CREATIVITY IN ACADEMIC SETTINGS:

EXPERIMENTAL VERSUS CONCEPTUAL APPROACHES

by

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ABSTRACT

Creativity in Academic settings: Experimental Versus Conceptual Approaches

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Common methods that have been used to study creative achievement include nomothetic and ideographic approaches. While providing some valuable findings, such methods have considerable limitations: the nomothetic approach minimizes individual differences among creators; the ideographic approach does not necessarily generalize well. A potential resolution to this problem is Galenson's (2001) "finder-seeker" typology, which identified two types of creators based on their approaches to creative tasks and career trajectories. Finders are characterized by a deductive approach and earlier career peaks, seekers, by the opposite tendencies. While this typology is promising as a unifying theory of creativity, so far it relies heavily on qualitative observations, and its statistical properties have not been studied in detail. For instance, is the finder-seeker distinction a one-dimensional or multi-dimensional distinction?

The main goal of this study was to create and examine a new paper-and-pencil self-report instrument, the Creative Approach Questionnaire (CAQ), to quantitatively assess the nature of Galenson's typology. The second goal was to understand the relationship of the CAQ to existing psychological constructs, such as ambiguity tolerance, need for cognition, creative thinking, and others.

The 40-item CAQ (including 20 "finder" items and 20 "seeker" items) was given to 105 undergraduate students, together with six other psychological measures. Item analyses and internal consistency measures of the CAQ yielded refined measures of the

finder and seeker subscales. The correlation between the two subscales was zero, suggesting that the constructs of finders and seekers are independent. Comparisons of scores on the two subscales with the other measures suggest that Galenson's typology can be "psychologized" and is actually related to a number of other constructs that psychologists have studied, including ambiguity tolerance, creativity, and Eastern versus Western thinking styles. General implication and future directions for continued refinement and application of the CAQ are discussed.

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CHAPTER 1: INTRODUCTION

How can we understand creative achievement? How varied are the kinds of approaches to solving creative problems that different people employ? Are there many paths to high levels of creativity, or only one? If there is only one path, how can we characterize the elements constituting this path? If there are many paths, to what extent do they share common elements, and what might those common elements be? To what extent can an individual creator adopt a wide range of different approaches to solving creative problems? Are differences in approaches to creative problems systematically related to other differences, such as when in their lives creators produce their best work, personality factors, or other constructs that psychologists have studied? This dissertation aims to begin to answer these complex questions.

Over the past fifty or so years, psychologists have had a variety of methods at their disposal for studying creative achievement (see, e.g., Sternberg, 1999). For instance, some researchers have adopted a nomothetic approach; that is, they have attempted to find very general patterns in creative thinking and creative productivity. Considerable research in the nomothetic tradition has addressed how creative productivity varies over the lifespan (Dennis, 1966; Lehman, 1953; Simonton, 1991, 1994, 1997, 2003a, 2003b). One common finding in this line of research is that across many domains, creators' most important contributions tend to be made around age 40, the age when creators are generally most productive (Simonton, 1991, 1994, 1997). However, there is great variability in the age at which creators produce their most renowned work, and most of this research has not focused on individual differences within domains. Instead, creators from different historical periods and who perhaps have

very different approaches to creative problems are lumped together into one aggregate trajectory.

A contrasting tradition of creativity research is the ideographic approach, which focuses on intensive investigations of creative individuals (e.g., Dasgupta, 2003; Gruber, 1981; Gruber & Wallace, 1999; Kozbelt, in press; Wallace & Gruber, 1989). These researchers tend not to generalize their findings to a number of creative individuals but rather attempt to explain individual and potentially idiosyncratic instances of creativity. Gruber and Wallace (1999) describe their approach to studying creativity as cognitive-historical case studies. Their goals are to provide "detailed analytic and sometimes narrative description of each case and efforts to understand each case as a unique functioning system" (Gruber & Wallace, 1999, p. 93). They also tend to try answering specific questions about that individual's creativity. For instance, Gruber (1981) wanted to understand how Darwin devised the theory of evolution by natural selection. Dasgupta (2003) sought to know how Herbert Simon was able to achieve "Renaissance man" status in the ultra-specialized twentieth century. Kozbelt (in press) attempted to understand how the art historian E. H. Gombrich was able to develop profound, prescient ideas about the nature of creativity without emphasizing creativity *per se* as an explicit focus of his scholarly research.

Both the nomothetic and ideographic approaches have provided valuable findings on the nature of creativity; however, both have important (and complementary) limitations. As already noted, the nomothetic approach largely ignores individual variation among creators. However, this individual variability need not only represent random error variance; rather, such differences could inform some basic aspects of the

nature of creativity. Also, since the nomothetic approach has tended to treat creativity essentially as a statistical phenomenon, with quality emerging from quantity (see, e.g., Simonton, 1997), this perspective has typically not informed the underlying psychological mechanisms and processes of creative thinking particularly well.

On the other hand, the goal of the ideographic approach is often to address the details of an individual's psychological processes, but these can be highly idiosyncratic and, moreover, lack integration, since case studies can be done by researchers who are interested in fundamentally different questions, using different data sources, theoretical frameworks, and analytical techniques. Thus, the ideographic approach does not easily allow for meaningful generalizations.

A method consolidating or combining the best aspects of the nomothetic and ideographic approaches would help in overcoming this impasse and potentially uncover new constructs and directions for creativity research in general. One way of resolving this issue would be to devise a classification system of different types of creators that would account for observed individual differences in variables such as career trajectories or approaches to solving creative problems. In such a scheme, the categories would provide more general nomothetic information, but the differences among individual creators' thinking and careers would still constitute a rich source of case study-like data.

Indeed, even within a domain, individuals do appear to vary a great deal in their approaches to creative problems and in their career trajectories. For a full understanding of the nature of creativity, it is important to understand these differences and to be able to make sense of them. One pioneering effort along these lines was Galenson's (2001) study of the careers of 99 famous French and American visual artists from the last two

centuries. Galenson discovered that variation in career trajectory (the age when artists produced their best work) is systematically related to variation in how artists approach the task of creating artworks. More recent research by Galenson (2002, 2003, 2004a, 2004b, 2004c, 2005) has provided further support for this typology and relation, in additional domains like poetry, architecture, and film direction.

This provocative typology, which spans levels of analysis that are rarely combined or integrated, has the makings of a more or less unifying framework for understanding many important aspects of creativity. However, perhaps because the typology was introduced rather recently and because it is the work of an economist rather than a psychologist, it has not yet entered the mainstream of psychological research on creativity, although some recent research has drawn upon it very directly, with positive results (see, e.g., Kozbelt, in press; Kozbelt & Durmysheva, in press). Since the promise of Galenson's typology is considerable, it is important to understand, test, explore, and extend its implications, as will be attempted in the present dissertation study.

Since Galenson's (2001, 2004a, 2005) typology is the main foundation of the present dissertation project, it will now be discussed in some detail. The main goals of the project are to attempt to "psychologize" Galenson's ideas by understanding the statistical nature of this typology (that is, how the constructs of being a finder versus being a seeker are related) and to relate each of these constructs to existing psychological measures that have been described in the literature. Doing so will be an important step in better understanding the nature of Galenson's typology.

Galenson's finder-seeker typology

Galenson's (2001) discovery that modern artists' career trajectories are systematically related to their creative approaches rests on two different sets of data, which incorporate methodological techniques from both the nomothetic and ideographic approaches to creativity. First, the career trajectories and career peaks of 99 artists were established quantitatively. Career peaks were defined by the period of each artist's career with the highest auction prices as well as the period that was most frequently illustrated in the art history books. Across artists, these two measures were found to yield very similar career peak estimates, suggesting that artists show reliable individual differences in the course of their career trajectories. By each of these measures, some creators produced their best works at very early stages of their careers, while others produced their best works at later stages, sometimes right at the end of their lives.

Prototypical examples of these two opposing trends are the artists Pablo Picasso and Paul Cézanne. Picasso's most renowned period of work was done in his mid- to late-twenties. In addition, his most renowned painting, *Les Demoiselles d'Avignon*, was created when he was just 25 years old; indeed, this is the most frequently reproduced of *all* modern French paintings (Galenson, 2004a). Thereafter, despite producing many great works, the average quality of Picasso's paintings is seen to have declined in a basically linear way essentially until his death at age 91. In addition, Picasso is known primarily for a few standout individual works, like *Les Demoiselles d'Avignon* and *Guernica*, rather than for a general style or for an overall body of work.

In contrast to Picasso, Cézanne's work constantly improved over the course of his career, and he produced his most valued and renowned paintings the year he died, when

he was 67 years old. Moreover, although he ranks third among modern French painters in terms of total number of illustrations in art history books (Galenson, 2004a), none of his individual paintings make the top ten list of most frequently reproduced modern French paintings. Thus, in contrast to Picasso, Cézanne's reputation rests on an overall body of work of fairly even quality, rather than specific, individual outstanding contributions.

In addition to these major differences in career peaks and trajectories, Galenson (2001) found differences in how creators approach the task of creating works of art. Galenson divided creators into two main types based on their approaches, and, interestingly, these groups also systematically differ in career peak ages (as in the contrast between Picasso and Cézanne just described).

One group, known as finders, or conceptual innovators, has a largely deductive approach to creativity. Their motivation comes from a desire to express their ideas through their work. They usually know exactly what they are trying to achieve, and, as a result, set very concrete goals for themselves while working and work with great confidence in the path they have chosen. Conceptual innovators usually plan their work in advance. By the time they begin working, they can usually imagine what a final product would be like. For these artists, the basic idea or concept behind a work is the important thing; the execution of the idea is straightforward and often perfunctory. Indeed, in extreme cases, a highly conceptual artist could have another person execute the work itself, based on the concept or algorithm devised by the artist. Because finders conceptualize the creative process as a very well-defined problem, once finders have expressed the ideas intended for a particular project, they have no problem finishing it

and moving on to a new one, which will often be quite different in nature from previous projects. Indeed, conceptual innovators' careers are often characterized by a series of dramatic innovations and stylistic discontinuities. Galenson noted that a true conceptual innovation, which involves changing the rules of a domain in some fundamental way, could theoretically happen at any point in a finder's career. However, in practice, such artists commonly come up with their best work at a relatively early age, as Picasso did. In part this may be due to being less entrenched in a paradigm earlier in their career compared to later in their career. In part this early peak also reflects the fact that by radically rewriting the rules of a domain, such artists can partly circumvent the normally lengthy process of expertise and skill acquisition, since traditional techniques often play little or no role in their work.

In contrast, aesthetically motivated experimentalists, or "seekers," show a very different approach (and substantially later career peaks) than finders. Seekers are empiricists who work inductively, often without a guiding aesthetic theory. They rely much more on sensations and perceptions than ideas, in contrast to finders. Seekers do not have well defined goals, approach work through trial and error, and use visual rather than conceptual criteria to judge the progress and completion of a work. Seekers rarely make plans or sketches in advance, even for rather major works. They learn by repeating the same theme over and over again in order to develop and improve their technique. Seekers produce a lot of creative work but make few radical innovations, and almost never are the innovations encapsulated in single breakthrough works that are discontinuous with what preceded them. Seekers are typically rarely satisfied with their efforts. As a result, it is very difficult for them to finish a project and move on to a new

one. They may continue to revisit, revise, and rework paintings for years. However, over time, seekers build on a foundation of skill and experience. Indeed, the visual and executive skills that are valued by seekers, and that are important for guiding their otherwise somewhat chaotic way of working, simply require extensive practice over a period of years for their full development. Since such skills cannot be faked, it is difficult or impossible for seekers to produce their best work early in their careers. This stands in contrast to finders, who can produce noteworthy contributions early in their careers precisely because they reject the kinds of traditional skills that take a long time to develop. Thus, like the prototype, Cézanne, seekers usually produce their best work in their maturity.

Galenson was not the first investigator to notice these differences among artists. As Kozbelt (in press) noted, the art historian E. H. Gombrich (1984) described two approaches to creativity that are rather similar to those that characterize seekers and finders:

> Creative articulation can take two almost opposite directions. The artist can strain the medium in an effort to extend its range and thus to discover novel possibilities at the extremes…But he [or she] can also make discoveries by refining his medium, by introducing a more subtle calibration…More dramatic innovations are more easily described and appreciated than their miracles of refining…[This has] introduced a bias into the discussion of artistic achievements which is far from healthy" (pp.

206-207).

In the Gombrich quotation, the description of the first artist is rather similar to that of a finder, while the second description resembles that of a seeker.

Extension and refinements of Galenson's finder-seeker typology

While Galenson's (2001) initial research focused on modern French and American artists, more recent work has developed this typology in several important ways. First, it has been extended to other domains and time periods, including Renaissance artists (Jensen, 2004), as well as experts in other artistic domains, poets (Galenson, 2003), novelists (Galenson, 2004c), playwrights, architects, and movie directors (Galenson, 2004b), and an art historian (Kozbelt, in press). Thus, the basic distinction between two fundamental approaches to creative productivity appears not to be an artifact of the domain of modern visual art but instead seems to be a general feature of creativity that applies to many real-world domains.

Second, the nature of the typology, specifically the relation between finders and seekers, has been elaborated somewhat in more recent work. Specifically, while Galenson's (2001) original characterization of finders and seekers was presented as a dichotomous typology, more recent accounts have softened this view. For instance, Galenson (2004a) suggested that seekers and finders are not mutually exclusive categories but are rather endpoints on a continuum. In this view, some creative individuals exhibit a mixture of characteristics of both experimental and conceptual innovators, as though they are in the middle of the continuum, rather than at an endpoint.

For example, describing the style that the painter Claude Monet used in his work, Galenson (2004a) noted that even though the painter made some preparatory sketches (as one would expect with finders), the sketches were not straightforward but rather ambiguous, allowing him to experiment with his paintings (as one would expect with seekers). Indeed, X-rays of Monet's paintings reveal that he made numerous changes in a process of painting. Other examples of artists with a mixture of finder and seeker characteristics, who would also perhaps occupy the middle of such a finder-seeker dimension, include Gauguin and Michelangelo (Galenson, 2004a; Jensen, 2004).

A related issue is whether it is possible to change approaches over time, as a matter of situational pressure or simply personal preference. Galenson (2004a) has speculated that perhaps it is easier for a conceptual innovator to become an experimentalist later in his or her career, rather than vice-versa. The painter Titian is arguably a good example of an artist who successfully transitioned from being a finder to a seeker (Jensen, 2004). The difficulty of transitioning in the other direction can be illustrated by the example of Cézanne. During a stage of infatuation with the works and style of his friend and colleague Camille Pissarro, who was a conceptual innovator, Cézanne attempted to paint using Pissarro's style and approach. However, this did not last very long, and Cézanne concluded that adopting a certain style is not a matter of choice but a result of a combination of a number of personality characteristics (Galenson, 2001). In any case, if the relation between finders and seekers is seen as a uni-dimensional continuum, at any one point in his or her career a given artist can be characterized as being at a particular location on this continuum.

Limitations of Galenson's finder-seeker typology

While Galenson's finder-seeker typology seems robust and appears to account for individual differences of creators across different domains quite well, in its present form it has several limitations that need to be addressed. First, while the basis of creators' varied career trajectories is highly quantitative, the explanation for these differences, rooted in the seeker-finder typology, relies heavily on interpretations of creators' own statements and other qualitative observations of their working methods. While such evidence has the undeniable richness that is characteristic of case study approaches, a more objective, quantitative approach would complement the earlier approaches and refine the seeker-finder distinction. For instance, each construct (i.e., being a finder and being a seeker) consists of numerous facets, including attitude toward tradition, criteria for judging a work finished, confidence in one's decision-making process, amount of pre-planning, amount of revision, changes of direction throughout one's career, and so forth. Are all of these facets equally important for characterizing the difference between finders and seekers? Or are some facets more central to the basic distinction than others?

Also, while Galenson's (2001) typology is very rich and seems relatable to many psychological constructs, many basic questions remain. For instance, even rather basic statistical properties of the distribution of seekers versus finders are unknown, because they have never been systematically examined. Part of the reason for this is that the component facets of the distinction have never been quantitatively addressed; rather, as just noted, a great deal of interpretation has thus far been used to categorize creators as finders versus seekers. As noted above, Galenson (2004a) has proposed that rather than being a strict dichotomy, the distinction between seekers and finders is a continuum.

However, the question of whether the seeker-finder distinction is a uni-dimensional or multi-dimensional construct has not been addressed at all. For instance, is there a necessary tradeoff between the two types, such that one creator is either more like a seeker or more like a finder? Or is it possible for one creator to have an approach containing many elements of both types? How are creators distributed across types? For instance, if this distinction is a uni-dimensional construct, is the distribution normal, flat, bimodal, or something else?

Relation of Galenson's typology to other psychological research

One main goal of this dissertation will be to "psychologize" Galenson's finder-seeker typology of creators. In particular, it will develop and refine a quantitative, self-report survey instrument to measure individual differences in the constructs of being a finder and being a seeker. Also, this project will relate these constructs to existing psychological literatures. Even though Galenson's categories represent a novel approach to the study of creativity, they have quite a few common elements with other psychological approaches to creativity. A number of quantitative measures used in psychological research might be related to Galenson's typology and thus better inform its essential nature. In order to identify the degree of relationship of different psychological measures to Galenson's finder-seeker typology, it is important to define each of them and to review the existing empirical research associated with these measures.

In the overview of psychological measures that are potentially relevant to Galenson's typology, also note that not every single one of the following measures will be empirically examined in the present study. Indeed, since some of these existing

constructs are themselves closely related to each other, choosing a cross-section of the constructs to test is more efficient and may be nearly as informative as trying to test every single measure, which is probably not practical. Moreover, some of the constructs have not been easily operationalized by simple paper-and-pencil self-report metrics (e.g., implicit vs. explicit knowledge), and, thus, they do not lend themselves to the methodology of the present study.

