behavioral variables observed in a job performance questionnaire

		Step 1: MBTI			Step 2: ViQ		
Dependent	n	Variable entered	ΔR^2	F	Variable(s) entered	ΔR^2	F
Vague	97	MBTI_TF	.068*	6.99[a]	ViQ *S*, ViQ *St*, ViQ *S**ViQ *St*	.104*	3.90[b]
Vague	97	MBTI_TF	.068*	6.99[a]	ViQ *P*, ViQ *St*, ViQ *P**ViQ *St*	.142**	5.57[b]
Precise	97	MBTI_JP	.042*	4.21[a]	ViQ *A*, ViQ *O*, ViQ *A**ViQ *O*	.062†	2.15[b]
Precise	97	MBTI_JP	.042*	4.21[a]	ViQ *S*, ViQ *St*, ViQ *S**ViQ *St*	.030†	3.06[c]

[a]*df*=1,96. [b]*df*=3,93. [c]*df*=1,95.

†*p*<.10 **p*<.05 ***p*<.01

ViQ versus NEO/FFI

Study 1 (NAK 2006 sample)

In this study the *NAK 2006* sample served to compare ViQ and NEO/FFI ("Big Five") for explaining variance in observations made during the assessment center (AC).

ViQ and NEO/FFI correlated for three of the ViQ scales. The ViQ *S* scale shows a negative correlations with the NEO/FFI O*penness* scale ($r=-.23$, $p<.05$), and the *Agreeableness* scale ($r=-.33$, $p<.05$). The ViQ *A* scale also shows a negative correlation with the NEO/FFI *Agreeableness* scale ($r=-.29$, $p<.05$). The ViQ *P* scale shows correlations with the NEO/FFI *Openness* scale ($r=.30$, $p<.05$).

As expected, the two instruments show lower correlations compared to the MBTI, which is due to their different theoretical background. However, the correlations still tend to be meaningful.

Both tests can explain variance in observations made during the assessment center (AC). Correlations were found between three AC observations and the NEO/FFI: *motivation in a practical teamwork exercise* correlated with the NEO/FFI *Neuroticism* scale ($r=-.25$, $p<.05$), *solution orientation in a negotiation role-play from an inferior position* also with the NEO/FFI *Neuroticism* scale ($r=-.25$, $p<.05$*)* and *conceptual thinking in a hypothesis-building exercise* showed a relationship with the NEO/FFI *Openness* scale ($r=.33$, $p<.05$).

For relationships between ViQ and AC observations, please see the section on *ViQ versus MBTI, Study 1.* For three of the AC observations both tests explain part of the variance. The results of the hierarchical regressions show an additional contribution of the ViQ to the NEO/FFI's R^2 of .039 to .126 equaling an increase of 61.90% to 185.71% with an average of 131.16% (*Table 6)*.

Table 6**.** Hierarchical Regression of NEO and ViQ scales on behavioral variables observed in an assessment center

		Step 1: NEO			Step 2: ViQ		
Dependent	n	Variable entered	ΔR^2	F	Variable(s) entered	ΔR^2	F
Motivation	68	Neuroticism	.063*	4.46[a]	ViQ *S*, ViQ *St*, ViQ *S**ViQ *St*	.117*	3.01[b]
Motivation	68	Neuroticism	.063*	4.46[a]	ViQ A	.039†	2.82[c]
Motivation	68	Neuroticism	.063*	4.46[a]	ViQ A	.029	2.05[c]
Solution orientation	68	Neuroticism	.062*	4.33[a]	ViQ *A*, ViQ *O*, ViQ *A**ViQ *O*	.100†	2.51[b]
Conceptual thinking	68	Openness	.109**	8.07[a]	ViQ *S*, ViQ *P*, ViQ *S**ViQ *P*	.126*	3.45[b]
Conceptual thinking	68	Openness	.109**	8.07[a]	ViQ *Se*	.036	2.72[c]

[a]*df*=1,66. [b]*df*=3,63. [c]*df*=1,65.

