

Individual Differences in Creativity:
How Different Processes and Mind-Wandering Influence Performance

by

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Abstract

Past research has shown that creativity is affected by inhibitory control. In particular, divergent thinking abilities are improved when there is less inhibitory control. This study attempted to show that creativity can also be affected by other cognitive functions, specifically mind-wandering. We examined participants' performance on divergent thinking, convergent thinking, and fluency tasks. We compared this to self-reported measures of mind-wandering, and to more subjective measures (the Connor's Continuous Performance Test). Individuals with greater degrees of mind-wandering tended to perform worse on divergent thinking tasks than individuals with lower degrees of mind-wandering. This may be due to both a lack of inhibitory control and to the individual's fixation on a single task-unrelated thought while mind-wandering.

Individual Differences in Creativity:

How Different Strategies and Mind-Wandering Influence Performance

The ability to think creatively has long been a valued trait in all societies. This is true, regardless of whether creativity is thought to be manifested through the ability to produce novel items (e.g., inventions and works of art), to simply use one's imagination, or to perform well in certain tasks and competitions with others (Barron & Harrington, 1981). Despite this broad range of ways in which to define creativity, not everyone is considered creative. So what is it though that allows some people to be creative, but not others? Research over the years has suggested that there are a variety of factors that can influence or predict creativity, underlying cognitive processes, executive functions, and personality factors (Barron & Harrington, 1981; Eysenck, 1993). In addition to this, recent studies have linked creative achievement to various disorders, such as depression and Attention Deficit/Hyperactivity Disorder (ADHD) (Verhaeghen, Joorman, & Khan, 2005; White & Shah, 2006).

Two of the main underlying cognitive processes related to creativity are divergent and convergent thinking. Divergent thinking may be defined as the ability to explore many different mental categories and thus generate multiple, unique ideas or solutions to a given problem (Guilford, 1957). It is often assessed with the Unusual Uses Test (UUT), in which participants are given a common, everyday object (e.g., a brick), and are required to generate as many possible uses for that object as they are able (e.g., build a house, use as a prop, etc). Success on the UUT is generally based upon fluency- the number of different ideas generated, originality- the number of novel ideas, and flexibility- the number of different categories ideas fall into (Torrance, 1974).

A question related to divergent thinking is how tasks of this nature are approached. To examine this, the present study includes tasks measuring fluency by itself in addition to measuring it in the context of divergent thinking. The goal is to determine whether or not performance differs depending on the requirements of the task to be completed. For example, success on fluency-only tasks requires high levels of output in a short period of time, but does not require much in the way of originality. Conversely, success on divergent thinking tasks requires high levels of output in the context of both originality and diversity. Examples of the fluency-only tasks included in this study are the Controlled Oral Word Association Test (COWAT) and the five-point test (Borkowski, Benton, & Spreen, 1967; Regard, Strauss, & Knapp, 1982). In the COWAT participants are given a particular letter (e.g., “F”), and are required to list as many words as they are able that begin with that letter (Borkowski et al., 1967). The five-point test, on the other hand, requires participants to connect dots in unique ways. If performance on these tasks does differ from the fluency performance on divergent thinking tasks, it could imply that there is something fundamentally special about how divergent thinking is approached.

In contrast to divergent thinking, convergent thinking may be defined as the ability to see similarities and form associations between diverse concepts (Mednick, 1962). The most common measure of convergent thinking is the Remote Associates Test (RAT). In this test participants are given three words that seem unrelated (e.g., stop, petty, sneak), and are required to generate a fourth word that connects them all (e.g. thief). Both convergent and divergent thinking are required for successful production of ideas or creative achievement, however, an individual’s performance on tasks assessing these cognitive processes may be quite different (Barron & Harrington, 1981; Carson, Peterson, & Higgins, 2003). For example, in a study

conducted by Carson et al. (2003) it was found that a lack of executive inhibitory control can lead to increased performance on tasks requiring divergent thinking, and that both are positively correlated with high levels of creative achievement in real life (achievement not under laboratory conditions- such as the invention of a new product for a company, the development of an original ad campaign, choreography of a dance, or an artistic masterpiece). Conversely this same lack of inhibitory control can lead to decreased performance on tasks requiring convergent thinking ability. One possible reason for this is that a lack of inhibitory control reduces the suppression of ideas that may at first seem irrelevant, but that are really just novel approaches to a problem (Carson et al., 2003).

The effects of deficits in inhibitory control can be further demonstrated through the performance of individuals with ADHD on tasks requiring both divergent and convergent thinking ability. In a study conducted by White & Shah (2006), it was found that individuals with ADHD performed better than healthy controls on tasks requiring divergent thinking (such as on the UUT), but worse than healthy controls on tasks requiring just fluency or convergent thinking (such as the RAT). This relationship between executive inhibitory control and creative performance is most likely only part of the explanation for individual differences in creativity however. Rather, it is possible that other areas of executive control could also be playing a role. One such area is mind-wandering. This is of particular interest to researchers because mind-wandering is considered to be a shift in the focus of one's attention, and may be the result of an executive control failure to maintain task-related thoughts (McVay & Kane, 2009).

