

---

# **The Relationship between Personality Traits, Creative Ability and Lateral Thinking Ability.**

## **Abstract:**

The ongoing developments of the information age and compounded growth in technological innovations have highlighted skill gaps that are needed by the next generation of industry minds, in developing future based business solutions. Creative and lateral thinking ability (LTA) skills are essential for the development of products and services that do not currently exist. Limited research is available in understanding whether LTAs are a product of nurture or of nature or if, as DeBono believes, they are teachable thinking skills. This study set out to investigate one element in this gap in knowledge – to understand whether LTAs are related to particular personality traits and synonymous with creative ability. Participants completed a Big 5 Personality questionnaire, a self-reported creativity questionnaire and 10 lateral thinking quiz questions. A Multiple Regression analysis was conducted. The results suggest that unlike creative ability, which is positively correlated to the Openness trait, no positive correlation exists across personality traits for LTA. The Conscientiousness trait, however, showed an inverse correlation to LTA. Mean scores indicated that LTA increased with participant age, which may indicate that age and life experience could have a positive influence on a person's ability to think laterally. Further research may help identify how age and life-experience improves LTAs and, if the correlation is positive, if there are practical applications for teaching younger generations of workers the skills they need within a future-solutions-based business environment.

---

## **Literature review:**

### **The importance of creativity in future-based businesses.**

The backbone of our 1<sup>st</sup> world economy was built on an industrial revolution that prized and thrived on the intellectual disciplines of maths, science and engineering (Robinson, 2007). With the onset of the information age, a more complex world with rapidly changing trends has highlighted the need to solve future based industry related problems on a regular basis (Robinson, 2007; Huitt, 1992). The need to shift towards recognising and encouraging creative, divergent and lateral thinking within industry is more pressing than ever (De Bono, 2014; Runco, 2004b). Sir Ken Robinson (2007) suggests that children starting school today, will be filling jobs that do not currently exist and yet the schooling system has been preparing children to work in jobs that may not exist by the time they enter the job market. Bruner suggested in 1963 (cited in Runco, 2004b) that creativity is something we should encourage in children to prepare them for a future that is increasingly more difficult to predict. Societies perception of creativity and the creative arts (such as art and dance) however, still lacks the social status given to the more scientific skills including maths and English. Logical analysis, orderly reasoning and vertical problem-solving skills are still the main thrust of education, and highly valued in both business schools and large companies alike (Dollinger & Skaggs, 2012; Eilon, 1986). Although there is some recognition, in the business world, for independent, creative and horizontal thinking skills, that produce novel ideas and solve complex innovative problems, these 'soft-skills' are perceived to be solely the remit of innovation and creative agencies rather than something encouraged as everyday business skills (Eilon, 1986).

### **Creativity: nurture vs nature**

Not only is true creativity very difficult to define (Catell, 1971), the question of whether creativity is a result of nurture or nature is still being debated. Recent research on twin studies (Fradera, 2017) seems to indicate that genetics does have some impact on creative ability, with around a 70% chance of heritability influencing a person choice of career within a creative field. The study further indicated that 62% of those who pursued and engaged in creative based activities were perceived by both themselves and others as being creative. Barron & Harrington (1981 p. 453) agreed with this in indicating that creative individuals have a 'firm sense of self as 'creative''. Although the interpretation of the degree of creativity and creative behaviour is dependent on its situational originality, creative interpretation is subjective, culturally appropriate and ratified by socio-culturally defined experts (The Open University, 2016). Runco (2004b) believes that everyone displays creativity in everyday problem solving, without requiring either expertise or culturally defined creative achievement. He believes that creativity emerges

---

as a result of a person's ability to be flexible enough to cope with the changes, challenges, opportunities and advances of everyday life. Studies on the link between creativity and intelligence (Runco, 2006, p. 3) have shown that creativity is 'not dependent on traditional intelligence' but rather, as Steinberg (1995, cited in Balkis, 2005) suggests, is defined by how cognitive processes are used to solve problems in meaningful and useful ways, rather than the products of creativity being a result of high IQ.

### **Creative Thinking vs Divergent Thinking vs Lateral Thinking and their measurement in research.**

Balkis (2005) suggests that thinking styles are a direct indication of how individuals prefer to use their cognitive abilities to process data. A few thinking styles identified within literature include creative thinking (Batey et al., 2010), critical thinking (Balkis & Isiker, 2005), divergent thinking (Batey et al., 2010) and lateral thinking (De Bono, 2014). The Penguin Dictionary of Psychology (Reber et al. 2009, p.179) defines creativity and creative thinking as 'mental processes that lead to solutions, ideas, conceptualisation, artistic forms, theories or products that are unique, novel, appropriate and useful'. Whereas creativity is measured by ideas, products, processes or press being original and appropriate for use within the culture or situation for which it is intended (Runco, 2004b), creative thinking is the processes involved in coming up with the ideas for the products, processes or press (Batey et al., 2010). Critical thinking differs from creative thinking in that it does not lead to new solutions and insights, but rather tests and checks possible solutions or ideas for errors or flaws, in order to find a meaningful solution to a problem (Reber et al. 2009; Balkis & Isiker, 2005). Divergent thinking, the opposite of convergent thinking, is one of the elements of creative behaviour and is a good predictor of an individual's creative ability, thinking or potential. The requirements for divergent thinking is the ability to have 'ideation fluency' and 'flexibility' and requires the movement of thought in a variety of directions that leads to unusual, novel or unique ideas and solutions (Sage, 2009, p.253; Reber et al. 2009, p.814). Where creativity is often the measurement of a person's 'interpretive capacities, discretion, and intensions' (Runco, 2004a, p11), lateral thinking, although according to DeBono is closely related, is the description of a thinking process (DeBono, 1990). It is the search for a simple solution outside of a logical systematic framework and requires a person to 'think outside the box' and pick the 'low-probability' answers rather than the 'most sensible, high-probability answer'.