Tolerance for ambiguity

One of the clearest psychological links to Galenson's typology is via the psychological construct of tolerance for ambiguity. Tolerance for ambiguity refers to a tendency to prefer ambiguous situations over the straight-forward ones. On the other hand, intolerance for ambiguity is defined as a tendency to view ambiguous situations as threatening. Although the two terms seem to be antonyms, no common, all-encompassing definition of these constructs has been accepted, and they have often been defined and treated separately (e.g., Budner, 1962; MacDonald; 1970). A number of instruments have been created in order to measure ambiguity tolerance (e.g., Budner, 1962; Eysenck, 1954/1999; Frenkel-Brunswik, 1949; Rydell & Rosen, 1966). The most common instrument is the Revised Scale for Ambiguity Tolerance (MacDonald, 1970), which was created in an attempt to improve the construct validity, internal consistency and reliability of Rydell and Rosen's (1966) instrument. The revised instrument consisted of 20 questions requiring "true" or "false" answers. Higher scores indicated higher ambiguity tolerance. Some examples of questions were, "A problem has little

attraction for me if I don't think it has a solution," and "Vague and impressionistic pictures really have little appeal for me" (MacDonald, 1970, p. 793).

Tolerance for ambiguity is very likely to be related to Galenson's typology in a straightforward and systematic way. In particular, seekers are probably more likely to tolerate ambiguity better than are finders. Since finders typically know when they have solved a creative problem, they much more rarely face ambiguity than seekers do and may thus be less tolerant of ambiguity. Since seekers' working methods naturally involve a great deal of ambiguity, as they are rarely sure whether they have finished a work, seekers are probably more likely to be able to tolerate ambiguity, or may even prefer situations that are ambiguous and unresolved.

Besides tolerance for ambiguity in its most basic sense, other constructs that appear to be related to tolerance for ambiguity are also likely to be related to Galenson's finder-seeker typology. These include rigidity, field dependence, psychological differentiation, and need for cognitive closure. To complete this background review, all of these are now detailed, though all will not necessarily be empirically examined in the present investigation.

Rigidity

One psychological construct that has been found to relate to ambiguity tolerance is "rigidity." One of the two meanings of rigidity is literally intolerance of ambiguity (Frenkel-Brunswik, 1949); the other meaning referred to a tendency to be reluctant to change (MacDonald, 1970). According to Eysenck (1954/1999) a rigid individual would also be intolerant to ambiguity because he or she has a tendency to categorize things into

straightforward categories and resist change. Even though rigidity is related to intolerance for ambiguity, it is also related to "close-mindedness," which has a negative correlation with creativity (Eysenck, 1954/1999). Thus, one would not expect a strong direct relation between this construct and Galenson's typology, since both finders and seekers are highly creative.

Field dependence

Field dependence/independence refers to the amount of autonomy that people have from the surrounding world (Goodenough, 1978). Thus, people with external frames of reference are called field dependent. These individuals tend to passively process the information that they get from the external world. Field independent people, on the other hand, have internal frames of references and tend to actively process new information. In addition, unlike field dependent individuals, those who are field independent are more likely to pay attention to different components of new information, and reorganize them, forming new categories. When introduced with new information, field dependent individuals tend to perceive it as gestalt, not focusing on its consistent parts. As a result, they integrate the new information into their knowledge system without analyzing or criticizing it. In addition, field dependent people tend to be better in inter-personal communication, while field independent people tend to "have a sense of separate identity" (Goodenough, 1978, p. 166). They judge situations according to how they fit their personal standards.

Field dependence theory is very rich and has broad theoretical implications. Different aspects of this theory may be related to Galenson's typology. Witkin and

Goodenough (1981) described the historical development of the theory. The origins of the concept of field dependence versus field independence can be traced to the studies of perception of the upright. These studies revealed individual differences in the perception of the upright as well as consistent patterns that people rely on while performing tasks that involve determining the upright. Thus, some people prefer relying on the external cues to help them determine the upright, while other people constantly rely on the internal cues, such as a position of their bodies. Later, these findings led to broader conceptualization of the theory, including cognitive aspects of field dependence.

Witkin, Dyk, Faterson, Goodenough, and Karp (1962) observed numerous differences in performance on some problem solving tasks between field dependent and field independent individuals. For instance, it takes longer for field dependent people to recognize familiar shapes or patterns concealed in complex designs. Field dependent people tend to have a hard time interpreting Rorschach inkblot tests and report the images to be ambiguous. They also perform less well on some parts of IQ tests that require restructuring, or decomposing and reassembling information relevant to solving a problem. They do not do well on insight problems that involve novel uses for familiar objects. However, there are no differences in performance on other parts of IQ tests, and tasks involving learning of new material between field dependent and field independent people.

Studies involving perceptual tasks measuring field dependence, e.g., the Rod and Frame Test (RFT), led to the development of a paper-and-pencil measure of field dependence called the Embedded Figures Test (EFT), where the task it to find a particular simple figure hidden within the complex figure. In order to do that, one would

have to avoid relying on an organized pattern presented in the complex figure (Witkin & Goodenough, 1981). These studies allowed measuring individual differences in field dependence and explore related elements that contribute to these differences. One such element was psychological differentiation (Witkin et al., 1962).

Differentiation refers to the degree of the structural complexity of any given system. The human psychological system is highly differentiated by definition because it is comprised of many different components. In psychology, differentiation refers to a degree to which different psychological states (e.g., thinking, perceiving, or acting) are separated from one another. The opposite of differentiation is the concept of integration. Psychological integration refers to relationships between different parts of a psychological system. Both differentiation and integration are important parts of a psychological system.

In the exploration of cognitive aspects of field dependence/ field independence, the concept of "cognitive styles" was introduced. A cognitive style describes how a person tends to handle a particular situation rather than evaluate how well he or she would deal with it. Unlike ability measures like intelligence, which tend to be unipolar, cognitive styles are bipolar (Goodenough, 1978, p. 166). In the context of field dependence theory, the term "cognitive styles" was primarily used to refer to articulated versus global field approaches (Witkin & Goodenough, 1981). People can be categorized as having global or articulative cognitive style, based on their tendency for psychological differentiation or integration. Individuals with an articulative cognitive style tend to outperform those with global cognitive style on tasks involving separating a figure from the ground (Cacioppo & Petty, 1982). Thus, people with an articulative style may be

better at differentiation, appear to be more field independent, and are perhaps more like Galenson's finders. Finders tend to break the rules of their domain and thus may have more internal frames of reference (i.e., be more field independent) than seekers, who tend to follow the rules of their domains and make fewer radical innovations. Thus, seekers may have a more global (rather than articulative) cognitive style and show the opposite set of tendencies: they may be worse at restructuring and more field dependent.

The field dependence theory is multifaceted theory, and thus, its relationship to Galenson's typology may not be straightforward. However, some connections exist between some aspects of field dependence and other psychological constructs that might possibly be related to Galenson's typology. Thus, some parallels may be found between field dependence and the typology itself. For example, a positive correlation was found between field dependence and tolerance for ambiguity (Goodenough, 1978). Ambiguous social situations tend to affect the behavior of field dependent individuals more than the behavior of field independent individuals. Thus, in experiments involving verbal cues in conversations it was found that field dependent participants who were interviewed by a person providing them with feedback tended to be more verbal than those who did not get any feedback from the interviewer. In addition, at the end of the experiment, participants were asked a number of questions regarding the interview. Field dependent participants tended to report that they believe that the interview would have been better if the interviewer had provided them with more feedback. Field independent participants, on the other hand, reported that the amount of feedback they got from the interviewer would not have an effect on the quality of their interview.

Interestingly, in a somewhat different application of these ideas, Kozbelt (2001) found that artists outperformed non-artists on a set of visual perception tests, including the Group Embedded Figures Test (Witkin, Dyk, Faterson, Goodenough, & Karp, 1971). Kozbelt's results suggest that high performance on the Group Embedded Figures Test might be associated with factors besides field independence *per se* (construed as an aspect of personality). These might include visual cognitive ability or creative thinking ability. This potential link with creative thinking, also to some extent alluded to by Witkin et al. (1962), is another reason the Group Embedded Figures Test might be relevant to Galenson's creative typology.

In sum, in terms of Galenson's typology, finders are probably more likely than seekers to have internal frames of reference because they tend to produce innovative works that sometimes break the rules in their domains. Seekers, on the other hand, tend not to rebel as strongly against the rules of their domain; thus, seekers might have more external frames of reference. Thus, we expect that finders will show more field independence and seekers more field dependence. In addition, since field dependence and tolerance for ambiguity are positively correlated, and we expect a positive relation between ambiguity tolerance and seeker status, we expect that field dependence might also show a positive correlation with seeker status.

Need for cognitive closure

Another psychological construct related to tolerance for ambiguity and potentially to Galenson's typology is need for cognitive closure. Need for cognitive closure refers to a tendency to prefer immediate and straightforward answers to questions rather than

ambiguous ones (Chirumbolo, Livi, Mannetti, Pierro, & Kruglanski, 2004; Webster & Kruglanski, 1994). An opposite tendency is referred to as a need to avoid cognitive closure. Individuals differ in their need for closure. In addition, it may vary as a function of a particular situation (e.g. time pressure). Webster and Kruglanski (1994) proposed a measure of individual differences in the need for cognitive closure. The items for the instrument were initially selected from the pool of different concepts supposedly related to the need for cognitive closure, such as "preference for order and structure," "discomfort with ambiguity," "decisiveness in judgments," and "desire for secure knowledge" (Webster & Kruglanski, 1994, p. 1050). As a result, a pool of 57 items based on the above-mentioned concepts was included into the Need for Cognitive Closure Scale (NFCS). In order to select the items tapping into the construct, the instrument was administered to a sample of college students. Results revealed a model with five factors and reduced the number of items from 57 to 42. The results were replicated with a sample of participants selected from different public libraries.

In addition, NFCS was compared to other constructs in order to test its distinctiveness from these constructs. The results showed that several constructs are partly related to the need for cognitive closure. Thus, a small positive correlation was found between the need for closure and some aspects of authoritarianism (e.g. rigidity and conventionalism). A small positive correlation was observed between the need for cognitive closure and dogmatism (which is a concept related to individuals' belief system), impulsivity and the need for structure. A small negative correlation was found between the need for cognitive closure and cognitive complexity (which refers to interpreting social behavior using multiple variables), fear of invalidity, and intelligence.

In addition, two other factors found to be partly related to the need for cognitive closure may also be related to Galenson's typology. These factors are tolerance for ambiguity and need for cognition (see below for the latter).

Tolerance for ambiguity produced a small negative correlation with need for closure. Even though the two concepts are tightly related conceptually, need for closure includes aspects other than tolerance for ambiguity. People high on need for closure would experience discomfort with an ambiguous situation. According to Webster and Kruglanski (1994), the relationship between need for cognition and need for closure "is not simple or straightforward" (p. 1055). First, need for cognition requires a person to think either too little or too much, depending on situation, in order to achieve a comfortable state. Results show a small negative correlation between the two constructs. Finders may be expected to have higher need for cognitive closure than seekers because of the negative correlation between the two concepts. Thus, since finders are expected to show low tolerance for ambiguity we also expect them to show high need for closure. In addition, since we expect seekers to show high tolerance for ambiguity we also expect them to show low need for cognitive closure.

Need for cognition

Another psychological construct, this time not necessarily related to tolerance for ambiguity, which might be related to Galenson's typology is need for cognition. A Need for Cognition Scale was developed and later refined in order to reliably measure this construct (Cacioppo & Petty, 1982; Cacioppo, Petty, Feinstein, & Jarvis, 1996; Cacioppo, Petty & Kao, 1984). Need for cognition can be defined as a "tendency to engage in and

enjoy thinking" (Cacioppo & Petty, 1982, p. 116). In their study, Cacioppo and Petty (1982) developed a paper-and-pencil need for cognition measure. Two groups of participants were administered a number of questions possibly relevant to the need for cognition. The first group was comprised of university faculty and defined as a high need for cognition group. The second group was comprised of assembly lines workers and defined as a low need for cognition group. Results of the study showed that as expected, a group of university faculty consistently answered the questions in a way that showed much higher need for cognition than the group of assembly line workers, thus validating the scale. The results of factor analysis revealed one factor associated with the need for cognition, namely, the self-reported tendency to enjoy thinking. In the subsequent experiments, the researchers replicated the results of the earlier experiment with a sample of college students and found that participants that had a high need for cognition reported enjoying more complex version of a number-circling task administered to them. Those who scored low on the need for cognition scale a preferred a less complex version of the task. These results suggest that those who have high need for cognition will enjoy tasks that involve more cognitive effort than those with the low need for cognition.

In addition, Cacioppo and Petty (1982) reported that even though the need for cognition can be distinguished from the concept of cognitive style, these two constructs are related. Cognitive style is related to the form of cognitive activity rather than its content. It is a stable characteristic. Need for cognition refers a degree to which a person prefers to engage in thinking and elaborating on ideas Cacioppo and Petty (1982).

It is likely that both seekers and finders would display high need for cognition. However, in the process of creation, they may think in different ways or more at different

stages of the process. For instance, finders may have a higher need for cognition in the ideation phase of creation and less need in the elaborative phase. In contrast, seekers may focus their need for cognition on the elaboration of ideas, rather than on generating them. However, if any global differences between finders and seekers do exist in need for cognition, this will be evident by correlating participants' performance on these measures.

Types of knowledge

Another psychological aspect of the typology described by Galenson deals with different aspects of creators' cognition. Knowledge acquisition and distinctions between different types of knowledge are essential aspects of understanding cognition. The knowledge system is comprised of different components, such as declarative vs. procedural knowledge or explicit vs. implicit knowledge. Declarative knowledge refers to knowledge about certain facts, while procedural knowledge refers to knowing how to do something. Thus, knowing names, dates, recipes, would be examples of declarative knowledge, while being able to drive, or knowing how to make chili, would be examples of procedural knowledge (Brauner, 2002). Unlike explicit knowledge, which is acquired deliberately and usually easily articulated, the process of acquiring implicit knowledge is automatic and often unnoticed by the person (Reber, 1993). There is a parallel between explicit versus implicit and declarative versus procedural knowledge. Research with patients suffering from amnesia showed that they do not lose both implicit and procedural knowledge, which may suggests that these two types of knowledge are not only related but may be identical (Brauner, 2002). In addition, implicit as well as explicit knowledge

may be both declarative and procedural. Based on this notion, Brauner (2002) identified four subtypes of knowledge, namely explicit-declarative (conscious knowledge about facts), explicit-procedural (conscious knowledge about procedures), implicit-declarative (conscious knowledge that cannot be readily verbalized, e.g., stereotypes or attitudes), and implicit-procedural knowledge (non-deliberate control of complex systems, e.g., sequence-learning).

In addition to the different types of knowledge, Brauner (2002) described metaknowledge, which is knowledge about knowledge. Thus, in addition to knowing facts and procedures, people also know about which facts and procedures they know and which they do not know about. Even though all people have different types of knowledge, and creative people usually have a great amount of knowledge, at least in their area of expertise, they may differ in the degree of metaknowledge that they possess. Thus, seekers may have better metaknowledge about procedures and finders may have better metaknowledge about concepts. Moreover, seekers may differ from finders in a way they process information. Galenson (2001) described finders as being able to verbalize their goals better than seekers, which may be due to the differences in knowledge representations between the two types of creators. Specifically, it has been suggested that seekers may have more implicit representations and problem solving strategies and finders may show more explicit representations and problem solving strategies (Kozbelt, in press).

Eastern versus Western approaches to creativity

According to the writer T. S. Eliot (1964), the traditions of the past play an important role in creativity: “no poet, no artist of any art, has his complete meaning alone. His significance, his appreciation is the appreciation of his relation to the dead poets and artists. You cannot value him alone; you must set him, for contrast and comparison, among the dead” (p. 4). In psychology, in addition to identifying individual approaches to creativity, a body of literature exists on the differences between cultural approaches to creativity, namely Eastern and Western approaches (Averill, Chon, & Hahn, 2001; Kippner & Arons, 1973; Lubart, 1999; Wonder & Blake, 1992). The Western approach to creativity is product oriented and focused on originality, while the Eastern approach is process oriented and perhaps less concerned with overt originality (Lubart, 1999; Wonder & Blake, 1992). In addition, the Eastern approach to creativity is seen as largely intuitive, while the Western approach to creativity is often seen as more logical (Wonder & Blake, 1992).

In the context of Galenson’s typology, the Eastern, process-focused approach might be seen as similar to the methods of seekers, while the Western, product-focused approach might be seen as similar to the methods of finders (Kozbelt & Durmysheva, in press). The importance of the process emphasized by the Eastern approach to creativity, learning through work and not valuing the end product are characteristics of both. The Eastern approach to creativity is connected to spirituality. Thus, Lubart (1999) states, “The Eastern conception of creativity…involves a state of personal fulfillment, a connection to a primordial realm, or the expression of an inner essence or ultimate reality…Creativity is related to meditation because it helps one to see the true nature of

the self, an object, or an event" (p. 340). Similarly, describing Cézanne, who was a classic example of a finder, Galenson (2001), provided memories of Cézanne's fellow painter Emile Bernard who said, "his way of working was actually like a form of meditation, brush in hand" (p. 53). Thus, we can see that the Eastern approach to creativity is similar to aesthetically motivated experimentation, while the Western approach to creativity is similar to conceptual execution. Survey instruments developed to understand the differences between these cultures' approaches, e.g., the East-West Questionnaire (Gilgen & Cho, 1979; see also Braithwaite & Scott, 1991) might also serve to illuminate Galenson's typology in psychological terms.

A recent cross-cultural study by Kozbelt and Durmysheva (in press) found quantitative support for Galenson's typology in general, and further support for the extension of the typology to explain differences in lifespan creativity patterns between Eastern and Western creators. Specifically, if Western artists on average are more concerned with raw originality (like finders) and Eastern artists on average are more concerned with maintaining building on tradition, then Eastern artists should on average show a later career peak than Western artists. In that study, we investigated the famous and respected tradition of Japanese "ukiyo-e" printmaking (c. 1670-1865). Almost 2,000 illustrations of datable prints by 44 artists were found in 36 art books. Career landmarks (earliest, most frequent, and latest illustrated print) and eminence ratings were estimated for each artist. The results were largely consistent with prior research on Western samples: artists' career peaks vary greatly, averaging around age 40, and the most prolific artists (e.g., Hokusai, Hiroshige, Utamaro, etc.) usually (but not always) created the most popular individual prints. One basic, central finding was that Japanese artists showed a

marginally later career peak than modern French painters. Moreover, when using artworks rather than artists were used as the unit of analysis, the most frequently reproduced Japanese prints were found to be created by artists at older ages than the most frequently reproduced modern French paintings or European "Old Master" paintings. Thus, these cross-cultural data are consistent with predictions derived from Galenson's typology.