Failure to maintain task-related thoughts as a result of mind-wandering could potentially lead to the generation of ideas that are unique and apparently irrelevant, similar to the types of ideas generated under a lack of inhibitory control. Research has suggested that the extent of

mind-wandering is inversely related to age (Giambra, 1989). Since an individual's inhibitory control is generally improving up through their mid-twenties, it is reasonable that there could be a relationship between it and mind-wandering, especially in adolescents and younger adults. In addition, a study by Shaw and Giambra (1993) suggests that individuals with ADHD experience mind-wandering more often than healthy controls. Given that individuals with ADHD also tend to exhibit more difficulty exerting inhibitory control, it would make sense that mind-wandering and inhibitory control would produce the same effect on creative performance (White & Shah, 2006). In other words, mind-wandering could be expected to produce similar effects on performance during divergent and convergent thinking tasks, as well as fluency-only tasks, as were seen in those with a lack of inhibitory control. An explanation for this might be that an individual experiencing mind-wandering is shifting not only between connected thoughts, but also between more diverse categories of thoughts. Since divergent thinking is characterized by the generation of unique ideas from different categories, mind-wandering could lead to increased performance on such tasks (Guilford, 1957). In addition, mind-wandering may have an opposite impact on convergent thinking. This would also make sense, considering convergent thinking tasks require the individual to hold on to thoughts and information in working memory long enough to form associations between different ideas (Mednick, 1962).

The present study examined the relationship between creativity, attention, and mind-wandering. Performance of a relatively large number of adults on divergent thinking, convergent thinking, and fluency tasks was compared to their degree of mind-wandering and ADHD symptomatology. There were three main hypotheses. The first hypothesis was that there would be a difference between performance on divergent thinking tasks (specifically in relation to fluency), convergent thinking tasks, and tasks measuring fluency of responses alone. The second

hypothesis was that mind-wandering would influence creative achievement, and that this influence would be different for divergent thinking, convergent thinking, and fluency tasks. It was expected that individuals demonstrating higher degrees of mind-wandering would perform better on divergent thinking tasks (such as the UUT) and worse on convergent thinking (e.g., the RAT) and fluency tasks (e.g., the COWAT) than individuals with lower degrees of mind-wandering. The third hypothesis was that individuals with ADHD would exhibit higher levels of mind-wandering than normal individuals, and that they would therefore perform better on divergent thinking tasks in relation to healthy controls. Individuals in this study were not diagnosed with ADHD. Rather symptomatology of ADHD was assessed through the Connor's Adult ADHD Rating Scales self-report measure (Connors, Ehrhard, & Sparrow, 1999). It was expected that people with more self-reported ADHD symptoms would demonstrate both higher degrees of mind-wandering and higher performance on tasks requiring divergent thinking abilities (e.g. the UUT).

Method

Participants

A total of 102 subjects from the University of Michigan in Ann Arbor participated in this study. All of these subjects were enrolled in a social science course at the university, and received 1.5 hours of credit towards their required hours in the Undergraduate Psychology Subject Pool. As only a certain number of participants were allotted per semester, data was collected in two rounds (fall and winter).

Materials

Controlled Oral Word Association Task (COWAT). The COWAT is a measure of verbal fluency. In this task, participants were given three different letters (F, A, and S), one at a

time. After presentation of each letter they had one minute during which they were to write down as many words starting with that letter that they could think of (Borkowski et al., 1967). Participants were instructed not to repeat words, use variations of the same word, or use proper nouns. Scoring was based upon fluency, which is the number of unique responses generated.

Theme Task. The theme task was created as another measure of fluency. Participants were provided with three different “themes”- forest, ocean, and circus. For each they were instructed to generate as many items as they could think of which might be found within that particular theme. Responses were to be as specific and unique as possible, while still remaining realistic (it would be plausible to actually find that item in such a location). An example of this, given to the participants before the onset of the task, was that of a city park- for which possible responses could include items such as pigeons, oak trees, swings, etc. As in the COWAT, the three themes were presented one at a time, and participants were given 1 minute to work on each. Again, scoring consisted of an evaluation of fluency- the number of unique responses. An example copy of the theme task may be found in the Appendix.

Five-Point Test. The five-point test task is a measure of non-verbal fluency (Regard et al., 1982). Participants were given three pages of 40 boxes (in 5 x 8 rows), each containing five dots in an arrangement similar to that on a die. They were instructed to draw as many different combinations of lines connecting the dots as quickly as possible, but that they were not to repeat any particular combination. Not all dots had to be used in any given combination (Regard et al., 1982). Three minutes were allotted to this test. Note: most participants did not complete all three pages in this time. An individual’s scores were based upon the fluency of their designs.

Unusual Uses Task (UUT). The UUT is a measure of divergent thinking ability. Participants were provided with two different objects, a brick and a bucket, one at a time. For

each they had two minutes to generate as many different uses for that object as they could (Torrance, 1974). As in the theme task, participants were instructed to write down ideas that were unique, but that were also realistic enough to be considered a plausible use for it. Scoring was completed by three research assistants who determined the fluency, originality (generation of unusual or infrequent responses), and flexibility (the use of multiple and unique strategies for generating responses) for each response given by a particular participant. Since a common set of guidelines for originality and flexibility were used by all three research assistants, the scores obtained were reliable.