Lateral thinking looks at problems in a non-conventional way in order to come up with a number of possible solutions (Reber et al. 2009, p.814) and 'allows the answer to a

---

problem to come about from a non-sequential thought process or by viewing a situation from a different angle', in contrast to the sequential thought processes of traditional thinking (De Bono, 2014, p. vii). It differs from creative thinking, critical thinking and divergent thinking – what DeBono refers to as traditional or 'vertical thinking' (2014), which generally use a set of 'correct' logical steps to achieve a result. Lateral thinking searches for solutions outside of a logical systematic framework, using thought processes that are not immediately obvious to the problem at hand and where an 'incorrect' answer is sometimes needed in order to find a 'more correct' answer than either creative, critical or divergent thinking would have. It is an insight tool that can be used as part of a deliberate, learned process of logical thinking and restructuring of established memory patterns in order to create new ways of organising thinking and thought process pattern creation. It requires the deliberate search for and generation of irrelevant information in order to repattern and restructure this information so as to generate new ideas (DeBono, 2014, p. 143; DeBono, 1990).

### **Research on Personality Traits and links to Creativity, Divergent Thinking and Lateral Thinking.**

Much research has been conducted to identify key personality traits that display similar attributes within a world population of unique individuals (Huitt, W.G., 1992; Runco, 2004b). Zhang (2001) has revealed a significant relationship between thinking styles and personality, with the 'external thinking style' being linked to social and enterprising personalities and the 'conservative thinking style' associated with personality traits that prefer structure, guidelines and working on details. It has now become commonly accepted that the Five Big personality factors have identified five key personality traits (Goldberg, 1981 as cited in Maclean, R., 2016). These Big Five traits are Extraversion, Agreeableness, Conscientiousness, Neuroticism and Openness and encapsulate all the dimensions identified in previous variations of personality frameworks – including, amongst others, the Eysenck and Myers Brigs models (John, Naumann and Soto, 2008). Those with the Openness trait display characteristics such as resourcefulness, being intellectually curious and open to new experiences. Conscientious traits include self-discipline and deliberate, ordered and controlled actions. Extraversion, describes those who are energetic, sociable, friendly and talkative. Agreeableness traits are those that are sympathetic, affectionate, trusting and soft hearted. Neuroticism describes those who are anxious, nervous, tense and display emotional instability (MacLean, 2016; John et al., 2008)

In a review of research on creativity and creative tendencies Barron and Harrington (cited in MacLean, 2016) revealed a set of personality characteristics that were directly

---

associated with creativity. These characteristics were not dissimilar to the personality traits of Openness and Extroversion, so it is not surprising that there is a strong positive correlation between both Openness, Extroversion and creativity (Fradera, 2017; John et al., 2008). In contrast, research has shown a weak correlation between creativity and Neuroticism and a negative correlation with Agreeableness and Conscientiousness (MacLean, 2016). When it comes to linking personality traits with LTA, De Bono (2014) believes that this skill can be learned by anyone and, by implication, by anyone with any personality trait. Outside of circumstantial evidence presented by the success of DeBono's books and popularity of his training, very little research has been conducted to quantify that claim. There seems to be no research evidence of the link between personality traits and the ability to learn or hone LTA skills.

### **Measuring Creativity & Lateral Thinking.**

Measuring creativity can be difficult as it can refer to either a trait characteristic or a finished product. The question for research is the discovery of the relationship between the trait and the product (Eysenck, 1993). As mentioned previously, the artistic interpretation of products of creativity are measured and rated using standards set by socio-culturally deemed experts in their field (The Open University, 2016; Maclean, 2016). When it comes to measuring LTAs, DeBono (2014) believes that normal intelligence tests would not be able to identify lateral thinkers as they require getting the most sensible correct answers. Lateral thinking, however is about seeing things in a way others do not. These tests are usually observational in nature, however some quiz type questions have been developed which, although they do not represent the future-based problems faced workers, they can give some insight into a person's ability to think 'outside of the box' (Woodcock, 2017).

The research study investigated the relationship between personality trait – based on Costa and McCrae's (cited in John et al., 2008) Big Five personality factors of Openness, Conscientiousness, Extraversion, Agreeableness and Neuroticism – creative ability and the ability to think laterally. Although lateral thinking is a form of creative thinking, no research has been found to confirm what personality traits are more common with lateral thinkers or if lateral thinking skills are synonymous with creative skills. This could be investigated by either understanding the characteristics of candidates who show strong abilities to think laterally or by testing candidates across the personality spectrum, to ascertain which common personality traits are most suited to be able to learn LTA skills.

---

## **Hypotheses & Variables.**

*Hypothesis:* The ability to think laterally is directly related to the Openness personality trait, as defined by the Big Five Personality Factors (John et al, 2008), and the ability of a person be able to think and be creative.

*Null hypothesis:* The ability to think laterally has no relationship to the Openness personality trait or the ability to think and be creative.

*Dependent variable 1:* the ability to think laterally.

*Dependent variable 2:* the ability to think and be creative.

*Independent variable 1:* Openness Trait

*Independent variable 2:* Agreeableness Trait

*Independent variable 3:* Extraversion Trait

*Independent variable 4:* Conscientiousness Trait

*Independent variable 5:* Neuroticism Trait.

## **Method:**

### **Participants & Ethical issues.**

There were no exclusion criteria in participant recruitment for the three-part survey. Of the 125 people who initially consented to participate, 27 participants did not complete all 3 parts of the survey and were excluded from the final analysis. All surveys were answered on an individual basis. Ethical considerations were made for the lateral thinking questions and the necessary wording adjustments completed (Appendix 5).

### **Procedure.**

A pilot study was conducted to ensure the questionnaire flowed and lateral thinking questions were easily understood and not offensive. Survey questions were uploaded into Qualtrics (Qualtrics, Provo, UT, 2017) and participants were recruited via Facebook. A link to the Qualtrics survey was posted on the DE300 Participant Pool Facebook wall and the researchers personal wall. Participants were required to click on the Qualtrics survey link and consent to the survey aims, requirements and their participation prior to taking part in the survey (Appendix 3). Participants were briefed and debriefed of their

---

right to withdraw at any time, assured of the anonymity of their data, reassured that their lateral thinking scores were not an indication of their IQ and given the details of both the researcher and OU module chair(s) in cases of distress or complaint (Appendix 2 & 4). The survey was live for four weeks and was re-posted on both Facebook walls after week two. Once 125 participants had been recruited, the study was closed.