The exceptions to this pattern are also largely consistent with Galenson's predictions. For instance, the seven artists with the largest number of reproductions accounted for almost all of the top thirty most frequently reproduced ukiyo-e prints. A wide gulf separated the top seven artists from the remaining artists with prints among the top thirty: Shunman, Kunimasa, and Shigenaga. All three were far down on the list of productivity, ranking 15th, 21st, and 22nd in illustrations and 19th, 23rd, and 20th in prints, respectively. Interestingly, only three of the top thirty prints were done by artists in their twenties, and these were all done by artists with relative few reproductions overall. One was created by Kunimasa at age 24, and two were created by Shunman at age 29, including one ranked tenth overall, that is, above the top-rated works of Harunobu, Kiyonaga, and Masanobu, all "significant figures" in Japanese art history (Murray, 2003). Thus, Kunimasa and Shunman seem analogous to arch-finder Marcel Duchamp, that is, creators who produced relatively little, but who achieve fame through one or two notable breakthrough contributions. Just as Kunimasa's and Shunman's most popular prints are youthful works, Duchamp's best-known paintings, *Nude Descending a Staircase No. 2* and *The Bride Stripped Bare by Her Bachelors, Even*, were done relatively early, at 25 and 36, respectively (Galenson, 2004a). Thus, even within the Japanese sample, there

appears to be considerable variation in creative types: not all Eastern artists should be considered seekers, just as not all Western artists should be considered finders.

Therefore, in sum, cross-cultural differences in Eastern and Western thinking appear to be at least somewhat related to Galenson's finder-seeker typology. An important aspect of the present study will be to examine this relation in more depth.

Creative thought

In some respects, of all possible psychological constructs that could in principle be measured and compared to Galenson's (2001, 2004a, 2005) typology, the construct of creativity is the most relevant. Galenson's model explicitly attempts to explain how creative processes play out, and it deals with indisputable instances of very high-level creativity. In such cases, the creative contributions are generally highly domain-specific; and the sample of creators is highly knowledgeable, talented, and motivated. Measures of creativity with such elite samples typically reflect citation frequency, critical acclaim, or monetary value of artworks. Such high-level, real-world measures typically provide a solid grounding for claims about creativity, particularly since these kinds of measures usually agree with each other quite well.

Operationalizing creativity in less historically important cases is somewhat trickier. First, there may be important differences between such a sample and a non-expert sample. Second, a reasonably valid and reliable measure of creativity must be devised to measure creative thought, since non-experts typically will not have produced highly acclaimed creative products. Third, one might question whether a simple,

domain-general, paper-and-pencil measure allows one to tap into the same kinds of creative processes as are shown by eminent creators of historical importance.

Thus, it is a debatable issue whether Galenson's typology would be applicable to a non-expert sample at all. However, there are several reasons to think this is worth attempting. First, if one construes creativity as a form of ill-defined problem solving (e.g., Newell, Shaw, & Simon, 1962; Weisberg, 1986), rather than as a Romantic or ineffable or genius-driven process, then the same basic principles should apply to experts and novices (and perhaps artificial intelligence computer programs). Moreover, since the finder-seeker typology likely has important potential educational implications (Galenson, personal communication – 2005), even non-experts (or at least experts-in-the-making) should likely show some differentiation in their approaches to creative problems. Other research already reviewed above (e.g., on individual differences in constructs like tolerance for ambiguity) is again suggestive that meaningful differences might be found in the approach of non-experts. Finally, it is possible to operationalize creativity in a reasonably meaningful way among non-experts. That is, while truly world-class, high-level creative achievement involves a host of factors, such as intelligence, motivation, and the opportunity for being creative (Murray, 2003), another hypothesized component is divergent thinking, or the ability to generate new ideas. This ability, originally emphasized by Guilford (1950; see also Mednick, 1962) is thought to be rooted in the ability to make rather far-flung associations between concepts, which provide the raw material for the creative process - at least in the phase of creativity concerned with ideation, rather than elaboration (Simonton, 1984; Ward, Smith, & Finke, 1999).

Regardless of the extent to which raw divergent thinking abilities characterize real-world creative productivity in experts, it is relatively straightforward to operationalize this aspect of creative thinking in a paper-and-pencil measure that is appropriate for non-experts. One such instrument, the Torrance Test for Creative Thinking (TTCT) is the most widely used creativity test. The test was originally developed to measure divergent thinking in children. Other versions of the test exist including the Demonstration Form of The Torrance Test (D-TTCT: Torrance, Wu, & Ando, 1980), which is not only a shorter version of the original test but also the one appropriate for adults, as well as the Abbreviated Torrance Tests for Adults (ATTA: Golf & Torrance, 2002), the most recent incarnation of the test, as well as the most efficient to administer. This version was used in the present study, as will be described below.

The Torrance test appears to capture at least some important aspects of creative thinking that apply to more ecologically valid situations. For instance, Plucker (1999), using structural equation modeling to reanalyze Torrance's original longitudinal data, found that creativity scores on the TTCT accounted for about half of the variance in adults' publicly recognized creative achievements and participation in creative activities obtained several years later. This corresponds to a predictive validity coefficient of about .70, suggesting that the TTCT's scores differentiate individuals who subsequently go on to achieve public acclaim as creative from those who do not. In that investigation, the TTCT predicted about three times as much of the criterion variance as IQ tests.

Thus, the domain-general Torrance measure appears to be a reasonable proxy for creative thinking among non-experts. In the present investigation, the Torrance test will

be an important measure in examining the psychological nature and basis of Galenson's finder-seeker typology.

The Present Study

The present study has several key goals. The first goal is to devise and analyze a novel paper-and-pencil survey instrument that will allow the components of Galenson's typology to be understood quantitatively. The measure includes separate questions on characteristics of seekers and finders, in order to allow any multidimensionality in these constructs to emerge. The statistical analyses will include exploratory factor analyses, correlations between responses on pairs of items thought to measure finder versus seeker versions of the same facet of creativity, and refinement of the finder and seeker subscales using part-whole correlations and measures of internal consistency. These results will reveal whether or not the finder-seeker typology is uni-dimensional or multi-dimensional. In particular, if the refined finder and seeker subscale scores show a reliable negative correlation, then this implies that seekers and finders are two more or less mutually exclusive categories of creators occupying opposite endpoints of the same uni-dimensional continuum. If, however, the refined subscale measures are not correlated, this implies that the finder and seeker subscales are orthogonal and that there are at least four types of creators, who are either high or low on each subscale.

The second major goal of the present study is to explore the relationship between the above-mentioned psychological constructs, and Galenson's finder-seeker typology, as measured by the novel paper-and-pencil instrument. Once these refined subscale scores have been generated, they can be used to examine the relation between these and other

psychological constructs that are potentially relevant. Specifically, on both the refined finder and seeker subscales, median splits will be performed and factorial ANOVAs will be performed on each other psychological measure that is being studied. Pearson correlations between all of these measures will also be performed and reported.

As noted above, several of the constructs may be closely related to the typology. For example, since seekers choose to work without particularly well-defined goals, they may show a higher tolerance for ambiguity than finders, who have a much clearer sense of their goals as they work. Thus, common psychological measures of constructs like tolerance for ambiguity (e.g., MacDonald, 1970) or the need for closure (Chirumbolo, Livi, Mannetti, Pierro, & Kruglanski, 2004; Webster, & Kruglanski, 1994) might be related to and illuminate some of the cognitive differences between seekers and finders. In addition, the quality of finders to plan their work in advance and know how their product would come out before they even started working on it, allows for a possibility that finders may have a higher need for cognition than seekers, at least in the ideation phase of the creative process. On the other hand, seekers may show a higher need for cognition in the elaborative phase of the creative process. The Need for Cognition Scale (Cacioppo & Petty, 1982) will help us test these relationships. Field dependence is also expected to be related to the typology. Specifically, seekers are expected to have external and finders to have internal frames of references, and, as a result differ in the degree to which they restructure the new information. Finders may also be less field dependent because of their ability to break free from traditions of their domains. Finally, seekers' approach to creativity may be similar to the Eastern ways to thinking, and finders' to Western ways to thinking. The results of this investigation will yield a rich, quantitative

description of the statistical structure of Galenson's typology, putting this promising and provocative set of ideas on an even firmer quantitative grounding than has been the case until now.

CHAPTER 2: METHOD

Participants

A total of 113 Brooklyn College undergraduate participants were recruited from the introductory psychology subject pool. There were 25 male participants 87 female participants. One participant did not report gender. The *M (SD)* age of participants was 23.04 (4.95) years. Eight participants out of the 113 (two males and six females, *M (SD)* age, 26.14 (7.75)) did not fill out all of the questionnaires described below, and their data were excluded from analyses. Thus, data from a total of 105 participants were analyzed.

General Procedure

Participants were tested in groups of 10 to 20 people simultaneously; however, each participant worked individually. Upon arrival, participants were greeted and provided with the following overview of the study:

> In this experiment you will participate in several tasks. In one task, you will fill out a paper-and-pencil questionnaire. The questionnaire is divided into five sub-parts. There are no right or wrong answers, and your data will be anonymous, so try to answer the questions honestly and efficiently. In the other two tasks, you will fill out a paper-and-pencil instrument on creative thinking and a paper-and-pencil instrument where you search for visual patterns. We will give you more specific instructions for each task.

Participants then read more detailed instructions about each task and had the opportunity to ask questions about each task. Participants' questions were answered to the extent possible without revealing the hypotheses. When participants were ready, they signed the consent form, and the session began.

The one-hour session consisted of three main kinds of tasks. The order of the three tasks was counterbalanced in each group of participants to avoid the order effect. Two of the tasks were timed paper-and-pencil performance measures, that is, tasks with answers that were scored in terms of correct versus incorrect or better versus worse responses. One of these was a test of domain-general creativity, the Abbreviated Torrance Test for Adults (Golf & Torrance, 2002); the other was a measure of field independence, the Group Embedded Figures Test (Witkin, Dyk, Faterson, Goodenough, & Karp, 1971). Written and verbal instructions for these two tasks were provided when the tasks were administered. These are described in more detail below.

The remaining task was a rather long composite paper-and-pencil self-report instrument, which was divided into five separate sub-parts. Each sub-part consisted of a psychological instrument intended to measure a particular psychological construct of interest. Four of the scales measured the established psychological constructs of Ambiguity Tolerance (MacDonald, 1970), Need for Cognition (Cacioppo, Petty, & Kao, 1984), Need for Cognitive Closure (Kruglanski, Webster & Klem, 1993), and Eastern versus Western style thinking (Gilgen & Cho, 1979). The remaining sub-part was the "Creative Approach Questionnaire," the new instrument under investigation, which was intended to "psychologize" Galenson's (2001, 2004a, 2005) "finder-seeker" typology (see Appendix). Four of the five sub-parts used a 6-point Likert scale ranging from 1 (strongly agree) to 6

(strongly disagree); questions in the remaining sub-part, which measured Ambiguity Tolerance, used dichotomous true-false responses (see below for details).

The five sub-parts of the self-report instrument were presented in different random orders across participants, to avoid any order effects. Participants received separate written instructions for each sub-part, which are detailed below. Participants also received general written instructions prior to starting the survey. The general instructions for the paper-and-pencil self-report instrument were:

> In this task, you will complete a paper-and pencil questionnaire. The questions deal with personality and creativity. Your goal is to answer the questions as honestly as possible. Remember, there are no right or wrong answers. Try to focus on your first response in answering the question. Try to work as efficiently as you can, while still answering each question honestly.
>
> There are about 180 questions on the questionnaire. Your response to each question will be how much you agree or disagree with the statement. The questionnaire is divided into five sub-parts. Please read the individual instructions for each section of the questionnaire.
>
> Some of the questions deal more with aspects of personality, and others deal more with aspects of creativity. For the questions that ask you to think about creativity or problem solving, you may want to think about a specific activity

in which you are or might be creative. This might be a personal hobby type of activity, or something like writing an essay, where you have to be creative. If you finish with the task please stay in your seat and wait for further instructions.

Once participants felt ready, they began the session. At the end of this task, participants were instructed to hold on to their test and wait for everyone else to finish. When all participants had finished, the next measure was distributed and the next task began. When participants completed the last task, they were thanked and debriefed.

Each specific measure is now detailed.

Specific Measures

Abbreviated Torrance Tests for Adults (ATTA)

As noted earlier, the Torrance Test for Creative Thinking appears to be a reasonably valid and reliable instrument for assessing individual differences in creative thinking ability (Plucker, 1999). Moreover, one version of the Torrance Test, the Abbreviated Torrance Tests for Adults (ATTA: Golf & Torrance, 2002) is a very efficient way of obtaining this information: the three tasks in the ATTA take only three minutes each; in contrast, administering the full TTCT requires over an hour. Since a number of other psychological instruments were also included in the present study, efficiency was important, and the ATTA was selected as the most appropriate version of the Torrance Test to use.

In the present study, participants received both verbal and written instructions for each activity in the ATTA. Participants were presented with the instructions taken directly from the Manual for Abbreviated Torrance Test for Adults. Participants had three minutes to complete each activity. Each activity included separate written instructions. Participants were explicitly encouraged to provide original and interesting responses. In the first activity, participants were asked to imagine being able to fly and to list possible problems that might be associated with it. In the second activity, participants were provided two incomplete figures and asked to create as many drawings as possible that would include these figures. Finally, in the third activity, participants were presented with nine triangles in a $3 * 3$ matrix and asked to create as many pictures as possible using these triangles.

The test allows one to measure a total of four Norm-Referenced creative abilities, including Fluency, Originality, Elaboration, and Flexibility, and fifteen Criterion-Referenced creativity indicators, which are categorized into two broad groups, Verbal and Figural responses. The details of the Norm-Referenced abilities are as follows. Fluency measures the ability to produce quantities of ideas that are relevant to the task instructions. The sum of fluency scores in all three activities provided a fluency raw score. Originality measured the ability to produce uncommon ideas or ideas that are totally new or unique. The sum of originality scores in all three activities provided an originality raw score. Elaboration measured the ability to embellish ideas with details. The sum of elaboration scores in Activities 2 and 3 provided an elaboration raw score. Finally, flexibility measured the ability to process information or objects in different ways, given the same stimulus. A flexibility raw score was obtained from Activity 3. Further, the raw scores for fluency, originality, elaboration, and flexibility were

transformed into scaled Norm-Referenced scores by the recommended procedure (Goff & Torrance, 2002), which take age-related norms into account. This total Norm-Referenced score represents one way to measure a person's level of domain-general creativity.

The two Criterion-Referenced creativity indicators were computed in the following way. The Verbal Criterion-Referenced creativity score was computed as a sum of five verbal responses in Activity 1. This included components like humor and conceptual incongruity, future orientation, provocative questions, and so forth. The Figural Criterion-Referenced creativity score was computed as a sum of 10 Criterion-Referenced creativity indicators assessed in Activities 2 and 3. This included components like resistance to premature closure, internal visual perspective, and the richness and colorfulness of imagery. This total Criterion-Referenced score represents a second way to measure a person's level of domain-general creativity.

In addition to the Norm-Referenced and Criterion-Referenced scores, a final creativity index was computed as a sum of four Norm-Referenced and two Criterion-Referenced creativity indicators scores. This represents a single composite measure of overall creativity. In the present set of analyses involving the ATTA, several creativity scores will be used: the overall composite creativity index, the overall Norm-Referenced scores and the overall Criterion-Referenced scores.

Higher scores on each of these indices represent higher levels of creativity, construed in a very domain-general way emphasizing divergent thinking, or the ability to generate new ideas. While one might object that real-world creative achievement, of the type investigated by Galenson (2001, 2004a, 2005) and others, is almost always very complex and domain-specific (see, e.g., Gardner, 1993; Murray, 2003; Simonton, 1994),

recall that the Torrance measures show respectable predictive validity, accounting for about half of the variance in adults' publicly recognized creative achievements and participation in creative activities obtained several years after taking the Torrance test (Plucker, 1999). Thus, the Torrance measure seems an adequate measure of creative thinking for the present sample of non-experts; almost certainly it is better than any alternative measures, which lack the Torrance's rather long history of validation and refinement.

In the present study, a subset of the ATTA data (the tests of 47 randomly chosen participants) was scored by two trained raters independently. Then, the scores produced by both raters were compared. The inter-rater reliability was measured by Pearson's *r* correlation coefficient. Thus, the inter-rater reliability between the two sets of the Norm-Referenced scores was high (r = .85), the inter-rater reliability between the two sets of Criterion-Referenced indicator scores was also high (r = .71). Finally, the inter-rater reliability for the total ATTA scores was also high (r = .96). As a result, the ATTA data for remaining participants were randomly divided between the two raters.

The Group Embedded Figures Test (GEFT)

The Group Embedded Figures Test is designed to measure field independence, which refers to the amount of autonomy that people have from the surrounding world (Goodenough, 1978). Several versions of this measure exist, in the present study, the version by Witkin, Dyk, Faterson, Goodenough, & Karp (1971) was used. The test is timed and consists of three parts. Participants are presented with 24 complex geometrical figures and are asked to locate simple shapes contained within the complex figures by

tracing over the simple shape with a pencil. Scores could range from 0 to 24 items correct. Higher scores indicate higher field independence. A previous investigation (Kozbelt, 2001) found that the original time limits for the test as specified in the 1971 manual (2 minutes, 5 minutes, and 5 minutes for parts one, two, and three, respectively) led to a ceiling effect. Thus, following Kozbelt (2001), in the present study, participants received one minute to complete the first part of the test, two minutes to complete the second part, and two minutes to complete the third part.

At the beginning of the task, participants received the following instructions:

> I am going to show you a series of designs. Each time I show you one of these designs, I want you to describe the over-all pattern that you see in it. After you examine each design, I will show you a simpler figure, which is contained in that larger design. You will then be given the larger design again, and your job will be to locate the smaller figure in it. Let us go through one to show you how it is done.

The participants looked at the two practice complex figures for about 30 seconds. Next, the participants got the complex figure again and were told to find a simpler figure within the complex one. After the participants found the simple figure, they were asked to trace it.

> This is how we will proceed on all trials. I would like to add that in every case the smaller figure will be present in the larger design. It will always be

> in the upright position. Work as quickly as you possibly can, since I will be timing you, but be sure that the figure you find is exactly the same as the original figure both in size and in proportions. As soon as you have found the figure, tell me at once. If you ever forget what the small figure looks like, you may ask to see it again. Are there any questions?