Abbreviated Torrance Test for Adults (ATTA). The ATTA is a shortened version of the Torrance Test for Creative Thinking (Torrance, 1974), which evaluates creativity through performance on divergent thinking tasks (Goff & Torrance, 2002). The ATTA includes three different activities, one verbal and two visual, with three minutes work time allotted to each. Tasks were scored according to fluency, originality, and flexibility. Traditionally a score for elaboration (the addition of detail) is also obtained (Goff & Torrance, 2002). However, it was excluded from this study in order to simplify the coding process.

Remote Associates Test (RAT). The RAT is a measure of convergent thinking ability adapted from Mednick (1962). It consisted of 30 word trios, for which participants were instructed to generate a fourth word that related to all three words in a given set. For example, if given *stop*, *petty* and *sneak*, the fourth word would be *thief*. Participants were given 3 minutes to complete the entire test. Scoring was based on the number of correct responses. RAT data for was obtained for only 46 participants, as this task was added in the second round of data collection (which was not included in this analysis).

Creative Achievement Questionnaire (CAQ). The CAQ is a self-report measure that assesses creative achievement across ten domains (Carson, Peterson, & Higgins, 2005). Scoring of these domains results in a composite score, which is weighted by the level of achievement obtained within each. In a recent factor analysis of the domains of the CAQ by Carson et al. (2005), a three-factor solution was found for nine of the ten domains. These factors are Expressive (visual arts, writing, humor), Scientific (invention, science, culinary arts), and Performance (dance, drama, music). The tenth and unassociated domain was architecture. In validity testing, also conducted by Carson et al. (2005), it was demonstrated that the CAQ has high test-retest reliability ($r=.81$) and internal consistency ($\alpha=.96$). As with the RAT, the CAQ was not included in this initial analysis as it was added in the second round of data collection, which resulted in data from only 46 participants.

Cognitive Failures Questionnaire-Memory and Attention Lapses (CFQ-Mal). The CFQ-*Mal* is a self-report measure that is an adaptation of the original Cognitive Failures Questionnaire (Broadbent, Cooper, FitzGerald, & Parkes, 1982). It was shortened by McVay and Kane (2009) to include only the questions pertaining to memory failures and lapses in attention, and can therefore be used to indirectly assess self-reports of mind-wandering. The measure consists of 40 questions, with responses on a 1-5 scale (1=never, 5=very often). Scores were calculated based upon the sum of each participant's responses to each individual question.

Connor's Adult ADHD Rating Scales Self-Report (CAARS). The CAARS is a self-report measure that assesses ADHD tendencies in adult participants (Connors et al., 1999). It consists of 30 questions, with responses ranging from 0=never to 3=frequently. Due to an error in data collection, the demographic information required to score the CAARS (including gender and age) was not obtained in the first round of data collection. The error was corrected in the

second round, and data was obtained for all but 3 of the 46 participants. These three were excluded from analysis.

Gough Personality Scale. This self-report checklist assesses creative personality, or disposition. It consists of 30 adjectives. The participants were instructed to mark those which they believed described themselves. The adjectives are considered either positively or negatively related to creativity, and are therefore each assigned a value of 1 or -1 respectively. Scoring is completed by calculating the sum of those responses indicated by the participant (Gough, 1979).

Connor's Continuous Performance Test (CPT). The CPT is a computerized task measuring response inhibition and attentional functions (Connors, Epstein, Angold, & Klaric, 2003). Participants were required to watch a computer screen and press the space bar in response to every letter presented except X, for which they were instructed not to respond. At random intervals the participants were prompted to answer a question regarding what they were thinking at that point in time. The purpose of this was to determine whether or not the participant's thoughts were related to the CPT, and was thus a self-reported measure of mind-wandering. The task lasted approximately 30 minutes. The test re-test reliability of the CPT is between .55 and .84 (Connors, 2000).

Of the variables measured in this test, of particular importance to this study were d' (perceptual sensitivity to targets measured by the distance between signal detection and noise), errors of commission (hit the space bar for X), errors of omission (fail to hit the space bar for all other letters), reaction time (RT), and the standard error (SE) of RT or RT(SE) (Connors et al., 2003) The RT(SE) is the variance in reaction times. Large variance means the participant was relatively inconsistent in how quickly they reacted to the presentation of each letter, which

suggests their thoughts were not always on the task at hand (e.g., they were experiencing mind-wandering).

Note: due to technical issues the data for six participants had to be excluded from the analysis of this study.

Procedure

This study was conducted in groups ranging from 5 to 15 participants. It lasted approximately 1.5 hours. For the first portion of the study participants were asked to complete creative tasks within a given time limit. They were instructed to follow along with the experimenter, and to not move between tasks until told to do so. Following completion of these tasks, participants were asked to fill out a series of questionnaires. They were informed that there was no time limit on any of these, and that there were no right or wrong responses. Once finished they were instructed to raise their hand and the experimenter start the computer portion of the experiment (the CPT). Finally, the participants were debriefed and thanked for their participation in the study.

Results

Fluency and Divergent Thinking

Preliminary correlational analysis of the different tasks revealed a positive correlation between fluency on the UUT and performance on the theme task ($r=.31, p=.02$). A positive correlation was also found between fluency on the UUT and fluency on the ATTA ($r=.41, p=.002$). Performance on the COWAT correlated negatively, but not significantly, with performance on the theme task ($r=-.06, p=.68$), fluency on the UUT ($r=-.13, p=.35$), and fluency on the ATTA ($r=-.23, p=.09$). Performance on the COWAT did correlate positively with performance on the five-point test ($r=.25, p=.063$). Figures 1 and 2 show the relationship of the

UUT to both the theme task and the ATTA. Table 1 presents the correlations between all of the tasks used in this study so far.