†*p*<.10 **p*<.05 ***p*<.01

Study 2 (NAK 2007 sample)

ViQ and NEO/FFI were compared in their explanatory power for the eight scales of the supervisor ratings collected for the participants *NAK2007* sample.

Between five of the ViQ scales and four of the NEO/FFI scales significant correlations were found. The ViQ *S* scale shows negative correlations with the NEO *Extraversion* (r=-.23, p<.05) and *Openness* scales (r=-.27, p<.05). The ViQ *A* scale correlates with NEO *Extraversion* scale (r=.19, p<.05). The ViQ *P* scale correlates with NEO *Extraversion* (r=.25, p<.05) and *Openness* scales (r=.34, p<.05).

The NEO/FFI showed considerably less correlation with the supervisor ratings than either MBTI or ViQ. This was no surprise, because the supervisor rating scales were

specifically designed for the Jungian personality concepts. However, significant effects could be found on two scales, namely *unaccommodating* with *Neuroticism* (r=.20, p<.05) and with *Agreeableness* (r=-.21, p<.05) and *precise* with *Agreeableness* (r=.20, p<.05). Fortunately for our examination for both these scales relationships exist with the ViQ (see *ViQ versus MBTI, Study 2*), so both could serve to examine the addition to R^2 contributed by the ViQ: The results show an addition on top of the R^2 explained by the NEO/FFI of .041 to .144 that is an increase of 100.00% to 351.22% with an average of 193.85% *(Table 7)*.

Table 7. Hierarchical Regression of NEO and ViQ scales on behavioral variables observed in supervisor ratings

		Step 1: NEO			Step 2: ViQ		
Dependent	n	Variable entered	ΔR^2	F	Variable(s) entered	ΔR^2	F
Unaccommodating	97	Neuroticism	.041*	4.06[a]	ViQ *S*, ViQ *St*, ViQ *S**ViQ *St*	.069†	2.41[b]
Unaccommodating	97	Neuroticism	.041*	4.06[a]	ViQ *P*, ViQ *St*, ViQ *P**ViQ *St*	.144**	5.46[b]
Unaccommodating	97	Agreeableness	.046*	4.59[a]	ViQ *S*, ViQ *St*, ViQ *S**ViQ *St*	.056	1.92[b]
Unaccommodating	97	Agreeableness	.046*	4.59[a]	ViQ *P*, ViQ *St*, ViQ *P**ViQ *St*	.120**	4.45[b]
Precise	97	Agreeableness	.041*	4.15[a]	ViQ *A*, ViQ *O*, ViQ *A**ViQ *O*	.066†	2.28[b]
Precise	97	Agreeableness	.041*	4.15[a]	ViQ *A*	.041*	4.21[c]

[a]*df*=1,96. [b]*df*=3,93. [c]*df*=1,95.

†*p*<.10 **p*<.05 ***p*<.01

ViQ versus HAKEMP (Action Control Scales)

Our last study which compared the predictive power of Kuhls Action Control Scale (1994) and the ViQ took place at an outdoor assessment center organized by the Ellernhof, a provider of outdoor team trainings, leadership trainings and assessment centers near Lueneburg (*Ellernhof 2006 sample)*. Participants worked on five different outdoor team tasks. *Building a bridge on a lake*: Participants worked in teams of 5-6 members and had to use diverse prepared materials they found in the forest nearby. *Mohawk Walk*: Participants had to help each other overcoming obstacles while climbing on cables and beams approximately 2 feet above the ground. *Labyrinth in the dark*: Participants had to find their way together through a labyrinth in complete darkness, interrupted by problem solving tasks given to them partly by intercom and partly by written messages they found on their way (they could be read by lighting a limited number of matches). *Harnesses:* Two participants had to help each other putting on the harnesses. *Giant Ladder*: 5-6 participants had to help each other climbing a "ladder" consisting of six massive beams approximately 6 feet apart from each other up to a height of about 30 feet. *Flying Eagle:* At the end of the day participants "sailed" down on a rope from about 25 feet above the ground. Trained observers who had shown inter-rater-agreement above .80 with outdoor training experts made scores on Behavior Expectation Scales which measured *involvement* into these team tasks, i.e. willingness to participate, to help others, to make suggestions to others, generally to show effort and motivation. All these aspects are highly correlated (internal consistencies were above .80) and were therefore summed up to a general score of involvement.