When participants indicated that they understood the task, the first set of trials began. After participants completed the task, they were asked to hold on to their test booklet and to wait for the beginning of the next task.

Revised Scale for Ambiguity Tolerance (AT-20)

The AT-20, one of the five sub-parts of the self-report survey, measures the construct of tolerance for ambiguity. Recall that tolerance for ambiguity is a tendency to prefer ambiguous situations to straightforward ones. In terms of Galenson's (2001) typology, seekers are probably more likely than finders to show high tolerance for ambiguity. The instrument used presently is the Revised Ambiguity Tolerance (AT-20) scale (MacDonald, 1970), which was created in an attempt to increase the reliability of the original 16-item Rydell-Rosen Ambiguity Tolerance Scale (Rydell & Rosen, 1966). The AT-20 scale consists of 20 True-False items. MacDonald (1970) reported that the internal consistency of the instrument was .86, calculated by split-half reliability, corrected by the Spearman-Brown formula. Moreover, test-retest reliability, with a six-month interval between tests, was high, $r\,(22) = .63$, $p < .01$.

In the present investigation, only 19 out of the 20 items were used. Item 4, "I would rather bet 1 to 6 on a long shot than 3 to 1 on a probably winner," was dropped because the majority of participants in the pilot study did not understand it. Notably, this item had the lowest part-whole correlation (r = .23) among all of the items in the 20-item version of the scale (MacDonald, 1970).

The AT-20 was scored so that a high score reflected high tolerance for ambiguity. For each question, an answer (either true or false) that reflected high tolerance for ambiguity was scored as a "1," and an answer that reflected low tolerance for ambiguity was scored as a "0." The overall score on the AT-20 was simply the sum of these scores. Thus, a higher overall score represents greater tolerance for ambiguity.

The 18-item Need for Cognition Scale (18-item NCS)

The 18-item NCS, another one of the five sub-parts of the self-report survey, measures the construct of need for cognition, that is, the tendency to engage in and enjoy thinking. One way to measure this construct is the Need for Cognition Scale (NCS), a 34-item instrument reported by Cacioppo and Petty (1982). However, Cacioppo, Petty, and Kao (1984) factor analyzed the items and came up with a revised 18-item instrument. Cacioppo et al. found that this shorter instrument is comparable in many respects to the longer version. For instance, the shorter version's internal consistency, measured by Cronbach's alpha coefficient (theta coefficient) was .90, compared to a value of .91 for the longer version. Moreover, Cacioppo et al. also found that the overall need for cognition scores in the original versus the short scale were highly correlated, r (525) = .95, $p < .01$. Obviously, the 18-item NCS is also more efficient than the longer original

scale. Thus, in present study, the 18-item Need for Cognition Scale was used. Responses were measured on a 6-point Likert scale, ranging from 1 (strongly agree) to 6 (strongly disagree).

The Need for Cognitive Closure Scale (NFCS)

The NFCS, another one of the five sub-parts of the self-report survey, measures the construct of need for cognitive closure, which is the tendency to prefer immediate and straightforward answers to questions rather than the ambiguous ones (Chirumbolo, Livi, Mannetti, Pierro, & Kruglanski, 2004; Webster & Kruglanski, 1994). In terms of Galenson's (2001) typology, finders are probably more likely than seekers to show a high need for cognitive closure. The Need for Cognitive Closure Scale (NFCS) is a 47-item instrument measuring the construct (Webster & Kruglanski, 1994). This instrument shows high internal consistency, Cronbach's alpha = .84. Moreover, test-retest reliability, with a 12-week interval between tests, was high, r (22) = .63, $p < .01$. In present study, a 42-item version of test (Kruglanski, Webster & Klem, 1993) was used. The only difference between the two versions is that the longer version includes a five-item lie scale. The shorter version was used in an attempt to reduce the number of questions in order to prevent any bias due to fatigue. Responses were measured on a 6-point Likert scale, ranging from 1 (strongly agree) to 6 (strongly disagree).

The East-West Questionnaire (EW)

The EW, another one of the five sub-parts of the self-report survey, was designed to assess the predominance of Eastern or Western thought, particularly the dualistic

Western vs. the non-dualistic Eastern, perspectives (Gilgen & Cho, 1979). As noted earlier, the Eastern, process-focused approach might be seen as similar to the methods of seekers, while the Western, product-focused approach might be seen as similar to the methods of finders (Kozbelt & Durmysheva, in press). The East-West Questionnaire consists of 68 items, half of which correspond to the Eastern view and half to the Western. Test-retest reliability, over a period of 2 weeks, was reported as .76 (Gilgen & Cho, 1979). Responses were measured on a 6-point Likert scale, ranging from 1 (strongly agree) to 6 (strongly disagree).

Creative Approach Questionnaire (CAQ)

One of the most important goals of the present study was to create and validate a new measure, the "Creative Approach Questionnaire," henceforth referred to as the "CAQ," which was one of the five sub-parts of the self-report survey. The instrument was designed to measure the extent to which people can be characterized as "seekers" and/or "finders," corresponding to the two approaches to creative problem solving outlined by Galenson (2001, 2004a, 2005). Questions were developed based on Galenson's (2001, 2002, 2003, 2004a, 2004b, 2004c, 2005) statements characterizing prototypical qualities of each type of creator. For instance, one question was, "I believe one's best work occurs in maturity" (derived from Galenson, 2001, p. 63). Another was, "About my work I can say "I have a mania for change"" (derived from Galenson, 2001, p. 59). These statements were grouped into categories based on the characteristics that they represent, such as a creator's goals, satisfaction with their creative products, and the role of planning in their creative process. Redundant statements were deleted, and the

two main subscales of the questionnaire were developed. One subscale involved "finder-related" items. The other subscale involved "seeker-related" items. For each facet of the typology, pairs of items were generated. One item in each pair was intended to measure finder-ness, and one item in each pair was intended to measure seeker-ness.

In the process of developing the statements, an emphasis was made to ensure that both versions of each statement were comparable. Specifically, we attempted to state both versions in a positive manner, to avoid any bias. For instance, one question we devised to measure the finder construct was "I tend to learn quickly." A natural opposite of this statement would be "I tend to learn slowly." However, since this has a negative connotation, this idea was reworded as, "I tend to learn deeply." In addition, since Galenson (2001) initially based the typology on experts in a domain-specific way (especially relevant to visual artists), domain-specific characterizations and statements had to be modified in order to apply to the general population.

The initial version of the questionnaire consisted of a total of 29 pairs of statements. This version was distributed to a small number of people who were familiar with Galenson's typology and to a small group of people who were unfamiliar with the typology. The goals were to examine the face validity of the questionnaire, to help identify statements that poorly characterized each type of creator, and to assess the clarity of each statement. As a result, nine pairs of statements were removed and the remaining 20 pairs comprised the questionnaire used in this study. The final version of the CAQ, as administered to participants, with 40 items, is provided in the Appendix. The question numbers will be referred to later. Also, in the Appendix, "finder" items are asterisked.

(Obviously, when the CAQ was given to participants, the finder items were not asterisked.)

The format of the questionnaire consisting of two subscales was created to allow for potential multidimensionality of these constructs to emerge. If this had not been done, and the questions had been written so that the endpoints of the Likert scale were the prototypical finder and seeker descriptions, then participants would have had to make a zero-sum choice on each item. Structuring questions in that way would prevent anyone from showing that they scored high on both the finder side of the scale and the seeker side of the scale, which is theoretically possible if a person has a variety of creative problem solving strategies available to them.

As with any novel instrument that attempts to measure a complex psychological construct, determining how to score the instrument presents certain challenges. Presently, the main goals of scoring are to generate an overall "finder" score and an overall "seeker" score for each participant, both of which are valid and show respectable internal consistency. Because both of these constructs are complex and multifaceted, an important part of the analysis will simply be to refine and purify the measures of each of the constructs. When this is achieved, the correlation between the subscales, as well as the correlations between each of the subscales and each of the other instruments, can be examined. Doing this should shed light on the statistical nature of Galenson's typology, namely whether the constructs of "finder" and "seeker" are mutually exclusive, or whether they are independent of each other.

CHAPTER 3: RESULTS - CAQ

In Chapter 3, a series of analyses that were performed to understand the statistical properties of the finder-seeker typology and to refine the CAQ measures are described. The goal of this analysis is to arrive at refined measures of both the finder and seeker constructs. In Chapter 4, the analyses that were performed to understand the relationship between the refined measures derived from the CAQ and other existing psychological measures are described.

Factor Analysis

One way to analyze the structure of the data is to perform a factor analysis. The goal of factor analysis is to simplify the overall pattern of correlations among the 40 items of the CAQ. While Galenson's finder-seeker typology is quite multi-faceted, the very fact that artists and other creators seem to cluster together into different types suggests that many characteristics and facets of each of the two types should be inter-correlated. In this view, rather than measuring 40 different constructs with the 40 different items of the CAQ, it is likely that a much smaller number of constructs are being measured. The exploratory factor analysis is a statistically bottom-up way of determining the extent to which this is the case. Note that factor analysis is only one way of understanding the structure of the data. Because a theory-driven approach was adopted in the design of the CAQ, with 20 pairs of items attempting to measure the finder and seeker sides of a variety of facets of the typology, the exploratory factor analysis will be followed up by other, more theory-driven, analyses.

Presently, a series of factor analyses were conducted to understand the factor structure of the CAQ measure. The results of the unrotated and rotated factor analyses (both with varimax rotation and oblique rotation) were similar. Therefore, only the varimax rotation solution is discussed. Results are shown in Tables 1, 2, and Figure 1. Table 1 represents the eigenvalues and proportion of variance accounted for by each factor in both the unrotated and rotated solutions.

Table 1

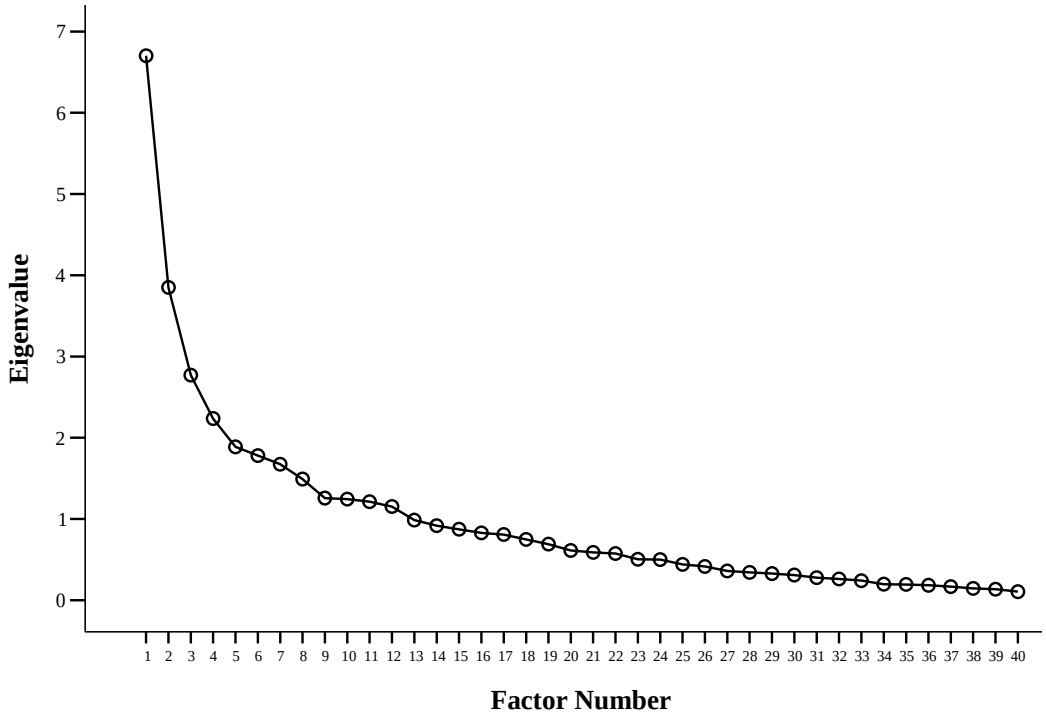
CAQ Eigenvalues and Proportion of Variance Accounted For By Each Factor

	Rotation Sums of Squared Loadings		
Factor	Total	% of Variance	Cumulative % of Variance
1.	3.077	7.691	7.691
2.	2.945	7.363	15.054
3.	2.392	5.979	21.034
4.	1.986	4.964	25.998
5.	1.752	4.380	30.378
6.	1.679	4.197	34.575
7.	1.645	4.112	38.687
8.	1.499	3.749	42.435
9.	1.453	3.631	46.067
10.	1.191	2.977	49.043
11.	1.183	2.958	52.001
12.	1.129	2.823	54.824

As can be seen, the analysis yielded 12 factors with eigenvalues greater than 1. One way to decide how many meaningful factors were produced in the analysis is to retain those factors that produced eigenvalues that are greater than 1 (Tabachnick & Fidell, 2001). Another way to decide on the number of factors is to assess the scree plot of the analysis. The scree plot is reproduced in Figure 1.

Figure 1

CAQ Factor Analysis: Scree Plot



As can be seen, the first 5 factors represented in Figure 1, produce almost a straight line, after which, the slope of the line changes. Another change happens after the 9th factor. Finally, the line essentially flattens after the 12th factor. To explore the data, several factor analyses were conducted, restricting the number of factors to 5 and 9. However, a model with all 12 factors allowed for the easiest and most straightforward interpretation. Therefore, the 12-factor model will be discussed further.

A more detailed sense of the data involves the factor loadings of individual items. Table 2 presents the varimax rotated loading structure. As a heuristic for interpreting the main pattern of findings, throughout Table 2, high factor loadings are shown in boldface. It is important to note that the bolded items refer to the items within each factor that have a higher loading on that factor than on any of the other factors.

Table 2

CAQ Varimax Rotated Factor Loadings Matrix

Item	F1	F 2	F 3	F 4	F 5	F 6	F 7	F 8	F 9	F 10	F 11	F 12
18f	**.629**	.033	.060	.064	.071	.000	.214	-.049	-.056	.161	.031	-.020
35s	**.621**	-.103	.132	.039	.129	.006	.009	.184	.023	-.015	.116	-.013
23f	**.610**	.292	-.080	-.022	.229	.060	.088	.023	.088	-.136	.158	-.047
31s	**.540**	.146	.077	-.037	.002	.064	-.038	.044	-.169	-.108	-.014	.100
33f	**.460**	.099	-.402	.143	-.045	.115	-.032	.086	.024	.028	-.098	.188
34f	**.419**	-.246	.221	.157	-.167	-.104	-.007	.065	.143	.198	.100	-.213
24s	**.397**	.344	.297	.009	-.125	.040	.098	.014	.247	.000	-.046	.153
17f	**.273**	.069	.029	-.007	-.004	.032	.022	-.063	.057	.135	-.158	.099
26f	.167	**.789**	-.055	.060	.007	.018	.036	.137	-.145	.109	.047	.039
32s	.068	**-.678**	.298	-.172	-.048	-.172	.091	.033	.103	-.047	-.088	-.179
13f	.190	**.609**	-.243	.243	.087	.280	.321	-.078	-.012	.123	.114	-.125
3f	.319	**.428**	-.150	-.047	-.029	.125	-.108	.240	-.005	.016	.096	-.126
8f	.153	**.387**	-.273	.363	.161	-.109	-.034	.315	.138	.175	.033	.109
25s	-.153	-.243	**.666**	-.058	.023	-.079	.185	.010	.185	.111	.075	-.019
30s	.192	-.316	**.660**	-.067	-.090	-.027	-.184	-.160	-.147	-.068	.026	.040
16s	.174	.054	**.534**	.234	-.012	-.029	.081	.027	-.040	.229	-.075	.248
28s	.309	-.004	**.475**	-.062	-.090	-.223	.178	-.028	.167	-.075	-.035	-.010
2s	.205	-.286	**.349**	.206	-.064	-.187	.116	-.246	-.169	.037	-.090	.050
20f	-.179	.032	-.132	**.659**	-.038	.208	.002	.177	.169	-.026	.049	.084
5f	.092	.126	.181	**.621**	.049	.016	.102	.093	-.083	.102	.166	-.200
21s	.243	.070	.034	**.401**	.131	.068	.039	.090	-.323	-.262	-.051	-.012
10s	.089	-.030	-.089	-.003	**.981**	.124	.039	.003	-.033	.031	.014	.017
19s	.223	.105	-.083	.315	**.345**	.065	.140	-.043	-.070	-.023	-.008	.044
22s	.003	.250	.083	.148	**.339**	.050	.147	.301	.079	-.093	.084	-.278
15s	.064	-.148	.356	-.076	-.010	**-.658**	-.066	-.074	-.052	-.053	-.178	.118
14f	.107	.079	-.083	.440	.100	**.536**	.147	.122	.206	.236	.130	.039
36f	.276	.275	.054	.236	.289	**.508**	.183	.230	-.042	-.243	.022	.051
29f	.208	.089	-.033	.016	.171	**.382**	.051	.284	.025	-.138	-.023	.042
7s	-.055	-.027	.168	.142	.223	.223	**.637**	-.078	-.071	-.014	.203	-.181
6s	.090	.202	-.002	.157	-.105	.044	**.635**	.329	.032	.049	.133	-.169
38f	.129	-.050	.077	-.039	.061	-.011	**.473**	.112	.046	-.063	-.016	.156
27f	.110	.202	-.096	.148	.037	.143	.140	**.710**	-.078	.054	.060	-.081
1f	.039	-.192	-.031	.180	-.110	.142	.243	**.384**	.012	.146	.049	.010
40s	-.021	-.265	.118	.124	-.094	.089	-.036	.029	**.821**	.118	-.192	-.089
37s	.124	.290	-.073	-.153	.205	.120	.206	-.160	**.446**	.096	.119	.259
12f	.052	.168	.085	.038	.011	.009	-.031	.082	.118	**.776**	-.077	.038
4f	.262	.283	.078	.137	.094	.215	.221	.040	-.104	-.019	**.842**	.008
9f	-.128	.029	-.082	.178	-.081	.062	.106	.246	-.050	-.145	**.348**	-.189
39s	.090	.065	.068	.019	.029	.006	-.021	-.055	-.027	.044	-.042	**.540**
11s	.380	.083	.006	.219	.298	.240	-.030	-.055	-.222	.183	-.017	**-.466**

Note. Items marked with an “f” represent the finder subscale and items marked with an “s” represent the seeker subscale.