### **Measures.**

The survey was formed of three parts (Appendix 1). Part 1 included a personality questionnaire on The Big Five (John et al., 2008), where participants rated how each of the 44 statements applied to them. A predefined Likert scale was used for this questionnaire, with 1 being 'disagree strongly', 2 'disagree a little', 3 'neither agree nor disagree', 4 'agree a little' and 5 'agree strongly'. Part 2 included 50 creative behaviour statements developed by Kaufman (2012). A predefined Likert scale was also used for this questionnaire, with 1 being 'much less creative' and 5 'much more creative'. Part 3 included 10 lateral thinking questions (Woodcock, 2017) ranging from easy to difficult. Permission to use these questions were given by B.E.Woodcock@kent.ac.uk (February 2017). Ethical issues were considered for these questions. To minimise stress, respondents were reassured that their ability to answer the lateral thinking questions was not indicative of IQ, and all questions that potentially involved ethnic, gender and emotional insensitivities within the lateral thinking questions were excluded or adapted to remove any potential level of offence. Respondents were asked for their gender and which predefined age range they fell into.

### **Data Analysis.**

The survey results were uploaded from Qualtrics into SPSS. The data was cleaned, checked for outliers, missing labels, missing data and non-completion of participant data. Participant data was deleted if all three parts were not completed. Some Part 1 answers required reverse scoring, these were questions 2, 6, 8, 9, 12, 18, 21, 23, 24, 27, 31, 34, 35, 37, 41, 43, so that 1 became 'agree strongly', 2 became 'agree a little', 3 stayed the same, 4 became 'disagree a little' and 5 'disagree strongly'. Personality trait scores were grouped for each participant by adding together the scores for each trait. Part 2 was scored as per the pre-existing measures used by Kaufman (2012). Participant scores for creativity were added together to obtain a total creativity score. The Lateral Thinking questions in Part 3 were scored as either a 1 for being right or 0 for being wrong. A right answer was the 'simplest reasonable explanation' and already predefined by Woodcock (2017). The lateral thinking scores were added together and multiplied by 100 to get a total percentage score per participant. Woodcock's scoring parameters suggested that any participant who got a score of above 50% had LTA skills.

Data was analysed using SPSS (Version 22). A Cronbach's Alpha was to ascertain the internal consistency of the questionnaire reliability. A multiple regression was run to ascertain the strength of correlation between personality traits and creativity and another on the correlation between personality traits and ability to think laterally. Assumptions were run to check the linearity of the relationship between the dependent and independent variables, that no multicollinearity of data existed, that residuals were independent, the variance constant and the value normally distributed and that there was no bias of the model by influential cases.

## **Results:**

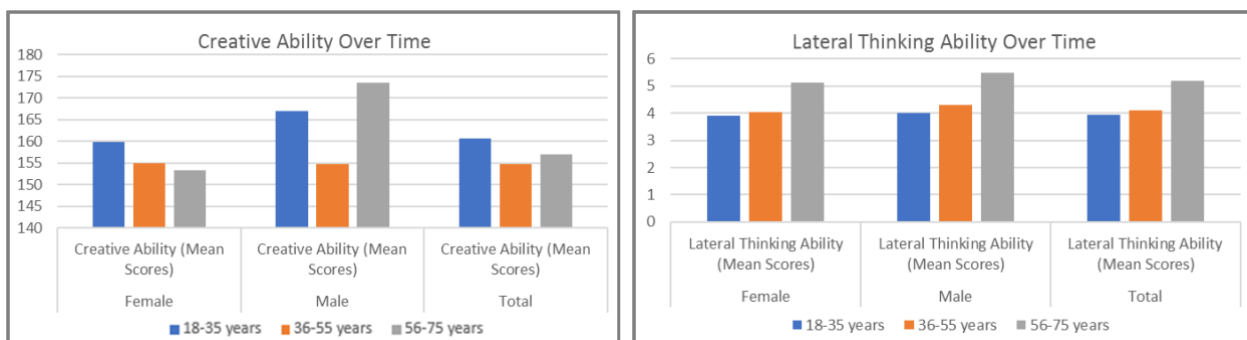
### **Participants.**

98 people completed all three parts of the survey, almost half of whom were female aged 36-55 years. Results of this study showed that female creative ability mean scores decreased, while LTA mean scores increased as women aged. Male LTA mean scores also increased by age, but creative ability mean scores had no distinct trend.

**Table 1: Summary of participant populations**

Gender	Age	18-35 years	36-55 years	56-75 years	Total
	<i>N</i>	24	46	9	79
<b>Female</b>	Creative Ability (Mean Scores)	159.83	154.89	153.22	156.20
	Lateral Thinking Ability (Mean Scores)	3.92	4.04	5.11	4.13
	<i>N</i>	3	14	2	19
<b>Male</b>	Creative Ability (Mean Scores)	167	154.64	173.5	158.58
	Lateral Thinking Ability (Mean Scores)	4	4.29	5.5	4.37
	<i>N</i>	27	60	11	98
<b>Total</b>	Creative Ability (Mean Scores)	160.63	154.83	156.91	156.67
	Lateral Thinking Ability (Mean Scores)	3.93	4.1	5.19	4.17

**Graph 1 and 2: Mean Scores for change in creative ability and ability to think laterally by age**



### **Crobach's Alpha.**



**Table 2: Summary of reliability analysis, standard deviation, N values per section and scoring range**

Domain	$\alpha$	Mean	Std. Deviation	N	Score range
Personality	.499	150.45	10.25	44	1-5
Creative Ability	.934	156.66	28.08	50	1-5
Lateral Thinking Ability	.607	4.17	2.10	10	0-1
Combined	.893	311.29	32.58	104	Varied

A reliability analysis was carried out on 44 personality scales, 50 creativity scales and 10 lateral thinking scales. Cronbach's alpha showed the total questionnaire to reach acceptable reliability,  $\alpha = 0.89$ . When analysed as a whole questionnaire, most Creative Ability items appeared to be worthy of retention, resulting in a decrease in the alpha if deleted. The majority of the Lateral Thinking and Personality items would increase the alpha up to  $\alpha = 0.90$ . As such, removal of these item could be considered, however, this could reduce the effectiveness of the survey to answer the hypothesis.

(see Appendix 2 for SPSS outputs)

### Multiple Regression.

A multiple regression was carried out to investigate whether the Big Five (John et. al. 2008) personality traits of Openness, Agreeableness, Extraversion, Conscientiousness and Neuroticism could significantly predict participant's Creative Ability and ability to Think Laterally.