Based on these correlations a principle components analysis, with varimax rotation, was conducted on the tasks with measures of fluency. Only components with eigenvalues over 1 were taken, resulting in a two-factor solution as the best fit for the data, which explained 59% of the variance in the data. The first factor, with an eigenvalue of 1.68, accounted for 33.6% of the variance after rotation. The second factor, with an eigenvalue of 1.27, explained 25.4% of the variance after rotation. Table 2 presents the tasks and their loadings onto the two derived factors. Loadings with an absolute value of .50 or greater were considered significant to the factor.

In this two-factor solution, Factor 1 includes the theme task, ATTA, and UUT. As all of these task require creativity in the form of divergent thinking to generate a maximum number of unique responses, this factor was interpreted as “divergence”. Factor 2 includes the COWAT and five-point test, both of which are measures of fluency that do not require much creativity for generation of responses. It was therefore interpreted as “fluency”. Since all of the tasks were considered to be either divergence or fluency, further analysis was conducted between these two categories rather than between the separate tasks. This was accomplished by first obtaining z -scores each task and then averaging them with the other z -scores within their respective category.

Factors and Mind-Wandering

Correlational analysis was conducted to determine if there was a relationship between divergence, fluency, and the attentional measures as obtained with the CPT and CFQ-*Mal*. It was found that there was a significant negative correlation between divergence and the frequency of errors of omission on the CPT ($r=-.32, p=.02$), suggesting that people high in divergent thinking abilities are less likely to fail to respond to target letters. There was also a significant

negative correlation between divergence and RT(SE) ($r=-.32, p=.02$). This suggests that people high in divergent thinking ability are likely to have less variance in their RTs, suggesting they are less likely to be exhibiting mind-wandering. See Figure 3 for a scatter plot of this relationship.

No significant correlations were found between divergence and d' , errors of commission, RT, measures of the task relatedness of a participant's thoughts during the CPT, or responses on the CFQ-*Mal*. Nor were there any significant correlations between fluency and any of these variables. In addition the CFQ-*Mal* was not significantly correlated with self-reports of task-relatedness of thoughts on the CPT. However, there was a significant correlation between RT(SE) and the task relatedness of a participant's thoughts on the CPT. This correlation was positive when thoughts were unrelated to the task ($r=.42, p=.003$). Figure 4 demonstrates this relationship, while Table 3 presents a list of all of these correlations between divergence, fluency, the CFQ-*Mal* and the CPT.

Factors and ADHD

Analysis of the relationship between ADHD and mind-wandering, divergence, and fluency will be conducted at a later time, once the demographic data necessary to code the CAARS has been obtained.

Discussion

Creative achievement is important to the success and progression of ideas in many areas, and in recent years has become the topic of many different studies. This study is one of relatively few so far to examine individual differences in creativity outside the context of variations in personality or intelligence. Although the results presented here only supported one

of the hypotheses suggested, the findings greatly contribute to what can be understood about the factors that influence the creative abilities of one individual in comparison to another.

The difference in performance on fluency-only tasks and fluency in divergent thinking tasks supports the first hypothesis proposed for this study. This would suggest that these two tasks are approached differently, an assumption that is supported by the findings of a recent study of Parkinson disease (PD) by Drago, Foster, Skidmore, and Heilman (2009). In the study it was found that patients who's PD was initiated in the right hemisphere performed worse on divergent thinking tasks (the ATTA) than healthy controls, but that they did not differ in performance on fluency-only tasks (the COWAT). While the present study was focused on healthy controls and individuals with ADHD rather than PD, it is interesting to note that the difference in performance appears to be relatively consistent across individuals and disorders.

Other studies previously conducted on individual differences in creativity have suggested that there is a relationship between lack of inhibitory control and creativity in the form of divergent thinking ability (Carson et al., 2003). Despite the proposal that mind-wandering and inhibitory control will influence divergent thinking in similar ways, the results of this study suggest that this is not true. If it were, results should have shown an increase in performance on divergent thinking tasks in individuals exhibiting greater degrees of mind-wandering. Analysis of the data revealed however, that mind-wandering instead leads to decreases in divergent thinking ability. This means that, the more an individual's mind-wanders, the worse they actually do on divergent thinking tasks.

A possible explanation for these results might be that the individuals who exhibit mind-wandering were not actually shifting their focus between many thoughts, as previously proposed. Instead they may have simply shifted their focus to one task-unrelated thought in particular, and

stayed with that thought (e.g., a single day dream or worry) for the extent of the time they allowed their mind to wander. Such fixation could hinder the ability of the individual to deviate from their current thought and could therefore limit their generation of numerous unique ideas from multiple categories. A recent theory by McVay and Kane (2010) suggests that mind-wandering results when the executive control system is unable to compensate for interfering thoughts that are automatically and unconsciously generated. According to the theory, when a person experiences high amounts of thoughts (mind-wandering) they are unable to give an adequate amount of attention to the task they are attempting to complete, and therefore often perform poorly on it (McVay & Kane, 2010). When extended to a specific and cognitively consuming task such as divergent thinking, this theory may therefore help to explain the unexpected results of this study.