The factor structure of CAQ is not entirely straightforward. While the factor analysis simplifies the picture to some extent, it is not the case that all of the items load in a simple manner on only one or two main factors. However, a good deal of structure does emerge, which is, not surprisingly, concentrated in the first several factors. In order to understand the structure of factor loadings, it is necessary to look closer at the patterns of items with high loadings on each factor.

What is the pattern of item loadings for each factor? Factor 1 has eight items with high loadings. The items themselves tend to represent both finder and seeker items. In factor 1, five out of eight high loadings represent finder items. All of the loadings are positive. The items with highest loadings represent beliefs that people have about necessary components of creativity, (e.g., item18: A theory is necessary for creative accomplishment, item 35: Technical skill is the key to creativity, item 23: When I think about creativity, I think about the creative product, and item 31: Real-world experience (data) is necessary for creative accomplishment). Thus, factor 1 appears to have much to do with theoretical factors in creativity, associated with the approach of both finders and seekers.

While factor 1 is comprised by high-loading of both finder and seeker items, factor 2 is dominated by finder items. Indeed, in factor 2, four out of five items with high loadings represent finder items. Only one out of five high loadings represents a seeker item (item 32: When I start a new project, I am not exactly sure how the work will turn out in the end item). However, this item has a negative loading, which means that the opposite of what this item represents is related to factor 2. Items with high loadings represent important characteristics of the finder construct, mainly clarity in planning,

(e.g. item 26: During the creative process, my work unfolds in a way that is consistent with my initial plan, item 13: As I am working on a project, I usually have a very clear sense of what I want to do next, item 3: When I start a new project, I usually have a clear sense of what the final product will be like, and item 8: When I have completed a project, I am confident that it is truly finished). Thus, factor 2 seems to concern process factors in creativity, particularly those associated with the approach of finders.

Factor 3 is comprised of entirely seeker items. Five items have high loadings on this factor. Items with high loadings represent important characteristics of the seeker construct, mainly lack of clarity and difficulty in decision making, (e.g. item 30: I have difficulty deciding that a project is definitively completed, item 28: When I am creating something, making decisions takes a lot of effort, and item 2: During the creative process, I find it difficult to describe what I'm trying to do)

Factor 4 is comprised of two finder and one seeker items with high loading. This factor represents the attitudes toward creative ideas and creativity in general, (high loadings on item 20: I am constantly trying to get novel ideas, item 5: Ideas themselves can be intrinsically good or bad, and item 21: Creativity is best achieved by building on tradition). Factor 5 is comprised of three seeker items. However, it seems to tap into similar aspects as factor 4. However, it is more difficult to name this factor because the relation between the items is not as obvious (high loadings on item 10: Developing ideas is the key to creativity, item 19: I use an inductive approach in my work, starting with specific pieces of information, and item 22: I use an inductive approach in my work, starting with specific pieces of information).

Factor 6 is not clear cut; however, it is easier to interpret than Factor 5. It is comprised of four finder items with positive loadings and one seeker item with a negative loading (item 15: As I am working on a project, I have difficulty deciding what my next move will be). Some items tap into the important characteristics of finders – formulation of goals and decision making process, (e.g., item 14: When I am creating something, making decisions is easy for me, and item 36: During the creative process, I can easily articulate my goals).

Factors 7 and 8 seem to represent different patterns of learning. Thus, factor 7 consists of two seeker items (item 7: During the creative process, my work undergoes substantial revisions, and item 6: I tend to learn very deeply), and one finder item (item 38: I use a deductive approach in my work, starting with general principles). Factor 8 consists of two finder items (item 8: I tend to learn very quickly, and item 1: I prefer working on problems that no one has studied before). Even though the remaining factors yield a few high loadings (see Table 3), the patterns of these loadings are unclear.

Thus, the factor analysis informs the nature of the typology to some degree. Many of the items appear to be closely related to other items, often in sensible ways, suggesting that Galenson's basic typology, which combined numerous facets of the creative person and the creative process, is on the right track. However, this exploratory analysis is limited in several important ways. First, as noted above, despite a rough separation of finder items and seeker items in some factors, the pattern of factor loadings is not always simple or clear. Partly this may be due to error variance in things like poorly worded or ambiguous items, which could be refined in later studies. Second, due to small sample size, the results of the analysis do not allow any conclusive

interpretations of the results. A much larger sample and a confirmatory factor analysis approach would be necessary for such conclusions. Ideally this would be done after any necessary refinement of the items was performed.

Another limitation of the factor analysis approach is that it represents a purely bottom-up approach to the data. However, as noted above, the CAQ was designed with pairs of items aimed to tap into the finder and seeker sides of the same set of constructs. This theory-driven approach is lost in the factor analysis itself. A potentially more informative approach may be to examine the relations among finder items and seeker items (separately and in meaningful pairs), which should complement the factor analysis. These analyses are reported next.

Correlations between pairs of items

While the factor analyses present a view of the data that is entirely bottom-up, because the CAQ was designed to measure the finder versus seeker aspects of particular facets of the typology with pairs of items, a more top-down or theory-driven set of analyses can also be performed, which should complement the factor analyses. Specifically, scores on each pair of items can be compared across all participants. The resulting set of correlations will inform the nature of the typology. If most or many pairs of items are reliably and negatively correlated, this indicates that they function more or less as opposites: a person strongly endorsing one item of the pair will tend to disagree with the other item in the pair, indicating a tradeoff between the two. This is precisely what one would expect if the finder and seeker types represent endpoints of a one-dimensional continuum. However, if pairs of items show correlations near zero, this

indicates independence of the finder and seeker constructs, at least for those facets of the typology. This is what one would expect if the finder and seeker types are separate dimensions, rather than being endpoints of a one-dimensional continuum. Finally, if pairs of items show correlations that are reliable and positive, this would be the most surprising and unanticipated outcome. This result would indicate that for that facet of the typology, if a person gives a high score on one item, they would also give a high score on the other item in the pair. Since each pair of items was designed to measure different or opposite tendencies of the same aspect of creativity, a positive correlation between two paired items likely indicates a problem with the instrument, for example questions that were ambiguous or not clear.

Table 3 shows the correlations between pairs of items. Items are always presented in pairs. Finder items are always listed first and are highlighted in gray. The correlation between each pair of items is shown in the rightmost column. Pairs of items are arranged in order of the strength of the correlation, starting with the most negative correlations at the top of the Table.

Table 3

The Pearson Correlations between the Pairs of Finder - Seeker Items

Item #	Finder Item / Seeker Item	Correlation
33f	Once I start working on a project, I usually complete it quickly.	-.436**
25s	It takes me a long time to complete a project.	
13f	As I am working on a project, I usually have a very clear sense of what I want to do next.	-.406**
15s	As I am working on a project, I have difficulty deciding what my next move will be.	
8f	When I have completed a project, I am confident that it is truly finished.	-.362**
30s	I have difficulty deciding that a project is definitively completed.	
3f	When I start a new project, I usually have a clear sense of what the final product will be like.	-.352**
32s	When I start a new project, I am not exactly sure how the work will turn out in the end.	
4f	I prepare a detailed plan when starting new projects.	-.298**
40s	I begin projects without a detailed understanding of where it will lead.	
34f	I believe that one's best work can be produced at a relatively early age.	-.207*
39s	I believe that one's best work occurs in maturity.	
12f	Creativity is best achieved by rebelling against tradition.	-.189
21s	Creativity is best achieved by building on tradition.	
36f	During the creative process, I can easily articulate my goals.	-.124
2s	During the creative process, I find it difficult to describe what I'm trying to do.	
9f	Over the course of my career, I have worked on a diverse array of projects.	-.093
16s	Over the course of my career, most of my works have had a common theme.	
14f	When I am creating something, making decisions is easy for me.	-.086
28s	When I am creating something, making decisions takes a lot of effort.	

Table 3 *(continued)*:

The Pearson Correlations between the Pairs of Seeker – Finder Items

Item #	Finder Item / Seeker Item	Correlation
5f	Ideas themselves can be intrinsically good or bad.	-.076
37s	Ideas are only good or bad in terms of how they are elaborated.	
1f	I prefer working on problems that no one has studied before.	-.019
24s	I prefer working on problems that are mainstream in nature.	
26f	During the creative process, my work unfolds in a way that is consistent with my initial plan.	.019
7s	During the creative process, my work undergoes substantial revisions.	
17f	Sheer originality is the key to creativity.	.137
35s	Technical skill is the key to creativity.	
20f	I am constantly trying to get novel ideas.	.142
22s	I am constantly trying to improve my skills.	
38f	I use a deductive approach in my work, starting with general principles.	.167
19s	I use an inductive approach in my work, starting with specific pieces of information.	
29f	Generating ideas is the key to creativity.	.239*
10s	Developing ideas is the key to creativity.	
18f	A theory is necessary for creative accomplishment.	.324**
31s	Real-world experience (data) is necessary for creative accomplishment.	
23f	When I think about creativity, I think about the creative product.	.363**
11s	When I think about creativity, I think about the creative process.	
27f	I tend to learn very quickly.	.453**
6s	I tend to learn very deeply.	

Note. In each pair a finder item is always listed first and highlighted in grey. Items were paired initially. Paired items represent opposite aspects of the typology. $df = 105$, $^{**}p < .01$, $^{*}p < .05$.

As can be seen, six correlations between the pairs of items were reliable and negative, with Pearson correlations coefficients with values below -.20. These

correlations were mainly found between the items that tap into the aspects of the typology dealing with clarity of decision making and the time it takes to complete a project, which is also likely related to clarity. Thus, this aspect of Galenson's typology appears to have a largely uni-dimensional structure. Perhaps this is not too surprising, since these kinds of measures are more rooted in behavioral measures during the creative process, rather than attitudes of goals. This analysis suggests that in terms of their decision-making clarity, individuals do show a tradeoff between a more finder-like approach and a more seeker-like approach. While these results are informative, a note of caution in interpreting them is due, since even the strongest negative correlations are not overwhelming and account for less than 20% of the variance in responses to those items.

Ten of the correlations were not reliable, suggesting that these facets of creativity represent independent subscales: a person can agree or disagree with one item in a pair, and this does not inform how they would endorse the other member of the pair. The pairs of items producing nonsignificant correlations tend to tap into the aspects of the typology dealing with attitudes and creative goals. The results suggest that creators' attitudes and goals are more flexible and multi-dimensional than their sense of clarity in decision-making. The fact that half of the paired items showed unreliable correlations is at least somewhat consistent with the factor analyses, which revealed a large number of fairly weak factors.

Finally, four pairs of items produced reliable positive correlations. These results were not expected and suggest that some of the items were unclear or poorly worded. For instance, an item like "Generating ideas is the key to creativity" was intended to tap into the ideation phase of the creative process, which is likely more important to finders

since this is where most of the work in the creative process takes place. The paired item, "Developing ideas is the key to creativity," was intended to tap into the complementary phase of the creative process, elaboration, which is likely more important to seekers since this is where most of their work in the creative process takes place. However, participants may have interpreted the word "Developing" in this item to mean something closer to generating an idea rather than taking an idea which has already been generated and then doing the (potentially) hard work of elaborating it into a final product. If that was the case, it is not surprising to find a reliable positive correlation between the items. In another case, which resulted in the highest positive correlation between pairs of items, participants endorsing the statement "I tend to learn very quickly" also tended to endorse the statement "I tend to learn very deeply." Here it seems likely that a person who thought that they thought quickly would then also have time to delve into a topic in much more depth than a person who thought more slowly.

In future research, these questions can continue to be refined, reworded, or removed if necessary. The extent to which positive correlations, indicating ambiguities in the questions, would be found in an expert sample remains to be seen. However, it is conceivable that some of the ambiguities apparently observed in a non-expert sample would be less of an issue with experts. In any case, the basic pattern of results (especially for the reliable negative correlations and correlations that were not reliably different from zero) is largely consistent with the factor analyses and reinforces the beginning of some structure to the CAQ and to Galenson's typology more generally. Namely, aspects of the typology having to do with behavior appear to be more uni-

dimensional than other aspects of the typology, such as goals and attitudes toward creativity, which appear to be more multi-dimensional.

Since some aspects of the typology show a tradeoff between the types, and other aspects show independence between the types, which is the more accurate view? One way to answer this question is to refine the measures of each subscale, for finders and for seekers, by maximizing the internal consistency of each subscale, and then comparing overall scores on the subscales. If the overall correlation is negative, this suggests that the uni-dimensional tradeoff view is more accurate. If the overall correlation is close to zero, this suggests that the constructs of being a finder and being a seeker are largely independent.

Part-whole Correlations and Cronbach's Alphas

Part-whole correlational analyses were performed on each of the two subscales of items (finder and seeker), to analyze how strongly each item reflects the general subscale. For each participant, scores on all 20 finder items were added to yield an overall finder score. Twenty Pearson correlations were then calculated comparing each person's score on each finder item with each person's overall finder score. A similar procedure was performed on the 20 seeker items. These analyses yielded two sets of part-whole correlations, one for the finder items and one for the seeker items. Within each of these sets, the correlations were rank-ordered by the strength of the part-whole correlation. The item with the highest part-whole correlation is the item that contributes most strongly to that subscale. Ordering the items in this way, for the finder subscale and seeker subscale separately, permits an analysis of the internal consistency of the items. Items

that strongly reflect the subscale in general should yield a relatively high level of internal consistency. Items that show only weak part-whole correlations likely include a great deal of error variance and should decrease the internal consistency of the subscale. By repeatedly calculating a measure of the internal consistency of the items as one works down the rank-ordering of items, one can determine where the point of maximum internal consistency is. By excluding items that serve to decrease the internal consistency of the subscale, one can thus purify the measure of the subscale.

In the present analyses, the measure of internal consistency is Cronbach's alpha. This statistic was first computed on the four items with the highest part-whole correlations, and then recomputed after adding each additional item in order from strongest to weakest correlations. This was done in order to find the subset of finder items that together show the highest internal consistency. This procedure was done for the finder and seeker subscales separately.

Part-whole correlations and Cronbach alphas for all finder items are listed in Table 4.1.

Table 4.1

Part - Whole Correlations and Cronbach's Alphas for Finder Items

Item	Finder Items	Part-whole Correlation	Cronbach Alpha
13f	As I am working on a project, I usually have a very clear sense of what I want to do next.	.620	-
14f	When I am creating something, making decisions is easy for me.	.617	-
36f	During the creative process, I can easily articulate my goals.	.594	-
27f	I tend to learn very quickly.	.582	.692
4f	I prepare a detailed plan when starting new projects.	.570	.734
8f	When I have completed a project, I am confident that it is truly finished.	.559	.750
23f	When I think about creativity, I think about the creative product.	.523	.771
3f	When I start a new project, I usually have a clear sense of what the final product will be like.	.513	.784
26f	During the creative process, my work unfolds in a way that is consistent with my initial plan.	.510	.807
5f	Ideas themselves can be intrinsically good or bad.	.489	.806
33f	Once I start working on a project, I usually complete it quickly.	.463	.807
18f	A theory is necessary for creative accomplishment.	.455	.811
29f	Generating ideas is the key to creativity.	.393	.816
20f	I am constantly trying to get novel ideas.	.384	.817
12f	Creativity is best achieved by rebelling against tradition.	.330	.808
1f	I prefer working on problems that no one has studied before.	.327	.802
9f	Over the course of my career, I have worked on a diverse array of projects.	.288	.800
34f	I believe that one's best work can be produced at a relatively early age.	.276	.793
38f	I use a deductive approach in my work, starting with general principles.	.251	.790
17f	Sheer originality is the key to creativity.	.219	.785

In Table 4.1 finder items are listed in descending order based on their part-whole correlations. All correlations are positive. Items with the strongest correlations are those that tap into important characteristics of the typology such as clarity in decision making (items 13, 14, 4, 8, and 3), planning (items 36, 4, and 26), creative goals (items 23, 18, 29 and 20), and learning/working speed (items 27 and 33). Moreover, some of the items with the highest part-whole correlations tend to be the same items with the highest positive loadings on factor 2 of the factor analysis, suggesting that many of the finder items jointly yield a relatively coherent construct.

This view is further supported by the Cronbach's alphas reported in the rightmost column of Table 4.1. As can be seen, a model with 14 finder items with the highest part-whole correlations produced the highest Cronbach's alpha, with a value of .817, a respectable level of internal consistency. Thus, this model can be used to calculate each participant's finder score. For each participant, the total "finder" score equaled the sum of the responses on these 14 items.

A similar analysis was performed on the 20 seeker items. Part-whole correlations for all seeker items are listed in Table 4.2.

Table 4.2

Part-Whole Correlations and Cronbach's Alphas for Seeker Items

Item	Seeker Items	Part-whole correlation	Cronbach Alpha
28s	When I am creating something, making decisions takes a lot of effort.	.583	-
35s	Technical skill is the key to creativity.	.511	-
30s	I have difficulty deciding that a project is definitively completed.	.503	-
2s	During the creative process, I find it difficult to describe what I'm trying to do.	.500	.585
16s	Over the course of my career, most of my works have had a common theme.	.484	.626
25s	It takes me a long time to complete a project.	.456	.680
24s	I prefer working on problems that are mainstream in nature.	.409	.690
7s	During the creative process, my work undergoes substantial revisions.	.389	.669
31s	Real-world experience (data) is necessary for creative accomplishment.	.378	.669
32s	When I start a new project, I am not exactly sure how the work will turn out in the end.	.357	.683
11s	When I think about creativity, I think about the creative process.	.326	.675
22s	I am constantly trying to improve my skills.	.305	.666
6s	I tend to learn very deeply.	.295	.669
21s	Creativity is best achieved by building on tradition.	.290	.676
19s	I use an inductive approach in my work, starting with specific pieces of information.	.275	.675
15s	As I am working on a project, I have difficulty deciding what my next move will be.	.264	.680
39s	I believe that one's best work occurs in maturity.	.247	.670
40s	I begin projects without a detailed understanding of where it will lead.	.221	.654
10s	Developing ideas is the key to creativity.	.210	.654
37s	Ideas are only good or bad in terms of how they are elaborated.	.203	.647

In Table 4.2 items are listed in descending order based on their part-whole correlations. As expected, all correlations were again positive. Items with the strongest correlations tap into important characteristics of the typology such as clarity in decision making process (or in this case, lack of clarity: questions 28, 30, 2, 8, and 32), lack of planning (question 2), creative goals (question 30, 16, 24 and 32), and learning/working speed (question 25). Moreover, many of the items with the highest part-whole correlations tend to be the same items with the highest positive loadings on factor 3 of the factor analysis. (This is analogous to the pattern of results found for the seeker subscale.) This reveals that the seeker items jointly yield a relatively coherent construct.