The results of the regression for Creativity indicated that the model explained 36.9% of the variance and the model is a significant predictor of personality traits and creative ability.  $F(5,91) = 10.66, p = .0001$ . The Openness ( $B = 2.261, p = .0001$  and Extraversion ( $B = .754, p = .047$ ) personality traits contributed significantly to the model with Agreeableness ( $B = -3.292, p = .001$ ) having a minimal contribution. Conscientiousness ( $B = .715, p = .116$ ) and Neuroticism ( $B = .529, p = .172$ ) personality traits did not contribute significantly. The final predictive model was: Creative Ability =  $138.845 + (2.26 * \text{Openness}) + (-3.29 * \text{Agreeableness}) + (.75 * \text{Extraversion}) + (.72 * \text{Conscientiousness}) + (.53 * \text{Neuroticism})$

**Table 3: Summary of Multiple Regression Analysis for Variables Predicting Creative Ability (N = 98)**

Variable	Model 1: Creative Ability			
	B	SE B	$\beta$	Sig.
Openness	2.246	.369	.517	.0001
Agreeableness	-3.194	.914	-.306	.001
Extraversion	.726	.372	.184	.054
Conscientiousness	.708	.449	.139	.118
Neuroticism	.528	.383	.133	.172

Creative Ability

$R^2$	.37
$F$	10.61 ***

\*\*\*  $p < .001$

The results of the regression for Lateral Thinking indicated that the model explained 11.3% of the variance and the model is a significant predictor of personality traits and ability to think laterally.  $F(5,91) = 2.329, p = .049$ . The Conscientiousness ( $B = -.133, p = .001$ ) personality trait contributed significantly to the model, whereas the Openness ( $B = .010, p = .750$ ), Agreeableness ( $B = .080, p = .328$ ), Extraversion ( $B = -.014, p = .665$ ), and Neurotic ( $B = -.041, p = .230$ ) personality traits did not contribute significantly. The final predictive model was: Lateral Thinking Ability =  $6.711 + (.01 * \text{Openness}) + (.08 * \text{Agreeableness}) + (-.01 * \text{Extraversion}) + (-.13 * \text{Conscientiousness}) + (-.04 * \text{Neurotic})$ .

**Table 4: Summary of Multiple Regression Analysis for Variables Predicting Lateral Thinking Ability (N = 98)**

Variable	Model 1: Lateral Thinking Ability			
	$B$	$SE B$	$\beta$	$Sig.$
Openness	.008	.033	.025	.805
Agreeableness	.094	.081	.121	.245
Extraversion	-.019	.033	-.063	.573
Conscientiousness	-.134	.040	-.353	.001**
Neuroticism	-.041	.034	-.138	.229
Lateral Thinking Ability				
	$R^2$	.11		
	$F$	2.36*		

\*  $p > .001$ , \*\*  $p = .001$ ,

**Table 5: descriptive statistics, Pearson correlation values and statistical significance for predictor and dependent variables**

Variables	$N =$	Mean	$SD$	Openness	Agreeableness	Extraversion	Conscientiousness	Neuroticism
Openness	98	36.87	6.46					
Agreeableness	98	37.03	2.69					
Extraversion	98	25.55	7.12					
Conscientiousness	98	34.37	5.51					
Neuroticism	98	23.59	7.07					
Creative Ability	98	156.66	28.28	.513 ***	-.207 **	.070 *	.042 *	.139 *
Lateral Thinking Ability	98	4.17	2.10	0.12 *	.045 *	.016 *	-.294 **	-.039 *

\*  $p > .001$ , \*\*  $p = .001$ , \*\*\*  $p < .001$

(see Appendix 3 for SPSS outputs)

---

## **Assumptions.**

The relationship between the IV's and the DV is linear. Scatterplots show this assumption had been met. There is no multicollinearity in the data. Analysis of collinearity statistics show this assumption has been met. VIF scores are well below 10 and tolerance scores are above 0.2. The values of the residuals are independent. The Durbin-Watson statistic showed that this assumption has been met, as the obtained value was close to 2 (Durbin-Watson = 1.99 for Creative Ability and 2.12 for LTA). The variance of the residuals is constant. The plot of standardised residuals vs standardised predicted values showed no obvious signs of funnelling, suggesting the assumption of homoscedasticity has been met. The values of the residuals are not normally distributed. The P-Plot for the model suggested that the assumption of normality of the residuals may have been violated. However, as only extreme deviations from normality are likely to have a significant impact on the findings, the results are probably still valid. There are no influential cases biasing the model. Cook's Distance values were all under 1, suggesting no individual cases were unduly influencing the model.

(see Appendix 4 for SPSS outputs)

## **Discussion:**

### **Results summary, findings and previous research**

The results of this study were relatively consistent with prior creative research in the area of personality. It revealed a strong correlation of Creative Ability to the Openness personality trait with some correlation to the Extraversion trait (Fradera, 2017; John et al., 2008). The Agreeableness trait had a negative correlation and Neuroticism trait with a weak positive correlation with Creative Ability (MacLean, 2016). A difference was found in Conscientiousness having a weak positive correlation rather than an inverse correlation shown in previous research. The relative consistency of the findings with prior research and the 36.9% variance of the model creates a good foundation in which to compare the LTA results with personality traits and Creative Ability.

Although DeBono (2014), the inventor of the lateral thinking concept, believes that LTA can be learnt by everyone, the inverse correlation between the Conscientiousness personality trait and LTA showing within the results of this study suggest that those who have a strong tendency to be Conscientious, are less likely to be able to learn to think laterally. Their need to order, control and deliberate on their actions (John et al., 2008) is juxtaposition to thinking 'outside the box', searching for alternative solutions and willing to be wrong, in order to come up with a new solution (DeBono, 2014). Although there is

---

no correlation between the remaining four personality traits and the ability to Think Laterally, in contrast to creativity, the Openness and Extraversion traits seem to be the least correlated to LTA. This suggests that Creative Ability and Lateral Thinking are skills require different, rather than similar, thinking styles and abilities. The initial Hypothesis must therefore be rejected and Null Hypothesis must be accepted.