An examination of the relationship of between mind-wandering and convergent thinking ability could lend further support to the theory of focused thought during mind-wandering that is presented here. Such an examination will be included once the second round of data from this study has been obtained. If there is a relationship, it would imply that mind-wandering has the opposite effect on creativity as inhibitory control, despite the apparent similarities between the two phenomena.

There were four main limitations to this experiment however. The first was that the sample only included undergraduate students from a four year university. It is possible that these students have better creative abilities (e.g., divergent thinking) that are independent of mind-wandering, which may not be the case for the population as a whole. It is also possible that they experience less mind-wandering in general the rest of the population, as mind-wandering could be a detriment to success in their academic careers. Future research should assess a more diverse

group of individuals to control for the possible confounding effects of high academic achievement.

A second limitation was the division of the experiment into two rounds of studies. For example, this initial analysis only includes the data from the first round of studies, the sample size of which was only 56. As can be seen in Figure 4, there are several outliers in the scatter plot of divergence and RT(SE). Given that the sample size is so small, these outliers may have a relatively large effect on the direction and degree of the correlation, and the interpretation of the data presented here should be viewed with caution. In addition to this, in analyzing only the first round, some measures could not be included (the RAT, CAQ, and CAARS), restricting the conclusions that can be made in answer to all of the hypotheses. Even once the data second round of studies is analyzed however, it should be noted that with the restrictions of the Undergraduate Psychology Subject Pool, and the time constraints imposed, a much smaller sample was obtained during the second round. As a result, the data from the measures included only during this round will be more open to interpretation. Future research should strive for a large sample size on all measures to ensure reliability of results.

The third limitation was the lack of a more representative sample of individuals with ADHD. All participants came from the same undergraduate pool, and there was no distinction between those with or without ADHD prior to the study. It is unlikely that there were as many individuals attending the university that had ADHD as there were individuals that did not, which would result in a probable underrepresentation of individuals with ADHD. In addition, since the only method used to assess ADHD was CAARS, results are based on self-reported ADHD symptomatology rather than the actual, diagnosed disorder. Any future research done on this subject should address these issues by obtaining two separate samples of individuals- one of

participants with no history of ADHD, and the other of participants who have been clinically diagnosed with ADHD.

The fourth limitation of this experiment was that it was conducted through assessment of laboratory performance. Despite the findings of Carson et al. (2003) that performance on divergent thinking tasks is positively correlated with high creative achievement in real world settings, some models suggest that the relationship is more complex (Finke, Ward, & Smith, 1992). According to Finke et al. it is not only the ability to generate many ideas across categories, but also the ability to work within constraints that leads to production of creative ideas. In addition, Amabile (1983) suggests that individuals creative in one domain may not be creative in another. As a result, some individuals, who might be creative in certain real world contexts, may not show much creativity under the constrained conditions provided. Future research would therefore do well to measure creativity through tasks that are more representative of real world creative contexts such as the in the design of collages or writing of haikus (Amabile, 1983).

Despite these limitations, the current findings do have exciting real world implications. Previously absent-mindedness has been associated with more creative individuals. According to the results of this study however, this stereotype may not be as accurate as people believe. If divergent thinking ability really is a good indicator of real world creative achievement as suggested by Carson et al. (2003), then the truly creative people may actually be those that are able to stay focused on the task at hand. This is consistent with Csíkszentmihályi and Csíkszentmihályi's (1988) idea of flow, which is a state of extremely focused motivation. It is experienced when an individual is completely occupied by a thought or activity (such as creative output such as dance choreography, music composition, or painting), to the point that they are

able to channel their emotions in a positive and productive manner that enhances their completion of the task at hand (Csíkszentmihályi & Csíkszentmihályi, 1988).

The theories described above could prove to be useful in promoting the cultivation of creativity in individuals with low degrees of mind-wandering, and in assisting those with higher degrees of mind-wandering in staying focused. In doing this, more individuals may be able to find their niche in life, and the overall creative production in this society could be greatly increased.

Conclusion

The results of this study emphasize the complex relationship between cognition and creativity. While lack of focus and control has previously been shown to enhance divergent thinking, and thus creativity, this study suggests the exact opposite in the case of mind-wandering. It will therefore be important in future studies to further explore these relationships to determine the true explanation of individual differences in creativity.

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Table 1

Correlations between Tasks with Measures of Fluency

	<u>Task Correlations</u>			
	COWAT	Theme	Five-Point Task	ATTA-Fluency
Theme	-.057			
Five-Point Test	.250	.129		
ATTA- Fluency	-.228	.147	.077	
UUT- Fluency	-.129	.310*	.071	.406**

*p<.05, **p<.01

Table 2

Creative/Fluency Task Loadings onto Two Factors Derived from Principle Components Analysis

Component Matrix

	Factor 1- Divergence	Factor 2- Fluency
UUT- Fluency	.791	
ATTA- Fluency	.742	
Theme Task	.576	.296
Five-Point Test	.130	.809
COWAT	-.397	.717

Note: Boldface indicates loadings of domains included in each factor.