Correlations between ViQ and HAKEMP, the German version of Kuhl's Action Control Scale were found for the *State Orientation* scale with ViQ *S* ($r=.40$, $p<.05$) and ViQ *Se* ($r=.34$, $p<.05$).

HAKEMP *State Orientation* showed a negative association to *involvement* in the outdoor assessment center ($r=-.39$, $p<.05$). Thus, as expected the positive pole Action Orientation is positively associated with involvement. Also as expected, the ViQ *St* scale

showed a positive correlation with *involvement* (r=.40, p<.05). Because State Orientation and need for Stimulation are independent, the ViQ can explain an additional variance of R^2=.154 equaling an increase of 73,38% *(Table 8).*

Table 8. Hierarchical Regression of HAKEMP and ViQ scales on behavioral involvement observed in an outdoor assessment center

		Step 1: Hakemp			Step 2: ViQ		
Dependent	n	Variable entered	ΔR^2	F	Variable(s) entered	ΔR^2	F
Involvement	32	Lop_Hop	.154*	5.45[a]	ViQ *St*	.113*	4.47[b]

[a]*df*=1,30. [b]*df*=1,29.

**p*<.05

Participants with an action oriented self-concept in the HAKEMP and an implicit need for Stimulation in the ViQ are thus highly involved in the thrilling experience of mastering a challenging outdoor assessment center. This makes sense from the perspective of PSI theory.

Results and Discussion

Across three samples consisting of more than 70.000 participants from diverse socio-demographic background and age we were able to confirm six well identified and robust factors that consist of optical stimuli. These stable factors can help to take an implicit approach to personality profiles: Although comprised of only four to six items each, the scales defined by these factors show quite substantial internal consistencies and retest-correlations reaching .70 or more. Two scales, specific information processing (S) and need for security (Se), were somewhat less satisfactory, because both indicators of reliability were slightly below .70. Adding another item to these scales should suffice to remedy this - future developments and research will address this point. To our knowledge, explicit self-reports

never reach this levels of reliability, robustness and broadness with only 4-6 items per scale. This may be explained by the saying that *one picture speaks louder than a thousand words*. Thus, a measure of how individuals process and classify visual stimuli seems to be a highly promising and efficient approach to measuring implicit personality systems: Six stable and orthogonal scales can be measured in less than 5 minutes in a way that is highly attractive to participants.

A visual approach to measuring personality systems seems to be capable of tapping the implicit or subconscious facets of a personality. This is evident especially for the scales *Automatic information processing* (A), *Objective classification* (O) and *need for Stimulation* (St), which showed no statistically significant correlation at all with three widely used self-report measures (i.e. the NEO FFI, the MBTI, the Action Control Scale). This is remarkable, because A-types actually behave in an intuitive way (i.e. detect patterns and act accordingly), O-types actually think in a logical, analytical way, and St-types seek stimulation. But many of these types do not report this in self-reports. In real life, again, these types behave according to their implicit types, as the validation studies confirm.

The behavioral measures used in the validation patterns were quite relevant. For example, individuals low on specific information processing and personal classification as well as individuals high on need for security scored significantly lower on *conceptual thinking* (ViQ vs. MBTI, Study 1). The gain in explained variance in this highly career moving thinking style was 220% by using the ViQ in addition to the MBTI (see Table 4). Other important work-related behavioral patterns could only be explained by the implicit visual test. For example, using the automatic rather than the specific mode of information processing is detrimental for showing negotiation skills in an Assessment Center observed by experienced personnel staff.