Creative Ability and the perception of being creative seemed to decline with age amongst females. Runco (2004b, p. 678) suggests that 'everyday creativity' can manifest in 'mundane problem solving'. This everyday creativity may seem, over time, less creative for women as they age as they may potentially see everyday problem solving as a necessity, rather than as creativity. Perceived creativity was erratic amongst the age groups for males. Although the sample of males may have been too small to draw a conclusion, recent research does suggest some evidence that gender has an influence on creativity. In recent research by Karwowski et. al. (2016, p. 164), it was found that women were fairly stable in their creative potential both individually and collectively, whereas men showed a much greater individual variability in creativity. This could be seen as biological and socio-culturally defined, with women tending towards day-to-day 'incremental creativity' (being the 'adaptor, rather than the 'innovator') and men towards 'revolutionary creativity' (being steered towards having 'original ideas' and being 'non-conformists'). This could confirm the results of this research that, in aging, women may normalise their incremental day-to-day creative solutions, whereas men expect themselves to be constant innovators and the 'middle-years' could be perceived by themselves as a period of reduced creativity due to the day-to-day demands of building a career and caring for a family, thereby reducing the time they set aside for more individualistic artistic, creative pursuits.

As defined by Woodcock (2017), a person obtaining a result of over 50% for the lateral thinking test, displayed LTA skills. The LTA quiz results seem to indicate that the older a person gets, either male or female, the more they are able to think laterally. This could be due to the culmination of experiences and possible life exposure, allowing them the ability to see things from different perspectives. The lateral thinking questions were all based on 'lived experience'. One would have had to have lived in a country that experienced snow in order to build a snowman, visited a library to borrow a book, travelled in an elevator to know how floor buttons are displayed, played monopoly enough to know the game pieces and rules well, and be old enough to understand the rules of the road etc. These 'lived experiences' potentially make answering the quiz questions easier for the older age groups, due to their diverse experience in many areas of life, giving them the skills to see the simple solutions to the questions given. It could,

---

therefore, be surmised that LTA is just another term for ‘wisdom’ that often accompanies age and life experience.

### **Research limitations.**

Not having the age and gender at the beginning of the survey gave little indication of the trait of participants who left the survey prior to completing any or each of the individual sections. Although this information may have minimal validity to these research outcomes, there is the potential of understanding if there is a propensity by age, gender or personality trait to not complete the lateral thinking questions.

Almost half the participants who completed the survey were female aged 36-55 years. A more uniform spread of age and gender may have helped to deliver more robust results – especially if there is a significant correlation between age and LTA. This would need to be invested further to gain greater insights into this correlation.

The Personality section and Creative Ability section were both self-perceived scores based on statements given. The Lateral Thinking section was based on quiz type questions. The style of questions differing across the two Dependent Variable sections could have made the two outcomes non-comparable as a result. Having similar style questions, i.e. either both self-perception or both quiz type questions, across the two Dependent Variable sections could have made the results more comparable on a like-for-like basis, and could have allowed for consistent coding of results.

The Personality and Creativity sections were standard questionnaires that had been pre-coded using Likert scales with (reverse) scoring systems already devised and well tested. The Lateral Thinking section needed manual coding of ‘0 for wrong’ and ‘1 for right’. This was based on Woodcock’s (2017) summation that in laterally thinking, either a person is right or wrong. This left room for subjective coding errors by the researcher where participants did not give standard ‘right or wrong’ answers.

The Lateral Thinking questions were very contextually based and made the assumption that a person e.g. had to have used a library, played monopoly, used a lift, lived in a region that experienced snowfall, had played with a ball in their past, etc. Those who had not experienced these contexts were at an immediate disadvantage of being unable to

---

answer the question correctly. Better questions that were more inclusive of generic experience may have resulted in more conclusive results.

### **Implications for future research.**

Little research has been done on the correlation between LTA and personality traits. This study has shown some indication that there is an inverse correlation between Conscientiousness traits and LTA. The study also shows some indication that LTA potentially improves with age and life-experience. Further studies investigating this could help to shed light on ways to improve LTAs, such as increasing life-skills, broadening experiences etc. for younger industry workers who do not yet have these life skills to draw from. These studies would need to be a combination of Lateral Thinking questions in surveys in addition to Lateral Thinking tasks measured through observation.

### **Conclusion.**

The onset of the information and technical revolution has increased the complexity of everyday life and will continue to do so into the foreseeable future. The skills once highly prized within the industrial revolution environment are losing their effectiveness in the information age, where the need for brand new ideas and solutions are critical to compete and develop new future-based solutions. Much research has been done on creativity and its link to intelligence, personality and genetic influence. However, research conducted on more specialist thinking skills, such as LTA is lacking, despite the vital needs in helping to train future workers in finding solutions within a rapidly changing innovation driven world.

This study investigated the relationship between personality traits, creative ability and the ability to think laterally and found, in line with previous research, a direct correlation between creativity and the Openness personality trait. Although it seems that, outside of the inverse correlation between Conscientiousness and LTA, there is no strong correlation between other personality traits and the ability to think laterally. There does however seem to be an indication that increased age has a positive bearing on the ability to answer lateral thinking questions. More research needs to be conducted to investigate if there is a strong correlation between age and LTA, as this may have some impact on how to improve training and skills within tomorrow's workforce.

---

## **References:**

Balkis, M., Isiker, G. B. (2005) 'The Relationship Between Thinking Styles and Personality Type', *Social Behaviour and Personality*, 2005, 33(3), 283-294. [Online] Available at: <http://web.b.ebscohost.com.libezproxy.open.ac.uk/ehost/pdfviewer/pdfviewer?sid=79ac4282-39e3-432b-a4af-5ec463477627%40sessionmgr102&vid=1&hid=124> (Accessed 11 February 2017)

Barron, F., Harrington, D. M., (1981) 'Creativity, Intelligence, and Personality', *Annual Review of Psychology* Vol 32. 439-76 [Online] Available at: <http://www.annualreviews.org/doi/abs/10.1146/annurev.ps.32.020181.002255?journalCode=psych> (Accessed 12 February 2017)

Batey, M., Chamorro-Premuzic, T., Furnham, A., (2010) 'Individual differences in ideation Behavior: Can the Big Five and Psychometric Intelligence Predict Creativity Scores?', *Creativity Research Journal*, Volume 22(1), Pages 90-97 [Online] Available at: <http://web.a.ebscohost.com.libezproxy.open.ac.uk/ehost/pdfviewer/pdfviewer?sid=44f3c7b9-6180-42b0-9f9d-c128d8c97c8b%40sessionmgr4008&vid=1&hid=4101> (Accessed 25 April 2017)