How coherent is the seeker construct, compared to the finder construct? To address this question, Cronbach's alpha was calculated on the items in the seeker subscale, beginning with the four items that produced the strongest part-whole correlations, and then adding each additional item in order from strongest to weakest correlations, just as with the finder items. This was done in order to find the subset of seeker items that together show the highest internal consistency. This value can also be compared to the value found for the finder subscale.

The resulting Cronbach's alphas for the seeker items are reported in the rightmost column of Table 4.2. The analysis revealed two models with comparable high values for Cronbach's alpha. First was a model with the 7 items with the highest part-whole correlations, which jointly produced the highest Cronbach's alpha, with a value of .69. However, as can be seen in Table 4.1, in addition, two models with 10 and 16 items produced the second highest value of Cronbach's alpha, .683, and .680 respectively, values very close to the maximum observed alpha. The 10-item model is used in many

subsequent reported analyses because it is more informative and more comparable to the finder model than the seven-item model, since it includes a larger number of items, but, as can be seen bellow, it is more refined than the 16-item model. In addition, the same analyses were done using the seven- and 16-item models and produced very similar results as those with the 10-item model. These models can be used to calculate each participant's seeker score. For each participant, the total "seeker" score equaled the sum of the responses on these 7, 10, or 16 items.

The results of the analyses of items comprising the finder and the seeker subscales revealed several things. First, in the seeker subscale the maximum Cronbach's alpha occurred with fewer seeker items, compared to finder items, is consistent with there being more 'noise' in the seeker items, especially those with low part-whole correlations. The seeker items with the lowest part-whole correlations reduce the internal consistency of the items, and hence the value of Cronbach's alpha. In general, the part-whole correlations for the finder items reflect greater internal consistency than for the seeker items. This is also evident by the Cronbach's alpha analyses. The overall values for alpha in the seeker items are lower than the finder items, again reflecting lower internal consistency in the seeker items. Thus, just as the approach of finders is more straightforward and direct than that of seekers (in terms of their actual behaviors), the construct of being a finder also appears to be simpler and statistically more coherent than the construct of being a seeker.

Overall, the main goal of the analyses described here was to refine the finder and seeker subscales of the CAQ by removing the ill-fitting items. This was achieved by first computing the correlations between each individual item and the total score across all

items on the subscale and then, computing Cronbach's alpha to find out how many of the item with strong part-whole correlations should be retained. As a result, a refined version of the subscales of the CAQ was generated, with 14 finder and 10 seeker items, which will be used in subsequent analyses.

Correlations between the Finder and Seeker Subscales

The goal of refining the finder and seeker subscales was to purify the measurement of each construct so that a valid comparison of the two subscales could be performed. This comparison provided a means of determining whether the finder and seeker constructs are negatively correlated or independent. Note that this is arguably the most central goal of the entire investigation, since the question of dimensionality is one of the most fundamental issues in understanding the nature of Galenson's finder-seeker typology: are the two types mutually exclusive endpoints of a one-dimensional continuum, or are they independent constructs?

In order to understand the statistical relation between the finder and seeker subscales, correlations between the two subscales were computed. Because the seeker subscale could be refined in several ways (i.e., with 7, 10, or 16 items) and because of the centrality of this analysis, all three versions of the seeker subscale measure are included. Finally, to round out the set of analyses, the unpurified 20-item measures of the finder and seeker subscales are likewise included, to see how (if at all) the refinement of the subscales changed the results.

The results of the analysis are summarized in Table 5.

Table 5

Pearson Correlations between the Finder and Seeker Subscales

		(1)	(2)	(3)	(4)	(5)	(6)
(1)	Finder 20	-	.309**	.954**	.086	.102	.289**
(2)	Seeker 20	.309**	-	.248*	.837**	.894**	.951**
(3)	Finder 14	.954**	.248*	-	.003	.010	.220*
(4)	Seeker 7	.086	.837**	.003	-	.950**	.850**
(5)	Seeker 10	.102	.894**	.010	.950**	-	.923**
(6)	Seeker 16	.289**	.951**	.220*	.850**	.923**	-

Note. $df = 105$. $^{**}p < .01$, $^{*}p < .05$.

Not surprisingly, the highest correlations were found within the finder and seeker subscales. Thus, the correlation between the 20-item and the 14-item finder models was very high, $r = .954$, $p < .01$. The correlations between the 20-item and the 16-item, 10-item, and 7-item seeker models were also very high, $r = .951$, .894 and .837, respectively, all $p < .01$. The correlation between the 16-, 10- and 7-item seeker models was likewise very high, $r = .923$, $p < .01$, between 16- and 10-item models, $r = .850$, $p < .01$ between 16- and 7-item models, and $r = .923$, $p < .01$, between 10- and 7-item models. All of these correlations were obviously strong because of the overlap of the items in different models.

The correlation between the unrefined 20 item seeker and finder subscales was positive and quite strong ($r = .309$, $p < .01$). This indicates that when the 'noisy' versions of each subscale are compared, the two constructs are actually positively related.

However, the whole point of the preceding analyses using part-whole correlations and Cronbach's alpha was to eliminate as much noise as possible from the subscales and arrive at purified measures of each construct. Thus, the reliable, positive correlation between the unpurified finder and seeker subscales is somewhat beside the point. Of far greater interest are the correlations when both of the subscales have been purified.

Interestingly, when this was done and both subscales were refined, the correlations between them were generally close to zero. Specifically, the correlation between the 14-item (refined) finder subscale and the 10-item (refined) seeker subscale was nonsignificant, $r = .007$. The correlation between the 14-item (refined) finder subscale and the 7-item (refined) seeker subscale was also nonsignificant, $r = .001$. This set of results suggests that when the constructs are refined, the relation between them is one of independence. The only reliable correlation obtained was the one between the 14-item (refined) finder subscale and the 16-item (refined) seeker subscale, $r = .22$, $p < .05$. This set of results suggests that there something about the last 6 six items added to the ten-item seeker subscale to yield the 16-item seeker subscale, that overlaps with the finder items contributing to positive correlation between the two models.

Although not completely necessary for the analysis, correlations were also computed separately when only one of the subscales (and not the other) had been purified. These are useful for informing the statistical nature of the subscales. Interestingly, the correlation between the 14-item (refined) finder subscale and 20-item (unrefined) seeker subscale was still reliably positive, $r = .245$, $p = .012$, though weaker than the correlation between the two unrefined subscales. However, the correlations between the 20-item (unrefined) finder subscale and both refined seeker subscales (i.e.,

10-item and 7-item) were weak and not reliable ($r = .100$, $p > .05$) and ($r = .085$, $p > .05$), respectively. This finding is consistent with the observation (in the factor analysis and Cronbach's alpha analyses) that the finder subscale is statistically "cleaner" than the seeker subscale: in other words, the seeker subscale benefits more from refinement than the finder subscale, because it was statistically noisier in the first place. It can also help explain the significant correlation between the 14-item finder and 16-item seeker subscales.

The Seeker subscale: A post-hoc analysis

While the correlational results suggest that the finder and seeker subscales are independent, a nagging complication is that when the 16-item seeker subscale is correlated with the 10-item finder subscale, a reliable (though small) positive correlation emerges. This suggests that there something about the last 6 six items added to the ten-item seeker subscale to yield the 16-item seeker subscale, that overlaps with the finder items contributing to positive correlation between the two models. To understand this issue, a set of post-hoc analyses were performed in order to understand what it was about the six items (items 11, 22, 6, 21, 19 and 15), which, when added to the 10-item seeker subscale, result in a positive correlation with the finder subscale. First, it is important to note that these six items yielded quite low part-whole correlations (see Table 4.2), indicating that they do not very well represent the seeker subscale. Is this possible that these items were somehow being interpreted as the finder items? The analysis of part-whole correlations of the seeker items with the finder subscale would allow a better answer to this question.

In order to explore this set of findings further the analysis of part-whole correlations was performed between the seeker items and finder subscales. In addition, in order to observe a pattern of relation of finder items to the seeker subscale especially those not included into the refined 14-item model, the analysis of part-whole correlations between the finder items and the seeker subscale was also performed. The results are summarized in Table 6.

Table 6

Part-Whole Correlations for the Seeker Items and the Finder Subscale, and for the Finder Items and the Seeker Subscale

Seeker Item Number	Correlation with Finder Subscale	Finder Item Number	Correlation with Seeker Subscale
Item 6	**0.488**	Item 18	0.434
Item 11	**0.416**	**Item 34**	**0.354**
Item 35	0.362	Item 23	0.305
Item 19	**0.327**	Item 5	0.286
Item 21	**0.315**	Item 36	0.226
Item 22	**0.296**	**Item 38**	**0.208**
Item 24	0.296	Item 4	0.181
Item 7	0.282	Item 29	0.146
Item 31	0.257	Item 14	0.143
Item 37	0.216	**Item 12**	**0.135**
Item 10	0.191	**Item 17**	**0.120**
Item 16	0.180	**Item 1**	**0.010**
Item 28	0.079	Item 27	0.087
Item 39	-0.007	Item 33	0.037
Item 2	-0.030	Item 13	0.036
Item 40	-0.036	Item 26	0.026
Item 25	-0.183	Item 8	0.024
Item 30	-0.240	Item 20	-0.029
Item 32	-0.325	Item 3	-0.039
Item 15	**-0.330**	**Item 9**	**-0.066**

Note. Items are sorted in descending order based on the strength of their part-whole correlations. The items are listed in the Appendix. The last six seeker items on the 16-item seeker subscale are bolded. The last six finder items that were not included into the 14-item finder subscale are bolded as well.

As can be seen in Table 6, five out six seeker items added to the 10-item refined subscale (items 6, 11, 19, 21 and 22) produced the highest part-whole correlations with the finder subscale. In comparison, out of the six finder items that were not included in the 14-item finder subscale only two produced high part-whole correlations with the seeker subscale. These results not only explain the reason that the 16-item seeker subscale produced significant positive correlation with 14-item finder subscale, but also provide more evidence suggesting that the seeker subscale needs more refinement than the finder subscale. Finally, this post-hoc analysis was conducted to illustrate that even though the 16-tem seeker subscale yielded a rather high Cronbach's alpha, it should not be utilized as the most refined or purified subscale. This reinforces the choice of the 10-item (refined) subscale as the most appropriate summary of the seeker construct.

Summary of Finder and Seeker Subscales

On the whole, these results suggest that Galenson's typology of finders and seekers does not represent a true dichotomy or even endpoints on a uni-dimensional continuum. Rather, each of these types appears to exist independently of the other. Thus, in principle a person can show a high or low score on the finder subscale or a high or low score on the seeker subscale, in any combination. Note that if the finder and seeker constructs were part of a uni-dimensional continuum and showed a trade-off, then a negative correlation between the refined subscales would be expected: a particular individual would either be one or the other, or to the extent that they showed more characteristics of one type, they would necessarily show fewer characteristics of the other type. However, this does not appear to be the case.

Since on the whole the two basic types appear to be essentially independent, we will treat each subscale separately when we compare the performance on the other psychological measures in the next chapter.

CHAPTER 4: RESULTS - CAQ VS. OTHER MEASURES

In the previous chapter, the development, analysis, and refinement of the Creative Approach Questionnaire were described. A measure of the extent to which each participant can be regarded as having characteristics of a finder and of a seeker was generated via the two subscales. In this chapter, each participant's scores on each of the two subscales are used to examine the relations between being a finder and seeker with each of the other measures tested. First, median splits on the finder subscale and seeker subscale are performed to yield a fourfold classification of high-low on each subscale (high-finder and high-seeker, high-finder and low-seeker, low-finder and high-seeker, and low-finder and low-seeker). Performance on each of the other measures is then examined, using median splits to yield finder and seeker classifications as independent variables in a factorial ANOVA. Then, performance on each of the subscales is correlated with each of the other measures. These analyses will inform the basic relations between the subscales and existing psychological constructs, which should help to "psychologize" Galenson's finder-seeker typology. The correlations will yield the basic sense of the relations between the variables. In addition, because the ANOVAs include an interaction term that jointly includes the effects of both subscales, they provide more information than the correlations by themselves. For instance, it might be the case that to show high tolerance for ambiguity, it is not enough score high on the seeker subscale, but one must also score low on the finder subscale. The ANOVA results are reported first, followed by the correlations.

Median splits

The first set of analyses involves using median splits on each of the two subscales. This enables a classification of each participant as being either "high" or "low" on the finder and seeker subscales. For this analysis, the refined 14-item subscale was used to compute each participant's total finder score. Thus, for each participant, the scores on the 14 finder items were added to produce the total finder score. Then, the total finder scores for all participants were ordered from highest to lowest and split at the median. Four participants shared the median score on the finder subscale. Thus, the 50 highest finder scores were assigned a score of 1 and 55 lowest finder scores were assigned a score of 0.

The results of Cronbach's alpha analysis revealed three seeker models with the highest alphas – one with 7 items, one with 10 items, and one with 16 items. Based on that, three sets of total scores were computed for the seeker subscale. The first set of total score was calculated based on the refined 7-item seeker model; the second set of scores was calculated based on the refined 10-item seeker model, and the third set of scores was calculated based on the refined 16-item seeker model. Theoretically each of these two sets of total scores can be used in subsequent analyses. Then, both sets of the total seeker scores were ordered from highest to lowest and split at the median. For the 10 item version of the seeker subscale, a large number of scores were tied at the median. Thus, assigning individuals with that median score to either the high or low group on that variable would create an imbalance in the sample sizes, which could affect the results of the analyses. To take either extreme possibility into account, both kinds of analyses were

performed; that is, individuals with that median score were in one case assigned to the high seeker group and in the other case to the low seeker group.

Thus, for the seeker subscale, four types of median splits were performed. One used total scores based on the 7-item model, where 51 high seeker scores were assigned a value of 1, and 54 low seeker scores were assigned a value of 0. The other two variations of median-split were performed was with the total seeker scores computed using the 10-item model, 47 high seeker scores were assigned a value of 1 and 58 low seeker scores were assigned a value of 0. In the other analysis, 56 high seeker scores were assigned a value of 1 and 49 low seeker scores were assigned a value of 0. Finally, the median splits were obtained using total scores based on the 16-item model, where 52 high seeker scores were assigned a value of 1, and 53 low seeker scores were assigned a value of 0. These scores were used in computing the ANOVAs. The subsequent analyses were performed with all variation of median splits for the seeker subscale. However, only the results obtained with the 10-item model with 47 high vs. 58 low seeker scores are reported below. The results obtained with 10-item model were chosen because this model is more informative than the 7-item model, more comparable to the 14-item finder model, and more refined than the 16-item model. Ultimately, however, the choice of the median splits model was arbitrary because all three models produced highly comparable results.

Comparison of CAQ and other measures: ANOVA

In order to reveal the relationship of CAQ to existing measures several factorial ANOVAs were performed, where the dependent variable was each participant's score on the existing scales and the two between-subject factors were the participant's

classification (high or low) on the finder subscale and on the seeker subscale, based on the median split on the 14-item finder model and 10-item seeker model with 47 high and 58 low scores. The analysis of each dependent variable was performed in an identical way. The descriptive statistics for each measure are reported in Table 7.

Table 7

Descriptive Statistics for Existing Psychological Measures

	Min.	*Max.*	*M*	*SD*
AT	0	18	7.99	3.23
NCS	26	87	54.97	11.99
NFCS	95	188	135.91	16.72
EW	0	89	42.09	16.86
ATTA	23	87	64.48	13.31
ATTA – NR	0	23	12.49	5.28
ATTA TIS	22	74	56.47	10.38

Note. AT = Ambiguity Tolerance, NCS = Need for Cognition Scale, NFCS = Need for Cognitive Closure Scale, EW = East – West Questionnaire, ATTA = Abbreviated Torrance Test for Adults, ATTA-NR = Norm Referenced Subscale of the ATTA, ATTA-CR = Criterion Referenced Subscale of the ATTA.

Ambiguity Tolerance

For Ambiguity Tolerance, the results of the ANOVA are reported in Table 8.1. As can be seen, the strongest effect was the statistically reliable interaction between the finder and seeker classification. There was no main effect of finder, and only a marginally reliable effect of seeker. According to Cohen (1988), a partial eta-squared

effect size of about .01 is small, that of about .06 is medium, and the effect size of about .14 is considered large. Thus, both main effects show rather small effect sizes; the interaction term shows a small to medium effect size.

Table 8.1

Relationship between Finder and Seeker subscales and Ambiguity Tolerance: ANOVA results

Source	*SS*	*df*	*MS*	*F*	*p*	Partial Eta Squared
Finder	13.30	1	13.30	1.34	.25	.01
Seeker	35.08	1	35.08	3.54	.06	.03
Finder x Seeker	41.53	1	41.53	4.19	.04	.04
Error	100.64	101	9.91			
Corrected Total	1086.00	104				

The descriptive statistics for the analysis of variance with the scores on the Ambiguity Tolerance Scale and the finder-seeker classification are reported in Table 8.2.

Table 8.2

Relationship between Finder and Seeker subscales and Ambiguity Tolerance: Descriptive Statistics

Finder Median Split	Seeker Median Split	*M*	*SD*	*N*
0	0	7.22	2.80	32
	1	9.65	3.10	23
	Total	8.24	3.13	55
1	0	7.77	3.48	26
	1	7.67	3.27	24
	Total	7.72	3.34	50
Total	0	7.47	3.10	58
	1	8.64	3.31	47
	Total	7.99	3.23	105

The cell means inform the nature of the interaction. For participants categorized as high finder and low seeker, the *M (SD)* score on Ambiguity Tolerance was 7.77 (3.48). For participants categorized as high finder and high seeker, the *M (SD)* score on Ambiguity Tolerance was 7.67 (3.27). For participants categorized as low finder and low seeker, the *M (SD)* score on Ambiguity Tolerance was 7.22 (2.80). For participants categorized as low finder and high seeker, the *M (SD)* score on Ambiguity Tolerance was 9.65 (3.10). Notably, the last reported cell mean, for participants categorized as low finder and high seeker is substantially higher than any of the other means, which yields the reliable interaction. This result is interesting, as it suggests that the participants who show the highest tolerance for ambiguity are those who score high on the seeker subscale

and low on the finder subscale. In other words, it is not quite enough to only be high on the seeker subscale (since this effect was not statistically reliable at the .05 level).