Table 3

Correlations between Factors, Mind-Wandering, and CPT

	<u>Correlations</u>							
	Fluency	Divergence	CFQ- <i>Mal</i>	CPT d'	CPT Errors of Commission	CPT Errors of Omission	CPT RT	CPT RT(SE)
Divergence	-.023							
CFQ- <i>Mal</i>	.009	.111						
CPT d'	-.016	.089	-.107					
CPT Errors of Commission	.015	.155	.165	-.848**				
CPT Errors of Omission	-.085	-.320*	-.151	-.524**	-.109			
CPT RT	.026	-.167	.068	.217	-.542**	.154		
CPT RT(SE)	.205	-.321*	.209	-.546**	.229	.342**	.437**	
CPT Task- unrelated	-.032	-.046	.076	-.302**	.106	.307**	.254	.418**

*p<.05, **p<.01

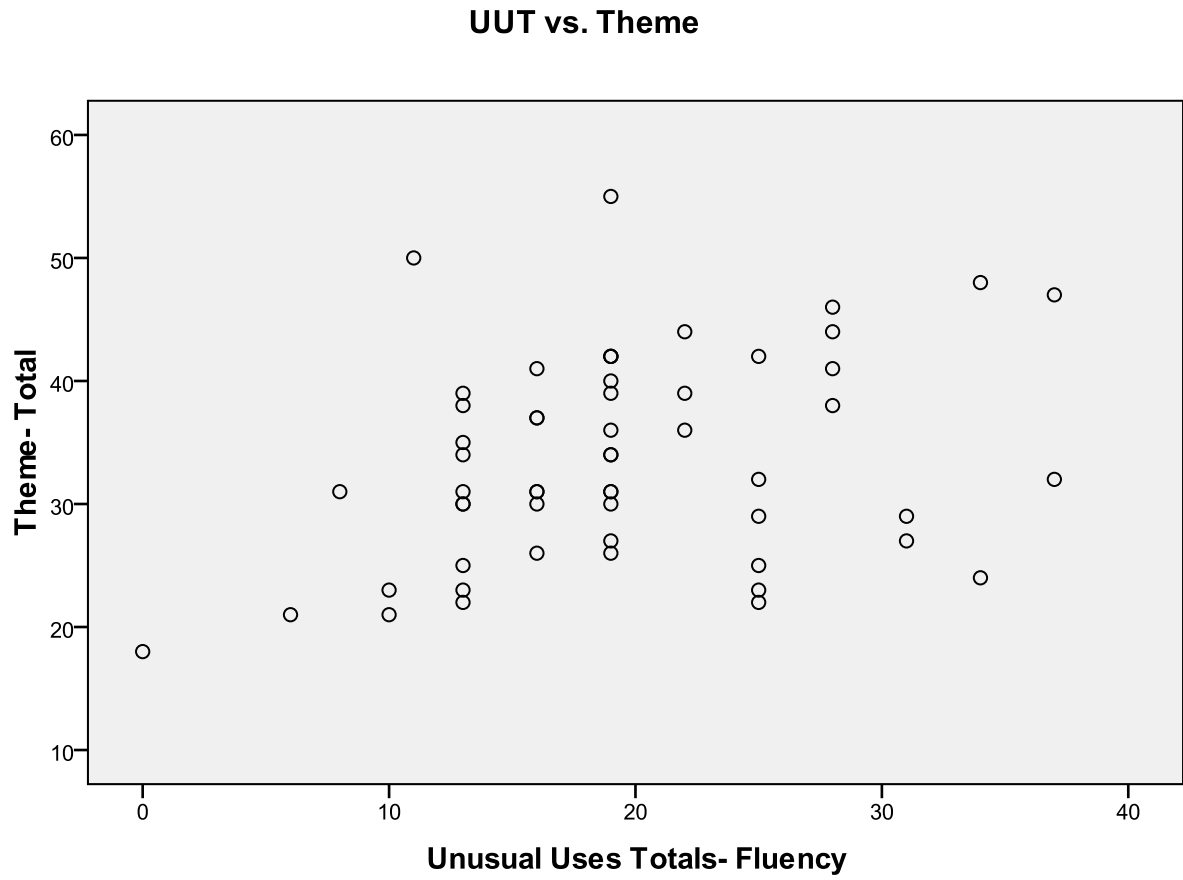


Figure 1. A scatter plot demonstrating the positive correlation between the UUT and theme tasks.