Also, supervisor ratings could be better predicted by the implicit visual method than by the MBTI alone. The holistic thinking style associated with an automatic information

processing style, personal classification and stimulation seeking is perceived by supervisors as imprecise and vague. This career-relevant impression can be predicted by the visual method but not by the ENFP-scales of the MBTI (ViQ vs. MBTI, Study 2).

The gain in explained variance is evident also when combining the ViQ with the NEO-FFI. Conceptual thinking, for example, is well predicted by the *Openness* factor. Adding the scales *specific information processing* and *personal classification* however, raises the explained variance by 62% (see table 6). And while being *unaccommodating* is associated with neuroticism and low agreeableness, high specific information seeking as well as low personal classification and stimulation seeking adds substantially to this unlucky impression (see table 7).

The scales *Specific information processing* (S), *Personal classification* (P), and *need for Security* (Se) showed significant, but not very high, correlations. The two highest correlations found were those between Specific information processing (S) and need for Security (Se) with the MBTI *Sensing* scale. However, the shared variance between these scales is less than 20%. Correlations between ViQ and the Big Five (NEO FFI) were even less, at average they had about 10% common variance. The largest correlations here were the negative association of r =-.33 between Specific information processing (S) and Big Five *Agreeableness*, and the positive association of r = .34 between Personal classification (P) and *Openness*. In between these was the association between HAKEMP *State Orientation* and the ViQ scales Specific information processing (S) and need for Security (Se).

The sizes and directions of these correlations are according to expectations and may be interpreted as follows: there is some conscious access to three of the six implicit personality systems conceptualized by the ViQ: The more explicit systems seem to be *Specific information processing* (S), *Personal classification* (P) and *need for Security* (Se). Our data further indicate that *Sensors* in the MBTI, *Agreeable* and *Open* subjects according to the NEO FFI and *State Oriented* people in HAKEMP have greater conscious access to their implicit

personality systems. This is in accord with the theoretical background of these three research traditions. One exception is the finding that these self-report scales correlate negatively with *Personal classification* (P) rather than positively with *Objective classification* (O). Because *Objective classification* is related to Jung's concept of *thinking* we would have expected that this ViQ scale should correlate with self-report scales, rather than *Personal classification* which is related conceptually to Jung's *Feeling.* From the perspective of PSI theory, however, the finding makes sense: Because feeling should be associated with an activated extension memory, good access to conscious representations of experiences and relived episodes is probable.

The data of three studies using different behaviorally anchored rating scales at work and in assessment centers clearly indicated that all six ViQ scales are well suited to predict behavior in different contexts. All findings could be well integrated into the theoretical framework on which the ViQ was built. Overall, the ViQ had better explanatory power than any of the employed self-reports. It could provide a substantial increase in the explained variance in behavior, on average this increase was about 140%. Furthermore, in all studies the ViQ could explain variance in some behavior variables where the self-reports could not. Interestingly, the ViQ was much more successful in explaining the extremes or exaggerations of normal behavior (for example *unaccommodating* or *vague* behavior). This could be interpreted as another hint that the visual scales can predict the implicit, socially undesirable facets of behavior as well as the normal range.

General Discussion

In the last 10 years there has been a tremendous interest in new methods of measuring the implicit internal structures that control behavior. An internet search for the search term *Implicit Association Test* resulted in more than 200.000 entries. Also a search for the search term *Thematic Apperception Test* resulted in 157.000 entries. These numbers illustrate the ongoing interest of measuring implicit associations as building blocks of personality systems.

But these numbers also raise the question whether there is a need for a new method for measuring implicit personality systems. We want to argue that this question can be answered positively.