Need for Cognition

For Need for Cognition, the results of the ANOVA are reported in Table 9.1. There was a strong main effect of finder, with a medium effect size, and no effects of seeker or interaction.

Table 9.1

Relationship between Finder and Seeker Subscales and Need for Cognition: ANOVA Results

Source	*SS*	*df*	*MS*	*F*	*p*	Partial Eta Squared
Finder	924.12	1	924.12	6.66	.01	.06
Seeker	23.32	1	23.32	.17	.68	.00
Finder x Seeker	1.34	1	1.34	.08	.79	.00
Error	14015.32	101	138.77			
Corrected Total	14948.91	104				

The descriptive statistics for the analysis of variance with the scores on the Need for Cognition Scale and the finder-seeker classification are reported in Table 9.2.

Table 9.2

Relationship between Finder and Seeker subscales and Need for Cognition: Descriptive Statistics

Finder Median Split	Seeker Median Split	*M*	*SD*	*N*
0	0	52.84	13.04	32
	1	51.26	7.450	23
	Total	52.18	11.01	55
1	0	58.19	12.85	26
	1	57.88	12.12	24
	Total	58.04	12.38	50
Total	0	55.24	13.12	58
	1	54.64	10.56	47
	Total	54.97	11.99	105

For participants categorized as high finder, regardless of the seeker score, the *M* (*SD*) score on Need for Cognition was 58.04 (12.38), while for participants categorized as low finder, regardless of the seeker score, the *M* (*SD*) score on Need for Cognition was 52.18 (11.01). Evidently the discrepancy between the high finder cell mean and low finder cell mean is very strong, which yields the reliable main effect of finder. This result is interesting, as it suggests that the participants who show the lowest need for cognition (indicated by high numeric scores) are those who score high on the finder subscale regardless of their score on the seeker subscale.

Need for Cognitive Closure

The results of the ANOVA with Need for Cognitive Closure, are reported in Table 10.1. No statistically reliable main effects were observed and there was no interaction between the finder and seeker classification. Not surprisingly, effect sizes were all quite small.

Table 10.1

Relationship between Finder and Seeker Subscales and Need for Cognitive Closure: ANOVA Results

Source	*SS*	*df*	*MS*	*F*	*p*	Partial Eta Squared
Finder	89.79	1	89.79	.32	.57	.00
Seeker	224.49	1	224.49	.80	.37	.01
Finder x Seeker	273.80	1	273.80	.980	.33	.01
Error	28397.89	101	281.17			
Corrected Total	29062.23	104				

The descriptive statistics for the analysis of variance with the scores on the Need for Cognitive Closure Scale and the finder-seeker classification are reported in Table 10.2.

Table 10.2

Relationship between Finder and Seeker Subscales and Need for Cognitive Closure: Descriptive Statistics

Finder Median Split	Seeker Median Split	*M*	*SD*	*N*
0	0	132.19	19.47	32
	1	138.39	13.75	23
	Total	134.78	17.44	55
1	0	137.31	14.05	26
	1	137.00	18.13	24
	Total	137.16	15.97	50
Total	0	134.48	17.30	58
	1	137.68	15.98	47
	Total	135.91	16.72	105

No difference in mean Need for Cognitive Closure was observed in any of the four groups.

East-West Questionnaire

The results of the ANOVA with East-West Questionnaire are reported in Table 11.1. There was no main effect of finder, only a marginally reliable effect of seeker, and no interaction. The main effects of finder and the interaction show rather small effect sizes; the main effect of a seeker shows a slightly larger effect size.

Table 11.1

Relationship between Finder and Seeker Subscales and East-West Questionnaire: ANOVA Results

Source	*SS*	*df*	*MS*	*F*	*p*	Partial Eta Squared
Finder	695.27	1	695.27	2.53	.12	.02
Seeker	838.68	1	838.68	3.05	.08	.03
Finder x Seeker	301.48	1	301.48	1.10	.30	.01
Error	27761.84	101	274.87			
Corrected Total	29572.03	104				

The descriptive statistics for the analysis of variance with the scores on the East-West Questionnaire and the finder-seeker classification are reported in Table 11.2.

Table 11.2

Relationship between Finder and Seeker Subscales and East-West Questionnaire: Descriptive Statistics

Finder Median Split	Seeker Median Split	*M*	*SD*	*N*
0	0	43.61	13.27	32
	1	45.89	17.31	23
	Total	44.56	14.99	55
1	0	35.00	17.31	26
	1	44.12	18.90	24
	Total	39.38	18.49	50
Total	0	39.75	15.68	58
	1	44.98	17.97	47
	Total	42.09	16.86	105

The cell means inform the ANOVA results. For participants categorized as high seeker, regardless of the finder score, the M (SD) score on East-West Questionnaire was 44.98 (17.97), which was somewhat larger that those characterized as low seeker 39.75 (15.68). The cell means indicate that there is a slight difference between the EW scores for those who scored as high seeker and those who scored as high finder, indicating that those with high seeker scores are more likely to exhibit somewhat high Eastern thought and than those with high finder scores.

Group Embedded Figures Test

For Group Embedded Figures Test, the results of the ANOVA are reported in Table 12.1. No statistically reliable main effects were observed, and there was no interaction. Small effect sizes were found for the seeker variable and the interaction, while a small to medium effect size was found for the finder variable.

Table 12.1

Relationship between Finder and Seeker Subscales and Group Embedded Figures Test: ANOVA Results

Source	*SS*	*df*	*MS*	*F*	*p*	Partial Eta Squared
Finder	44.42	1	44.42	1.60	.21	.05
Seeker	49.66	1	49.67	1.79	.18	.02
Finder x Seeker	0.06	1	.06	.00	.96	.00
Error	280.87	101	27.73			
Corrected Total	2902.23	104				

The descriptive statistics for the analysis of variance with the scores on the Group Embedded Figures Test and the finder-seeker classification are reported in Table 12.2.

Table 12.2

Relationship between Finder and Seeker Subscales and Group Embedded Figures Test: Descriptive Statistics

Finder Median Split	Seeker Median Split	*M*	*SD*	*N*
0	0	11.22	5.48	32
	1	12.65	4.81	23
	Total	11.82	5.21	55
1	0	12.58	5.55	26
	1	13.92	5.07	24
	Total	13.22	5.32	50
Total	0	11.83	5.50	58
	1	13.30	4.93	47
	Total	12.49	5.28	105

No difference in mean scores for the Group Embedded Figures Test was observed in any of the four groups.

Abbreviated Torrance Test for Adults

For Abbreviated Torrance Test for Adults, the results of the ANOVA are reported in Table 13.1. There was no main effects of finder or seeker and no interaction. The effect sizes were small.

Table 13.1

Relationship between Finder and Seeker Subscales and Abbreviated Torrance Test for Adults: ANOVA Results

Source	*SS*	*df*	*MS*	*F*	*p*	Partial Eta Squared
Finder	364.60	1	364.60	2.13	.15	.02
Seeker	447.60	1	447.60	2.62	.11	.02
Finder x Seeker	305.70	1	305.70	1.79	.18	.00
Error	17261.69	101	17.91			
Corrected Total	18428.19	104				

The descriptive statistics for the analysis of variance with the scores on the Abbreviated Torrance Test for Adults and the finder-seeker classification are reported in Table 13.2.

Table 13.2

Relationship between Finder and Seeker Subscales and Abbreviated Torrance Test for Adults: ANOVA Results

Finder Median Split	Seeker Median Split	Mean	SD	N
0	0	61.03	13.50	32
	1	64.96	16.00	23
	Total	62.67	14.59	55
1	0	64.88	12.28	26
	1	68.17	10.75	24
	Total	66.46	11.57	50
Total	0	62.76	13.00	58
	1	66.60	13.52	47
	Total	64.48	13.31	105

No difference in mean scores for the Abbreviated Torrance Test for Adults was observed in any of the four groups.

In addition to the overall analysis of the Abbreviated Torrance Test for Adults, two subscales of the ATTA were analyzed separately. One subscale represents the Norm-Referenced measure of four abilities: Fluency, Originality, Elaboration, and Flexibility. The other sub-score represents the Criterion-Referenced measure of fifteen creativity indicators group into either verbal responses, e.g., Emotion/Feelings, Humor, Provocative Questions, or Figural Responses, e.g., Movement and/or Sound, Abstractness of Titles and Fantasy. The ANOVA results for both subscores are reported next.

The Norm-Referenced (NR) Subscore of ATTA

For the Norm-Referenced subscore of the ATTA, the results of the ANOVA are reported in Table 14.1. There were no main effects of finder or seeker and no interaction. The effect sizes were small.

Table 14.1

Relationship between Finder and Seeker Subscales and the Norm-Referenced Subscore of the Abbreviated Torrance Test for Adults: ANOVA Results

Source	*SS*	*df*	*MS*	*F*	*p*	Partial Eta Squared
Finder	138.63	1	138.63	1.27	.26	.01
Seeker	44.21	1	44.21	.41	.53	.00
Finder x Seeker	2.77	1	2.77	.03	.87	.00
Error	11001.55	101	108.92			
Corrected Total	11204.13	104				

The descriptive statistics for the analysis of variance with the scores on the Norm-Referenced Subscore of the Abbreviated Torrance Test for Adults and the finder-seeker classification are reported in Table 14.2.

Table 14.2

Relationship between Finder and Seeker Subscales and the Norm-Referenced Subscore of the Abbreviated Torrance Test for Adults: Descriptive Statistics

Finder Median Split	Seeker Median Split	*M*	*SD*	*N*
0	0	54.63	10.80	32
	1	56.26	12.48	23
	Total	55.31	11.45	55
1	0	57.27	9.10	26
	1	58.25	7.97	24
	Total	57.74	9.00	50
Total	0	55.81	10.44	58
	1	57.28	10.35	47
	Total	56.47	10.38	105

No differences in mean scores for the Norm-Referenced Subscore of the Abbreviated Torrance Test for Adults were observed.

The Criterion-Referenced (CR) Subscore of ATTA

For the Criterion-Referenced subscore of the ATTA, the results of the ANOVA are reported in Table 15.1. There was no main effect of finder or interaction. There was a reliable main effect of the seeker variable, with a medium effect size.

Table 15.1

Relationship between Finder and Seeker Subscales and the Criterion-Referenced Subscore of the Abbreviated Torrance Test for Adults: ANOVA Results

Source	*SS*	*df*	*MS*	*F*	*p*	Partial Eta Squared
Finder	39.35	1	39.35	2.53	.12	.02
Seeker	133.82	1	133.82	8.60	.00	.08
Finder x Seeker	0.01	1	0.01	.00	.99	.00
Error	1572.31	101	15.57			
Corrected Total	1755.96	104				

The descriptive statistics for the analysis of variance with the scores on the Criterion-Referenced Subscore of the Abbreviated Torrance Test for Adults and the finder-seeker classification are reported in Table 15.2.

Table 15.2

Relationship between Finder and Seeker Subscales and the Criterion-Referenced Subscore of the Abbreviated Torrance Test for Adults: Descriptive Statistics

Finder Median Split	Seeker Median Split	*M*	*SD*	*N*
0	0	5.77	3.63	26
	1	8.79	4.20	29
	Total	7.36	4.19	55
1	0	8.26	3.39	23
	1	9.15	4.37	27
	Total	8.74	3.93	50
Total	0	6.94	3.70	49
	1	8.96	4.25	56
	Total	8.02	4.11	105

The cell means inform the ANOVA results. For participants categorized as high on the seeker subscale, regardless of their finder scores, the *M* (*SD*) score on ATTA-CR was 8.96 (4.25). For participants categorized as low on the seeker subscale, regardless of their finder scores, the *M* (*SD*) score on ATTA-CR was 6.94 (3.70). The reliable effect of seeker indicates that participants who score high on the seeker subscale tend to produce the high scores on the Criterion-Referenced subscore of the ATTA. This is an important finding because according to Goff & Torrance (2002), the presence of the Criterion-Referenced indicators "can be regarded as a creative strength" (p. 15), which suggests that high seeker scores may be associated with higher creativity, at least in this domain-general way.

The factorial ANOVAs between the seeker and finder subscales and other measures used in the study presented in this section shed light on the relationship of the CAQ to the other measures. It was found that participants who score high on seeker and low on finder subscale are more likely to be tolerant of ambiguity. Those who score high on the finder subscale are likely to exhibit low need for cognition. However, those who score high on the seeker subscale may exhibit high Eastern thought and are likely to me more creative (at least in regards to criterion-references indicators of creativity). No significant results were found between the subscales of CAQ and Need for Cognitive Closure, Group Embedded Figures Test, and Abbreviated Torrance Test for Adults (including its' Norm-Referenced subscore). These finding may indicate that there is either no relationship between the CAQ and these constructs or that this relationship was not detected in present study. A larger sample may be needed before making any conclusions about the nature of the relationship between these measures, although the effect sizes are likely to be small in any case.

Comparison of CAQ and other measures: Pearson correlations

In addition to the analyses of variance, Pearson correlations were computed between the finder and seeker subscales and other measures. These correlations may provide additional information about the relationships between these measures. In this section Pearson correlations between the refined seeker and finder subscales, other paper-and pencil questionnaires (Ambiguity Tolerance, Need for Cognition, Need for Cognitive Closure, and East-West Questionnaire), and performance measures (Group Embedded Figures Test and Abbreviated Torrance Test for Adults including the Norm-Referenced

and Criterion-Referenced subscores) are described. The results with 14-item refined finder and 10-item refined seekers models are reported. Pearson correlations with the 7-item refined seeker model produced similar results as those with the 10-item model. Thus, only the later results are reported, except one case where the results were marginally reliable with the 10-item model (p = .07) vs. reliable (p = .04) with the 7-item model. All correlations are reported in Table 16.

Table 16

Correlations between CAQ and Other Measures

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1)	Finder 14	-	.08	-.13	.24*	.05	-.21*	.14	.16	(.17)*	(.17)*
(2)	Seeker 10	.08	-	.25**	-.09	.22*	.23*	.11	(.18)*	.10	.10
(3)	AT	-.13	.25**	-	.41**	.22*	.22*	.08	.01	-.06	.05
(4)	NFC	.24*	-.09	.41**	-	-.11	-.14	-.10	-.12	-.10	-.16
(5)	NFCS	.05	.22*	.22*	-.11	-	.22*	.12	.13	.08	.22*
(6)	EW	-.21*	.23*	.22*	-.14	.22*	-	-.07	.02	-.01	.08
(7)	GEFT	.14	.11	.08	-.10	.12	-.07	-	.30**	.29**	.24**
(8)	ATTA	.16	(.18)*	.01	-.12	.13	.02	.30**	-	.97**	.79**
(9)	ATTA-NR	.13	.10	-.06	-.10	.08	-.01	.29**	.97**	-	.62**
(10)	ATTA-CR	(.17)*	.32**	.05	-.16	.22*	.08	.24**	.79**	.62**	-

Note: df = 105. **p < .01, *p < .05, (*)p < .10. AT = Ambiguity Tolerance, NCS = Need for Cognition Scale, NFCS = Need for Cognitive Closure Scale, EW- East = West Questionnaire, ATTA = Abbreviated Torrance Test for Adults, ATTA-NR = Norm Referenced Subscale of the ATTA,ATTA-CR = Criterion Referenced Subscale of the ATTA.

The results shown in the correlation matrix between the scores on all measures used in present study are consistent and even more informative than the results of the analysis of variance. Even though no correlation was found between the Ambiguity Tolerance scale and the finder subscale, a significant positive correlation was found between the Ambiguity Tolerance Scale and the seeker subscale. This result is consistent with the ANOVA results for Ambiguity Tolerance indicating a marginal effect of the seeker subscale and a significant interaction. Both analyses indicate that high Seeker scores are related to the high AT scores.

A significant positive correlation (r = .24, p = .01*)* was found between the Need for Cognition and a finder subscale. This result is consistent with the ANOVA results for the Need for Cognition indicating a strong main effect of the finder subscale. Again, both analyses indicate that participants with high finder scores exhibit low Need for Cognition.

Despite the lack of significance in the ANOVA results for the Need for Cognitive Closure scale, a reliable positive correlation (r = .22, p = .03*)* was found between the NFCS and the seeker subscale. This is an interesting result indicating a possible relationship between the two variables that could be pursued in future work.

A significant negative correlation (r = -.21, p = .03*)* was found between the East-West Questionnaire and the finder subscale and, and a significant positive correlation (r = .23, p = .02*)* was found between the EW and the seeker subscale. The ANOVA results indicated only a marginal effect of the seeker subscale. However, the current results suggest that there maybe a more complex and interesting between the two constructs. Thus, the analysis of correlations shows high Finders scores indicate low Eastern thought

and high Seekers scores indicate high Eastern thought, which is also consistent with Kozbelt & Durmysheva's (in press) comparison of Eastern and Western artists.

No reliable correlations were found between the Group Embedded Figures Test and either of the CAQ subscales, consistent with the results of the Analysis of Variance.

The correlation between the overall Abbreviated Torrance Test for Adults and the finder subscale was not reliable. However, a marginally reliable correlation was found between ATTA and the seeker subscale (r = .18, p = .07*)*. Moreover, the analysis of Pearson correlation between the ATTA and the 7-item refined seeker model, which was not reported in Table 16, indicated a reliable positive correlation between the two measures (r = .20, p = .04*)*. The results of the ANOVA for the ATTA were not reliable. Nevertheless, according to the correlational analyses a relationship may exist between the two measures, with high Seeker scores somewhat associated with high creativity scores. Additional analyses with the subscores of ATTA support these findings.

No reliable correlations were found between the Norm-Referenced subscore of the ATTA (ATTA –NR) and either of the two subscales. However, a marginally reliable positive correlation was found between the Criterion-Referenced subscore of the ATTA (ATTA-CR) and the finder subscale (r = .17, p = .08*)*, and a strong positive correlation was found with the seeker subscale (r = .32, p = .01*)*. The relationship was even stronger when the 7-item Seeker model was used (r = .34, p < .01). These results again support the results of the ANOVA, indicating a relationship between the Seeker construct and the Criterion-Referenced measure of creativity. The significant results with the Criterion-Referenced subscore of ATTA but not the Norm-Referenced subscore indicate that the construct taps into some of the aspects of creativity, but not other aspects of creativity.