Cattell R., (1971) 'Genius and the processes of creative thought', *Advances in Psychology* [Online]. [http://doi.org.libezproxy.open.ac.uk/10.1016/S0166-4115\(08\)60126-0](http://doi.org.libezproxy.open.ac.uk/10.1016/S0166-4115(08)60126-0) (Accessed 24 April 17)

De Bono, E. (1990). 'Lateral Thinking', London, Penguin Books Ltd

De Bono, E. (2014). 'Lateral Thinking, An Introduction', Random House Group

Dollinger S. J., Skaggs A. (2012) Does the ACT predict 'inside the box' thinking or creativity?: creative characteristics in the personality imagination exercise', *Imagination, Cognition and Personality*, Vol. 31(3) 199-216, 2011-2012 [Online] <http://journals.sagepub.com.libezproxy.open.ac.uk/doi/pdf/10.2190/IC.31.3.d> (Accessed 24th April 2017)

Eilon, S. (1986). 'Don't spit in the soup, we all have to eat'. *Omega*, Volume 14, Issue 2, 1986, Pages 85-90, [Online]. Available at: <http://www.sciencedirect.com.libezproxy.open.ac.uk/science/article/pii/0305048386900113> (Accessed 24 April 2017)

Eysenck, H.J. (1993). 'Creativity and personality: suggestions for a theory' *Psychology Inquiry*, 01 July 1993, Vol.4(3), p. 147-178 [Online]. <http://web.a.ebscohost.com.libezproxy.open.ac.uk/ehost/pdfviewer/pdfviewer?sid=ffee9468-d6b1-437a-aa42-5100474c6f7a%40sessionmgr4008&vid=1&hid=4101> (Accessed 23 April 2017)

Hayley, N. and Kaye, H. (2016). 'Investigating Psychology 3', The Open University

---

IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp for SPSS

Fradera, A. (2017). 'Is creativity something you inherit from your parents?' The British Psychology Society Research Digest, January 16, 2017 [Online]. Available at: <https://digest.bps.org.uk/2017/01/16/is-creativity-something-you-inherit-from-your-parents/> (Accessed 24 April 2017)

Huitt, W. (1992). 'Problem solving and decision making: Consideration of individual differences using the Myers - Briggs Type Indicator'. *Journal of Psychological Type*, 24, 33 – 44 [Online]. Available at: <http://www.edpsycinteractive.org/papers/1992-huitt-problem-solving-and-mbti.pdf> (Accessed 11 January 2017)

MacLean, R. (2016) 'Chapter 6: Measuring Differences in People: Creativity and Personality', *DE300 Investigating Psychology 3*, Oxford, Oxford University Press/Milton Keynes, The Open University.

John, O. P., Donahue, E. M., & Kentle, R. L. (1991). *The Big Five Inventory--Versions 4a and 54*. Berkeley, CA: University of California, Berkeley, Institute of Personality and Social Research.

John, O. P., Naumann, L. P., Soto, C. J., (2008) 'Handbook of Personality, Third Edition: Theory and Research', Guilford Press [Online] Available at: <https://books.google.co.uk/books?hl=en&lr=&id=8r4KlgerjUC&oi=fnd&pg=PA114&dq=paradigm+shift+to+the+integrative+big+five+train+taxonomy&ots=lcnaqN8I09&sig=BpoMc6TPR32LNGXG7RMVBateYdA#v=onepage&q&f=false> (Accessed 12 February 2017)

Karwowski, M., Jankowska, D. M., Gralewski, J., Gajda, A., Wisniewska, E., Lebuda I. (2016). 'Greater male variability in creativity: A latent variables approach', *Thinking Skills and Creativity*. Elsevier. [Online] Available at: [http://ac.els-cdn.com/libezproxy.open.ac.uk/S1871187116301407/1-s2.0-S1871187116301407-main.pdf?\\_tid=1ffb0d3c-3e8d-11e7-8da4-0000aab0f02&acdnat=1495416330\\_2f90bf6cdb89de6d103ad4fef56dfaf1](http://ac.els-cdn.com/libezproxy.open.ac.uk/S1871187116301407/1-s2.0-S1871187116301407-main.pdf?_tid=1ffb0d3c-3e8d-11e7-8da4-0000aab0f02&acdnat=1495416330_2f90bf6cdb89de6d103ad4fef56dfaf1). (Accessed 21 May 2017)

Kaufman, J. C. (2012). Counting the muses: Development of the Kaufman - Domains of Creativity Scale (K-DOCS). *Psychology of Aesthetics, Creativity, and the Arts*, 6, 298-308 [Online] Available at: <https://osf.io/bnhdt/>. (Accessed 11 February 2017)

The output for this paper was generated using Qualtrics software, Version February – April 2017 of Qualtrics. Copyright © 2017 Qualtrics. Qualtrics and all other Qualtrics product or service names are registered trademarks or trademarks of Qualtrics, Provo, UT, USA. Available at: <http://www.qualtrics.com> (Accessed February to April 2017)

Reber, A.S., Allen, R., Reber, E. S., (2009) 'Penguin Dictionary of Psychology', London, Penguin Books Ltd

Robinson, K. (2007) 'Do schools kill creativity?', Ted Talks [Online] <https://youtu.be/iG9CE55wbtY> (Accessed 12 February 2017)



---

Runco, M.A. (2004a) 'Creativity, When East Meets West', London, World Scientific Publishing Co. Pte. Ltd. [Online] Available at:  
<https://books.google.co.uk/books?hl=en&lr=&id=jgXJCgAAQBAJ&oi=fnd&pg=PA9&dq=runco+2004+creativity&ots=IB4GnuxFAP&sig=Nfj9NBo9ObRMr9ulDPcr-plzqe8#v=onepage&q&f=false>. (Accessed 12 February 2017)

Runco, M.A. (2004b) 'Creativity', Annual Review of Psychology Vol 55. [Online] Available at:  
<http://web.a.ebscohost.com.libezproxy.open.ac.uk/ehost/pdfviewer/pdfviewer?sid=0d2cc47d-da0b-45fe-83a2-14418f3a9f16%40sessionmgr4010&vid=1&hid=4114> (Accessed 12 February 2017)

Runco, M.A. (2006) 'Creativity', Elsevier Science. [Online] Available at:  
<http://ebookcentral.proquest.com.libezproxy.open.ac.uk/lib/open/reader.action?docID=283983> (Accessed 22 May 2017)

Sage (2009) 'Divergent Thinking', Encyclopaedia of Giftedness, Creativity and Talent [Online] Available at:  
<http://sk.sagepub.com.libezproxy.open.ac.uk/reference/download/giftedness/n114.pdf> (Accessed 29 April 2017)

The Open University (2016) *Week 7 Study Guide: Measuring Differences in People: Creativity and Personality*, Milton Keynes, The Open University [Online] Available at:  
<https://learn2.open.ac.uk/mod/oucontent/view.php?id=914304> (Accessed: 13 November 2016)

Woodcock, B (2017) 'Lateral Thinking Skills', University of Kent. [Online] Available at:  
<https://www.kent.ac.uk/careers/sk/lateral.htm> (Accessed 11 February 2017). Used with permission from B.E.Woodcock@kent.ac.uk.