So far no implicit measurement approach has been strictly visual. McClelland, Koestner, & Weinberger (1989) argued that implicit motives have to be measured indirectly by content analysis of a subject's response to ambiguous pictures, but their focus remained on the response, i.e fantasy stories written to describe the picture. Operant tests have been developed that rely on this procedure, like the Thematic Apperception Test or the Operant Motive Test. In such tests participants with a strong implicit power motive have been shown to report more power-related contents, while achievement motivated participants would report more achievement related contents for the same picture. The results obtained with the ViQ indicate that perception is not primarily determined by the stimulus cues. Rather, perception is influenced to a high degree by implicit (i.e. unconscious) personality systems aroused when looking at the pictures as has been assumed before already by Atkinson & McClelland (1948) and McClelland, Atkinson, Clark, & Lowell (1953). Thus the main source of the documented validity of such tests may be the individual differences in participants' perception of stimuli in the pictures (Scheffer, 2005). We are confident that further research of the interaction of personality and perception will help to improve the overall reliability and validity of operant tests.

Secondly, research could profit from the visual approach because of the high stability and robustness of this method. As has been mentioned before, the factor structure of the ViQ is stable in very different samples, even in those, were participants made the test just for fun. The ViQ also seems to yield reliable results for less educated people and even children. Furthermore, recent research indicates that the factor structure of the ViQ is robust across different cultures, and that internal consistencies and construct validity of the ViQ seem to be stable over different cultures as well (Scheffer & Manke, in prep). Thus, the ViQ could serve

as a short and attractive and at the same time robust and valid method in the field of implicit personality research.

McClelland, Koestner, and Weinberger (1989) have shown that there is a need for implicit measures of personality, because implicit traits are very important for predicting a wide range of *operant* (i.e., self-initiated) behavior, while conscious traits, measured by self-reports, are more likely to predict *respondent* (i.e., externally controlled) behavior. The difference between operant and respondent behavior largely depends on the degree of control exerted by situational cues (Emmons & McAdams, 1991). Operant behavior is generated in a less constrained way than respondent behavior and occurs in ambiguous unstructured (i.e. entropic) situations, whereas respondent behavior occurs more frequent in structured situations. Thus, as has been demonstrated in this article, implicit representations seem to predict aspects of a respondent's personality that can not be predicted by explicit representations.

Third, the association of implicit personality systems with operant behavior makes them highly valuable for market research. Among marketing experts there is growing consensus that the information overload of consumers is a major reason for products being forced from the market. Zaltman (2003) reviews stunning evidence that 80 percent of all new products or services fail within six months or fall significantly short of forecasted profits. Such a failure rate of new products means an incredible waste of resources. The cost of this phenomenon is tremendous – in terms of lost revenues, low customer satisfaction, and in terms of low employee motivation. Information overload, "chaos" and entropy are exactly the environment were operant behavior, regulated by implicit personality systems, dominates over respondent behavior, regulated by explicit personality traits (McClelland et al., 1989; Zaltman, 2003). Because understanding the consumers' psyche has always been the cornerstone of effective marketing and advertising (LaBarbera, Weingard, & Yorkston, 1998), an easy to use and robust method for measuring implicit personality systems may help to

overcome the remarkable neglect of personality variables in consumer research and marketing, were socio-demographic variables and sociological concepts like "life styles" still remain dominant for explaining behavior.

Finally, because its procedure is based on design elements, consumer profiles created with the ViQ can be easily translated back into advertising visuals and product designs that meets the perceptional preferences of the target group. A study conducted by LaBarbera et al. (1998) demonstrated that using visuals that are consistent with type preferences boosts advertising effectiveness; this could be further systematized and extended to implicit personality systems by applying the ViQ technology. A recent study conducted in collaboration with the German market research institute GfK demonstrated the validity of the approach (Scheffer & Loerwald, 2009): pairwise comparisons of two advertising concepts – one designed in congruence with the results of the ViQ, the other without knowledge of the Implicit Personality System of the target group – yielded a preference twice as high for the congruent concept as for the incongruent concept. Working with a visual approach to personality as a test method may help reduce the usually very high failure rate of new products (up to 99% in some markets) and save valuable resources in terms of lost revenues and profits, lower customer satisfaction and employee motivation.

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