This can also explain the nonsignificant results with the overall ATTA score – the nonsignificant results with the Norm-Referenced creativity indicators apparently produced sufficient error variance to cancel out the significant result on the Criterion-Referenced indicators.

The analysis of correlations also revealed relationship between the various existing psychological measures used in the study (apart from their relations with the CAQ). In particular, a strong positive correlation ($r = .41$, $p < .01$) was found between the Ambiguity Tolerance scale and the Need for Cognition scale. A significant positive correlation was found between the Ambiguity Tolerance scale and both the Need for Cognitive Closure scale ($r = .22$, $p = .02$) and the East-West Questionnaire ($r = .22$, $p = .02$). A strong positive relationship between the Ambiguity Tolerance scale and the Need for Cognition scale indicates that participants with high Ambiguity Tolerance scores also exhibit low need for cognition (recall that high scores on the NCC scale indicate low need for cognition). The positive correlation observed between the Ambiguity Tolerance scale and the Need for Cognitive Closure scale is consistent with previous findings. This indicates that participants exhibiting high ambiguity tolerance would be likely to also exhibit low need for closure. Webster and Kruglanski (1994) reported a positive relationship between the Need for Closure and the Intolerance for Ambiguity.

Need for Cognitive Closure correlated positively with the East-West Questionnaire ($r = .22$, $p = .03$) and the Criterion-Referenced subscore of the ATTA ($r = .22$, $p = .02$). These results indicate that individuals low on Need for Cognitive Closure (high scores indicate low NFCS) are likely to Exhibit Eastern Thought and tend to be more creative (at least on the tasks involving the Criterion-Referenced Indicators).

Although the relationship between NFCS and the EW scales have not been explored in literature, the present results are not too surprising. Previous studies showed that the Eastern approach to creativity is more process-oriented (Lubart, 1999; Kozbelt & Durmysheva, in press). Being process oriented (as opposed to being product-oriented) presumes the lack of need for closure because focusing on the process may motivate people to delay closure rather than seeking it. The second significant correlation, between the CR subscores of the ATTA, is not too surprising either. Indeed, one of the Criterion-Referenced Indicators is "Openness: Resistance to Premature Closure." Other Criterion-Referenced Indicators include "Abstractness of Titles" and "Fantasy." It is not surprising that the presence of these indicators may indicate low need for closure.

The remaining measures, the GEFT and ATTA, yielded a number of strong positive correlations. The scores on the Group Embedded Figures Test correlated positively with the scores on ATTA ($r = .31$, $p < .01$), including both NR ($r = .29$, $p < .01$) and CR ($r = .24$, $p = .01$) subscores. These results are not surprising because high scores on GEFT indicate field independence – a construct related to having internal frames of reference and actively processing the new information, reorganizing and restructuring it, which are qualities that may be very likely related to high creativity.

The results of the analysis of Person correlations between the measures used in present study not only largely support the Analyses of Variance with these variables but also provide additional information that sheds light on the relationships between these variables. The attempt to "psychologize" Galenson's finder-seeker typology yielded a number of sensible results that suggest that it is possible to ground much of the typology in existing psychological constructs.

CHAPTER 5: GENERAL DISCUSSION

The main goal of the study was to design a measure that would allow quantifying and systematically testing Galenson's (2001) finder-seeker typology. Other goals included understanding the statistical properties of the typology, refining the instrument in order to provide a reliable and valid measure of the finder and seeker constructs, and understanding the relationship of this measure to several relevant existing psychological measures.

The Creative Approach Questionnaire

In the present investigation, the Creative Approach Questionnaire (CAQ) was designed to meet these goals. The study provided variety of results, informing about the nature of Galenson's typology and examining the properties of the new measure. Thus, exploratory factor analysis was performed in order to understand the factor structure of the CAQ. The results of factor analysis were not entirely straightforward, such as providing only two factors for finder and seeker constructs. Instead, 12 factors emerged, and only the first few of them were informative. The first three factors account for the high proportion of variance and can be interpreted rather unambiguously. Thus, factor 1 provided high loadings of both finder and seeker items and tapped into the issues dealing with components of creativity. Factor 2, represented the finder construct and tapped into issues dealing with clarity in planning. Finally, factor 3 represented the seeker construct and tapped into the issues dealing with the lack of clarity and difficulty in decision making. The patterns of loadings on the remaining factors were not as clear.

Even though factor analysis provided some information about the factor structure of the CAQ, the results do not allow for conclusive interpretations for several reasons. First, the measure used in factor analysis was unrefined, and thus, not all items represented the typology in the best way. Some of them may not have been clear or worded well, which resulted in a certain amount of error variance. In addition, presently, the nature of factor analysis was only exploratory. In order to conduct a confirmatory factor analysis, a much larger sample would be necessary. This kind of analysis should be done only after any refinement of the items was performed.

In order to further understand the statistical properties of the finder-seeker typology, an analysis of Pearson correlations between the pairs of finder-seeker items was performed. The correlations between half of the pairs of items were not reliable, suggesting that these items represent independent subscales. Six pairs yielded significant negative correlations, suggesting that these items tap into a uni-dimensional construct. Four remaining items yielded significant positive correlations suggesting that these items were possibly poorly worded or unclear. Both the complex factor structure and the significant positive correlations between some of the pairs of finder-seeker items pointed to the necessity of refining the CAQ in future research.

The measures of being a finder and being a seeker were refined by first analyzing how strongly each item reflected the finder or the seeker subscales based on the analysis of part-whole correlations, and then eliminating the items that decreased the internal consistency of each subscale. The analyses provided one refined model with 14-finder items, and three models with 7-, 10-, and 16-seeker items, indicating that the finder subscale is more straightforward than the seeker subscale. These models yielded

comparable results with all but one of the subsequent analyses. Thus, a model that was used in these analyses was the one yielding a 24- item refined measure of Galenson's typology, with 14 finder and 10 seeker items.

A final and a very important step in understanding the statistical properties of the typology involved learning whether the typology represented a uni-dimensional or a multi-dimensional construct. The results of the analysis of correlation between the two refined subscales provided the necessary answers. This analysis yielded very interesting results. Namely, the correlation between the finder subscale and the two models used in order to obtain the refined seeker subscale (in particular, the 7-item and 10-item models) were close to zero, indicating that Galenson's typology of finders and seekers appears to represent two independent constructs. This was one of the most important findings, indicating that it is possible to show a high or low score on the finder subscale or a high or low score on the seeker subscale, in any combination. Thus, in the analysis of the relationship of the CAQ to other existing psychological measures, each subscale was treated separately. (The somewhat discrepant correlational results with the 16-item seeker model can be explained by the largely positive association between the additional six items and the finder subscale.)

CAQ vs. Other Measures

In order to understand how CAQ relates to other psychological measures, the scores on the two subscales were first divided into four categories (high-finder and high-seeker, high-finder and low-seeker, low-finder and high-seeker, and low-finder and low-seeker), by means of median splits, and then compared to six relevant existing

psychological measures. Several factorial ANOVAs with the existing measures used as dependent variables revealed statistically reliable results. A reliable interaction of the finder and seeker subscales with the Ambiguity Tolerance Scale was found, suggesting that the low scores on the finder subscale in addition to the high scores on the seeker subscale indicate the highest ambiguity tolerance compared to other combinations of scores. These results are not only consistent with a hypothesis but provide additional information, namely, that it is not enough to provide high seeker scores in order to score high on ambiguity tolerance; the finder scores must be low as well. Another finding that further supported the hypothesis suggesting a positive relationship between the seeker and ambiguity tolerance constructs was a strong positive correlation between the two constructs.

A reliable main effect of the seeker subscale (but no effect of the finder subscale) was produced with the Need for Cognition scale, suggesting that high seeker scores indicate low need for cognition (since high NCC scores mean point to the low need for cognition). However, the analysis of intercorrelations revealed nonsignificant correlation with the seeker but significant positive correlation with the finder construct, suggesting that high finder scores may also be associated with the low need for cognition scores. These results did not support the hypothesis that both finders and seekers would exhibit high need for cognition. The predictions about the relationship between the typology and other measures were based on the characteristics exhibited by highly eminent experts in different domains, described by Galenson (2001, 2005). Here, participants were undergraduate students, many of whom presumably lacked any kind of expertise. In addition, the CAQ measure was designed as a domain general measure of

problem solving approaches rather than a domain-specific measure applicable to experts, such as the prototypes for Galenson's typology.

Even though only a marginally reliable main effect of the seeker subscale was revealed with the analysis of variance using the East-West Questionnaire, the results of the intercorrelations between the EW measure and the finder and seeker subscales were quite promising. Namely, a significant negative correlation was produced with the finder subscale and a significant positive correlation was produced with the seeker subscale. This indicates that a high finder score is associated with low Eastern thought and a high seeker scores is associated with high Eastern thought, a finding consistent with Kozbelt and Durmysheva's (in press) comparison of Eastern and Western artists. The fact that both positive and negative correlations emerge between the two CAQ subscales and the East-West Questionnaire suggests a particularly close relationship between this set of constructs, which should be examined in more detail in future research.

The analysis of variance using the total scores on the Abbreviated Torrance Test for Adults produced no reliable results, and only a marginally reliable positive correlation was revealed with the seeker subscale (this correlation was significant with the 7-item seeker model). However, very interesting results were obtained when the subscores of the ATTA were analyzed. Thus, a reliable main effect of the seeker subscale was revealed in the analysis of variance using the Criterion-Referenced subscore of the ATTA. The correlation between the two measures was strong and positive. In addition, a marginally reliable positive correlation was produced with the finder subscale. These results indicate that one or both subscales of the CAQ may be related to some aspects of creativity measured by ATTA but not others. This explanation could also help one

understand why no reliable results were produced with the total creativity score. It is likely that some participants produced high scores on the Criterion-Referenced but low scores on the Norm-Referenced subscores of the ATTA, and thus, the nonsignificant results with the Norm-Referenced creativity indicators resulted in the error variance that canceled out the reliable result on the Criterion-Referenced subscore.

Overall, the results of the study were promising. Creation of the CAQ measure allowed for a quantitative analysis of Galenson's typology and provided an opportunity to further explore the properties of the finder and seeker constructs. In addition, the analysis of the relationship of the typology to existing psychological measures enabled attainment of one of the goals of the present study namely, to successfully "psychologize" Galenson's finder-seeker typology.

Limitations of the present study

The present study had several limitations. One of them was a relatively small sample size. As a result, some of the analyses could only yield exploratory results. Thus, the factor analysis in particular should be considered as preliminary. Significantly more data are needed in order to make any generalizations of the factor analysis. In addition, even though some items were eliminated during the process of refining the measure, initially some of the finder-seeker item pairs positively correlated with one-another. This may be an indication that some of these items were poorly phrased or not very clear and that participants may have had problems understanding them.

Another limitation is that in addition to the psychological measures used in the study, other measures exist that may be valuable for understanding the finder-seeker

typology. Unfortunately using all possible relevant measures was beyond the scope of the present study. Some psychological measures were hard to obtain, others were eliminated in order to avoid any bias due to fatigue. Indeed, the duration of the experiment was kept at no longer than one hour to prevent participants from getting tired. Thus, future research is needed to assess the relationships between the present measures and other measures that might be plausibly related to Galenson's typology. An example of such a measure is Sternberg's (1988) conceptualization of thinking styles. It has been proposed (O'Hara and Sternberg, 2001; Sternberg, 1988) proposed that, depending on the type of task, individuals prefer using their cognitive abilities for creative, practical or analytical ends, and thus that individuals can be characterized as using one of the three thinking styles thinking styles. People with "legislative" thinking style tend to explore different problem solving strategies. Those with "executive" thinking style prefer to have clear roles and follow directions. Finally, people with "judicial" thinking style prefer to evaluate other people's ideas. This theory provided a classification that may be somewhat related to Galenson's typology, though future research will be necessary to specify the nature of the relationship.

Another limitation was lack of a more thorough understanding of the relationship between the CAQ and our domain-general measure of creativity. The creativity measure used in the study was the Abbreviated Torrance Test for Adults. This is a common way of analyzing this measure (see, e.g., Kharkhurin, 2005) has entailed focusing on the total score provided by the ATTA - the Creativity Index. However, the results of the present study showed that the analysis of the subscores on the ATTA may allow for a much richer understanding of the relationship between the CAQ and creativity.

Moreover, even though the nature of the sample was appropriate for the initial testing of the new instrument, a sample of experts will be necessary to understand the properties of the typology that may be uniquely or specifically related to expertise. In addition, domain-specific versions of the CAQ measure may ultimately be necessary to fully understand the complexity of Galenson's finder-seeker typology within domains. Exploring the nature of expert samples' responses to the CAQ may provide the most interesting future directions for the measure.

Implications and future directions

This study provided a variety of notable results. However, this is only the first step in creating and validating the new CAQ measure, and future research is required to yield a truly reliable and valid instrument. As just noted, in order to test some of the most important aspects of Galenson's typology, the CAQ has to be tested with a sample of experts. In the course of this investigation, a pilot study was conducted with expert participants represented by the faculty in the arts, sciences and social sciences from different colleges and universities throughout the United States. Participants were asked to fill out the CAQ along with a subset of the existing psychological measures used in present study. The preliminary results were quite promising; however, much more data are necessary before any conclusive interpretations of the pilot dataset could be made. Moreover, given the ambiguities of some of the questions in the present version of CAQ, refinement of some of the items may be useful before recruiting additional experts.

Ultimately, creating domain-specific versions of the CAQ may be necessary for better understanding the typology as well as the implications of the new measure because

creative problem solving is highly domain-specific. Domain-specific versions of the questionnaire would allow for a variety of valuable research initiative, such as archival studies where the experts would rate eminent creators throughout the history of a field, such as Picasso or Cézanne in the domain of visual arts and Beethoven or Mozart in the domain of classical music. These studies would likely provide new insights into the careers of these eminent creators. In addition, studies with experts where creativity is assessed by means of measuring productivity or career trajectories of creators (Galenson, 2001) may lead to the use of the CAQ as an outcome measure.

The CAQ could have a variety of other implications. It could be applied in educational settings where learning about people's creative approaches could assist in the training and mentoring of graduate students. Determining each student's creative approach would allow their mentors or course instructors to meet each student's needs by providing them with tasks that are more appropriate for their approach, and create successful learning experience. Thus, those characterized high on the seeker subscale may benefit from flexible deadlines, being able to make multiple revisions to their work and getting feedback throughout the process. Persons characterized as high on the finder subscale may benefit from planning the course of their work in advance, being able to spend more time on generating ideas, and having more autonomy in their work.

In addition, the new measure could be used in organizational settings, for instance, in raising employee satisfaction and motivation or the group problem solving tasks. Thus, understanding a person's approach to creative problem solving could allow managers to assign tasks to employees that they may be more likely to enjoy performing and succeed at. Thus, finders may be better at generating ideas, planning, and performing

straight-forward and clear tasks, while seekers may prefer elaborating ideas and working on ill-defined tasks. Finally, in group problem solving, identifying each member's approach could prevent group conflicts and assist in assigning appropriate tasks for each member (e.g., finders would work on generation of ideas and seekers would work on elaborating ideas), which create more collaboration between the group members and raise the group's productivity.

In conclusion, this study is a first attempt to create and validate a new measure of typology identifying the differences between the two distinct approaches to creative problem solving. This measure was found to provide a way to quantitatively address Galenson's typology of creators and relate to some of the existing measures in psychology. However, future research is necessary to fully understand the properties of Galenson's finder-seeker typology.

APPENDIX

Creative Approach Questionnaire

There are 40 questions on this survey. Please read the following statements and decide how much you agree with each of them. Please indicate how much you agree or disagree with each of the following items on a scale from 1 to 6, where 1 is strongly agree and 6 is strongly disagree by circling the appropriate number.

When answering the questions, you should think of your own creative activity in your academic domain. Please try to answer the questions honestly – remember, there are no right or wrong answers. Also, your first response is important – please do not spend too much time on any question.

1. I prefer working on problems that no one has studied before.*
2. During the creative process, I find it difficult to describe what I'm trying to do.
3. When I start a new project, I usually have a clear sense of what the final product will be like.*
4. I prepare a detailed plan when starting new projects.*
5. Ideas themselves can be intrinsically good or bad.*
6. I tend to learn very deeply.
7. During the creative process, my work undergoes substantial revisions.
8. When I have completed a project, I am confident that it is truly finished.*
9. Over the course of my career, I have worked on a diverse array of projects.*
10. Developing ideas is the key to creativity.
11. When I think about creativity, I think about the creative process.
12. Creativity is best achieved by rebelling against tradition.*
13. As I am working on a project, I usually have a very clear sense of what I want to do next.*
14. When I am creating something, making decisions is easy for me.*
15. As I am working on a project, I have difficulty deciding what my next move will be.
16. Over the course of my career, most of my works have had a common theme.
17. Sheer originality is the key to creativity.*
18. A theory is necessary for creative accomplishment.*
19. I use an inductive approach in my work, starting with specific pieces of information.
20. I am constantly trying to get novel ideas.*
21. Creativity is best achieved by building on tradition.
22. I am constantly trying to improve my skills.
23. When I think about creativity, I think about the creative product.*
24. I prefer working on problems that are mainstream in nature.
25. It takes me a long time to complete a project.
26. During the creative process, my work unfolds in a way that is consistent with my initial plan.*
27. I tend to learn very quickly.*
28. When I am creating something, making decisions takes a lot of effort.
29. Generating ideas is the key to creativity.*

30. I have difficulty deciding that a project is definitively completed.
31. Real-world experience (data) is necessary for creative accomplishment.
32. When I start a new project, I am not exactly sure how the work will turn out in the end.
33. Once I start working on a project, I usually complete it quickly.*
34. I believe that one's best work can be produced at a relatively early age.*
35. Technical skill is the key to creativity.
36. During the creative process, I can easily articulate my goals.*
37. Ideas are only good or bad in terms of how they are elaborated.
38. I use a deductive approach in my work, starting with general principles.*
39. I believe that one's best work occurs in maturity.
40. I begin projects without a detailed understanding of where it will lead.

Note. This is the new instrument being tested. Finder questions are asterisked here, but no items were starred in the version distributed to participants.

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