Woodcock, B (2017) 'Second Lateral Thinking Test'. University of Kent. [Online] Available at:  
<https://www.kent.ac.uk/careers/sk/puzzles.htm> (Accessed 11 February 2017). Used with permission from B.E.Woodcock@kent.ac.uk.

Zhang, L., (2001) 'Thinking Styles and Personality Types Revisited', Personality and Individual Differences, Vol 31, Issue 6, 15 October 2001, Pages 883-894 [Online] Available at:  
[http://dx.doi.org.libezproxy.open.ac.uk/10.1016/S0191-8869\(00\)00189-6](http://dx.doi.org.libezproxy.open.ac.uk/10.1016/S0191-8869(00)00189-6) (Accessed: 11 February 2017)

---

## Appendices List:

**Appendix 1:** Questionnaire and response options

**Appendix 2:** Cronbach's alpha tables

**Appendix 3:** Multiple Regression SPSS output tables

**Appendix 4:** Assumptions tables and graphs

**Appendix 5:** Participant & Independent and Dependant Variables Means

## Attachment List:

- **Attachment 1:** EMA Workings Personality Creativity and Lateral Thinking.sav (SPSS Raw Data downloaded from Qualtrics and cleaned for analysis)
- **Attachment 2:** Descriptive Statistics.spv (descriptive SPSS output)
- **Attachment 3:** Assumptions CA & LT.spv (assumptions output for Creative Ability and LTA SPSS output)
- **Attachment 4:** Cronbachs Alpha.spv (SPSS output)
- **Attachment 5:** Multiple Regression CA & LT.spv (Multiple regression analysis for Creative Ability and LTA SPSS output)
- **Attachment 6:** Comparing Means IVs & DVs.spv (A comparison of means SPSS output)
  
- Appendix 1: Approved Survey Questionnaire.docx
- Appendix 5: Approved Ethical Approval Form through the Open University

---

## Appendix 1: Questionnaire and response options

### **Section 1:**

The questions within this section are based on The Big Five personality factors, which are: Openness, Conscientiousness, Extraversion, Agreeableness and Neuroticism. As the objective of the survey is to understand if there is any link between personality type, creative ability and lateral thinking, you will first be answering questions related to personality.

There are no "right" or "wrong" answers. Each statement is to be rated in terms of how you are in general. We will not obtain meaningful results unless you answer the questions honestly. These results are being used in scientific research, so please try to give accurate answers.

Here are a number of characteristics that may or may not apply to you. Please write a number next to each statement to indicate the extent to which **you agree or disagree with that statement.**

*(Note to marker: these questions are taken directly from John et al, 2008)*

<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
Disagree Strongly	Disagree a little	Neither agree nor disagree	Agree a little	Agree strongly

#### **I am someone who...**

1. \_\_\_\_\_ Is talkative
2. \_\_\_\_\_ Tends to find fault with others
3. \_\_\_\_\_ Does a thorough job
4. \_\_\_\_\_ Is depressed, blue
5. \_\_\_\_\_ Is original, comes up with new ideas
6. \_\_\_\_\_ Is reserved
7. \_\_\_\_\_ Is helpful and unselfish with others
8. \_\_\_\_\_ Can be somewhat careless
9. \_\_\_\_\_ Is relaxed, handles stress well.
10. \_\_\_\_\_ Is curious about many different things
11. \_\_\_\_\_ Is full of energy
12. \_\_\_\_\_ Starts quarrels with others
13. \_\_\_\_\_ Is a reliable worker
14. \_\_\_\_\_ Can be tense
15. \_\_\_\_\_ Is ingenious, a deep thinker
16. \_\_\_\_\_ Generates a lot of enthusiasm
17. \_\_\_\_\_ Has a forgiving nature
18. \_\_\_\_\_ Tends to be disorganized
19. \_\_\_\_\_ Worries a lot
20. \_\_\_\_\_ Has an active imagination
21. \_\_\_\_\_ Tends to be quiet
22. \_\_\_\_\_ Is generally trusting
23. \_\_\_\_\_ Tends to be lazy`
24. \_\_\_\_\_ Is emotionally stable, not easily upset
25. \_\_\_\_\_ Is inventive
26. \_\_\_\_\_ Has an assertive personality

- 
27. \_\_\_\_\_ Can be cold and aloof
  28. \_\_\_\_\_ Perseveres until the task is finished
  29. \_\_\_\_\_ Can be moody
  30. \_\_\_\_\_ Values artistic, aesthetic experiences
  31. \_\_\_\_\_ Is sometimes shy, inhibited
  32. \_\_\_\_\_ Is considerate and kind to almost everyone
  33. \_\_\_\_\_ Does things efficiently
  34. \_\_\_\_\_ Remains calm in tense situations
  35. \_\_\_\_\_ Prefers work that is routine
  36. \_\_\_\_\_ Is outgoing, sociable
  37. \_\_\_\_\_ Is sometimes rude to others
  38. \_\_\_\_\_ Makes plans and follows through with them
  39. \_\_\_\_\_ Gets nervous easily
  40. \_\_\_\_\_ Likes to reflect, play with ideas
  41. \_\_\_\_\_ Has few artistic interests
  42. \_\_\_\_\_ Likes to cooperate with others
  43. \_\_\_\_\_ Is easily distracted
  44. \_\_\_\_\_ Is sophisticated in art, music, or literature

## **Section 2: Creative Behaviours**

Before you rank the below statements, please answer the following two questions:

- On a scale of 1 to 10, where 1 is: 'not at all creative' and 10 is: 'extremely creative', how creative you believe yourself to be.
- Generally, do you think that people are born creative or they can be taught to be creative. Rate your answer on a scale of 1 to 10, where 1 is: 'born creative', and 10 is: 'creativity is a learned skill'.