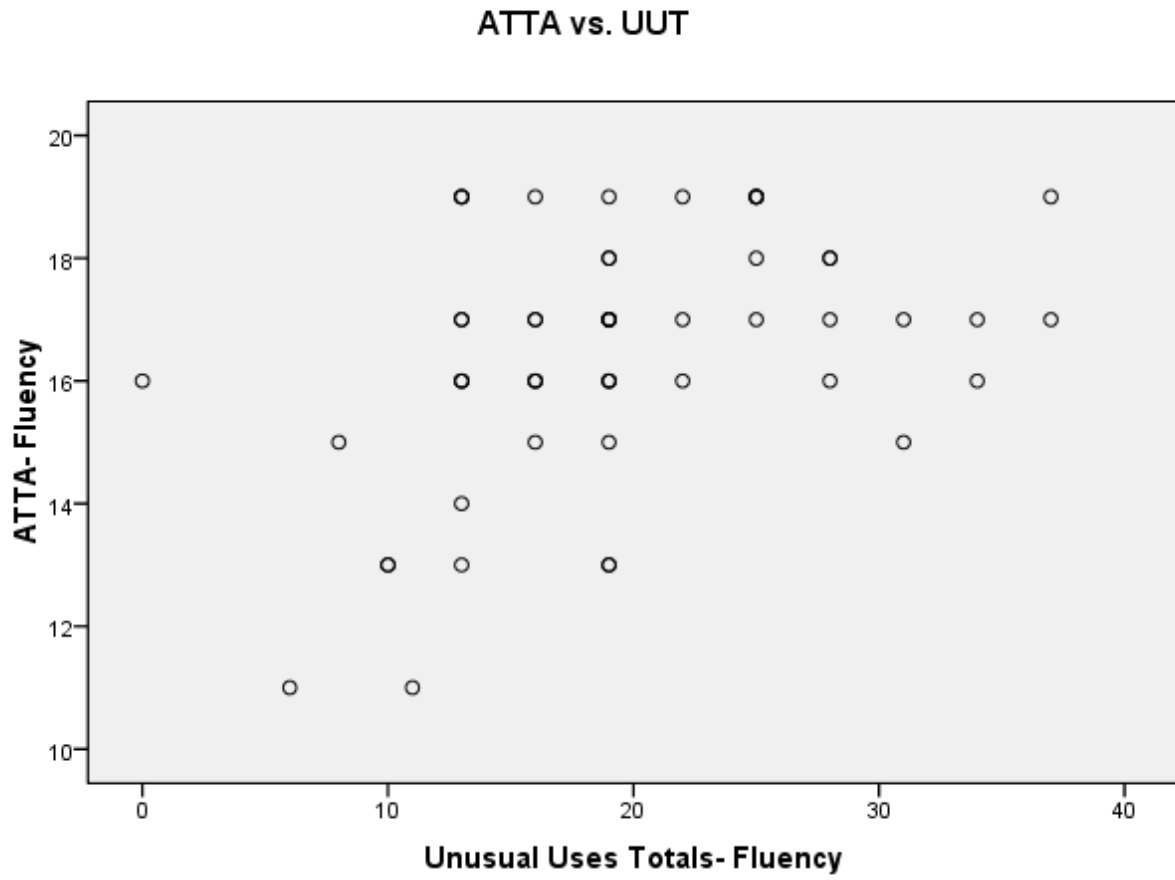


Figure 2. A scatter plot demonstrating the positive correlation between the UUT and ATTA.

Note: darker circles represent multiple responses.

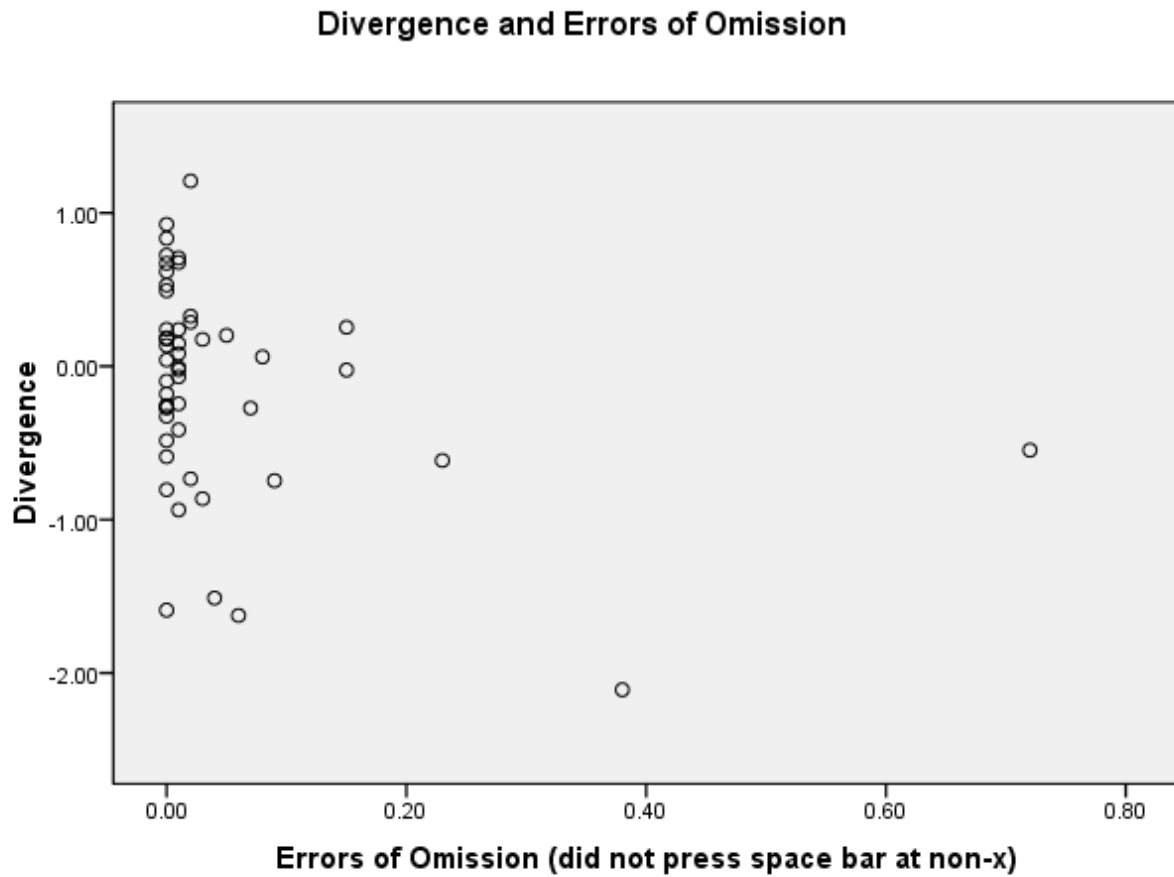


Figure 3. A scatter plot of the relationship between the divergence factor and errors of omission on the CPT. There is a slight downward slope, signifying a negative correlation between these two variables. If the outliers were to be removed this correlation would be even stronger, suggesting that high performance on tasks requiring divergence leads to fewer errors of omission.

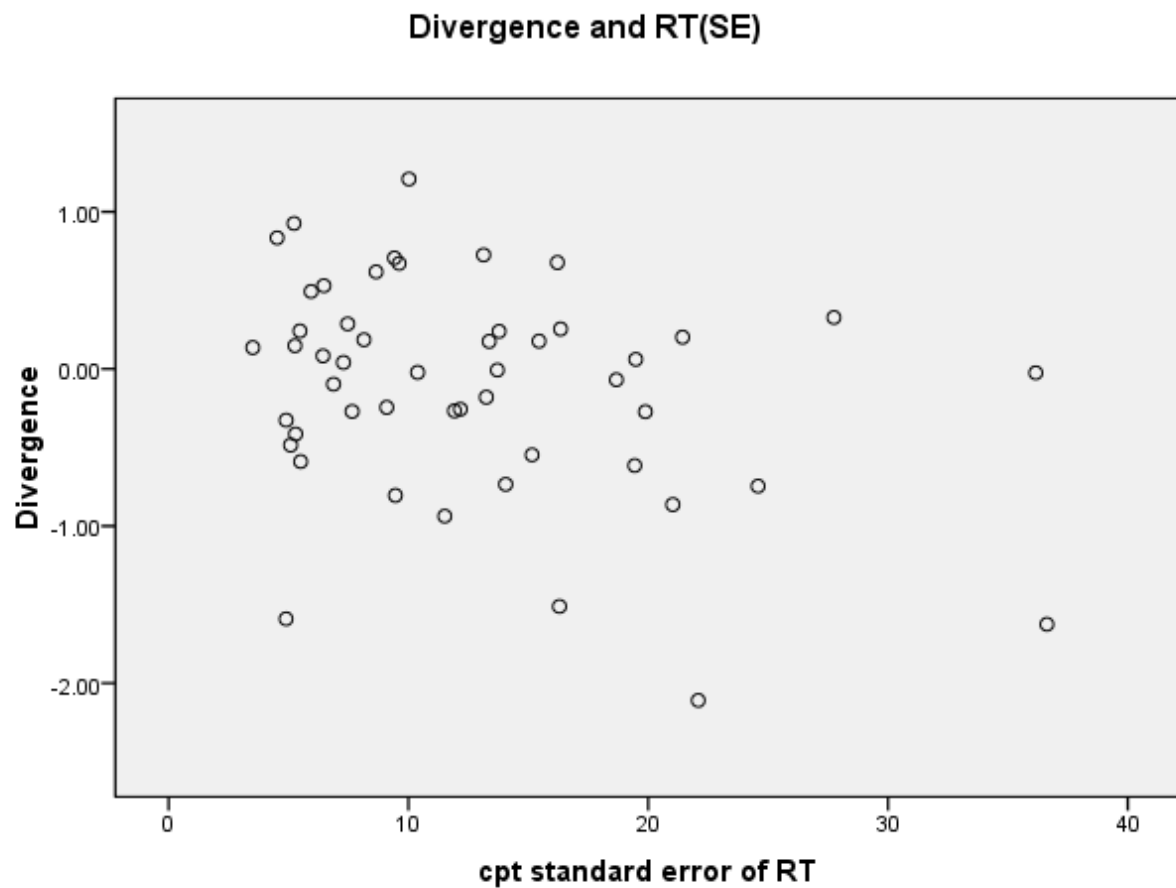


Figure 4. A scatter plot of the relationship between the divergence factor and mind-wandering as assessed by RT(SE) on the CPT. There is a slight downward slope, suggesting a negative correlation between mind-wandering and performance on tasks requiring divergent thinking.

Appendix

The Theme Task

INSTRUCTIONS:

For the next activity you will be given three different themes, one at a time. You will need to list all the things you can think of that you might normally find within that theme. Be as complete and specific as possible.

Example: **A city park**

Fountains and wishing wells

Pigeons

Street dancers/beat boys

Chess players

Slides, swings, monkey bars, merry-go-rounds

Oak trees

Try to provide ideas that are unique, but at the same time realistic.

For each theme you will have **1 minute** to generate as many ideas as you can. Please ask the experimenter any questions you may have before we begin.

**DO NOT GO ON TO THE
NEXT PAGE UNTIL TOLD
TO DO SO**