The below statements below are taken from a standardised creativity scale, developed by a well know psychologist, James C. Kaufman.

Using the scale of 1 to 5 where:

1 = Much less creative

2 = less creative

3 = neither more or less creative

4 = more creative

5 = much more creative

how would you rate yourself creatively for each of the following acts, compared to people of approximately your age and life experience? For acts that you have not specifically done, estimate your creative potential based on your performance on similar tasks.

1. Finding something fun to do when I have no money \_\_\_\_\_
2. Helping other people cope with a difficult situation \_\_\_\_\_

- 
3. Teaching someone how to do something \_\_\_\_\_
  4. Maintaining a good balance between my work and my personal life \_\_\_\_\_
  5. Understanding how to make myself happy \_\_\_\_\_
  6. Being able to work through my personal problems in a healthy way \_\_\_\_\_
  7. Thinking of new ways to help people \_\_\_\_\_
  8. Choosing the best solution to a problem \_\_\_\_\_
  9. Planning a trip or event with friends that meets everyone's needs \_\_\_\_\_
  10. Mediating a dispute or argument between two friends \_\_\_\_\_
  11. Getting people to feel relaxed and at ease \_\_\_\_\_
  12. Writing a nonfiction article for a newspaper, newsletter, or magazine \_\_\_\_\_
  13. Writing a letter to the editor \_\_\_\_\_
  14. Researching a topic using many different types of sources that may not be readily apparent  
\_\_\_\_\_
  15. Debating a controversial topic from my own perspective \_\_\_\_\_
  16. Responding to an issue in a context-appropriate way \_\_\_\_\_
  17. Gathering the best possible assortment of articles or papers to support a specific point of view  
\_\_\_\_\_
  18. Arguing a side in a debate that I do not personally agree with \_\_\_\_\_
  19. Analysing the themes in a good book \_\_\_\_\_
  20. Figuring out how to integrate critiques and suggestions while revising a work \_\_\_\_\_
  21. Being able to offer constructive feedback based on my own reading of a paper \_\_\_\_\_
  22. Coming up with a new way to think about an old debate \_\_\_\_\_
  23. Writing a poem \_\_\_\_\_
  24. Making up lyrics to a funny song \_\_\_\_\_
  25. Making up rhymes \_\_\_\_\_
  26. Composing an original song \_\_\_\_\_
  27. Learning how to play a musical instrument \_\_\_\_\_
  28. Shooting a fun video to air on YouTube \_\_\_\_\_
  29. Singing in harmony \_\_\_\_\_
  30. Spontaneously creating lyrics to a rap song \_\_\_\_\_
  31. Playing music in public \_\_\_\_\_
  32. Acting in a play \_\_\_\_\_
  33. Carving something out of wood or similar material \_\_\_\_\_
  34. Figuring out how to fix a frozen or buggy computer \_\_\_\_\_
  35. Writing a computer program \_\_\_\_\_
  36. Solving math puzzles \_\_\_\_\_
  37. Taking apart machines and figuring out how they work \_\_\_\_\_
  38. Building something mechanical (like a robot) \_\_\_\_\_
  39. Helping to carry out or design a scientific experiment \_\_\_\_\_
  40. Solving an algebraic or geometric proof \_\_\_\_\_
  41. Constructing something out of metal, stone, or similar material \_\_\_\_\_
  42. Drawing a picture of something I've never actually seen (like an alien) \_\_\_\_\_
  43. Sketching a person or object \_\_\_\_\_
  44. Doodling/Drawing random or geometric designs \_\_\_\_\_
  45. Making a scrapbook page out of my photographs \_\_\_\_\_
  46. Taking a well-composed photograph using an interesting angle or approach \_\_\_\_\_

- 
47. Making a sculpture or piece of pottery \_\_\_\_\_
  48. Appreciating a beautiful painting \_\_\_\_\_
  49. Coming up with my own interpretation of a classic work of art \_\_\_\_\_
  50. Enjoying an art museum \_\_\_\_\_

### **Section 3: Lateral Thinking Quiz Questions**

Lateral thinking, is defined as: a person's ability to think "outside the box", to use imagination and inspiration to solve seemingly unsolvable problems by approaching them in unexpected ways. It involves not looking at the obvious, putting on hold traditional thinking, and throwing away preconceived ideas (Woodcock, 2017).

Before you rank the below statements, please answer the following two questions:

- On a scale of 1 to 10, where 1 is: 'I solve problems and work through tasks in a proven, systematic way' and 10 is: 'I find great satisfaction in finding new solutions that are not based on conventional methods of problem solving', where would you rate yourself?
- Do you think that people need to be naturally creative to come up with new solutions for old problems or invent new ways of doing things or is this ability to think outside of conventional wisdom something that can be taught? Rate your answer on a scale of 1 to 10, where 1 is: 'naturally creative', and 10 is: 'inventing new ways of doing things is a learned skill'.

In this section, you will be given 10 short quizzes. The answers are not necessarily obvious and require you to think in a non-conventional manner. There is no time limit to answer the question, so take as long as you need. If you do know the answer, please write this in the box provided below the question. If you do not know the answer, please write 'unsure' in the box. There may be more than one answer to each these questions. What distinguishes the answers of the researcher is that they are usually the simplest reasonable explanation. Please remember that your ability to answer these questions is in no way an indication of IQ.

Question 1: There are six eggs in the basket. Six people each take one egg, how can it be that one egg is left in the basket?

Answer: The first five people take one egg out of the basket, the sixth person takes both the egg and the basket

Question 2: A police officer saw a truck driver clearly going the wrong way down a one-way street, but did not try to stop him. Why?

Answer: The truck driver was walking down the one-way street.

Question 3: Two people are sitting with a table in between them, but they cannot see each other. Why?

Answer: They are sitting in the opposite direction and not facing each other.

Question 4: A woman walked up to a man behind a counter and handed him a book. He looked at it and said, 'that will be four Pounds'. She paid the man and then walked out without the book. He saw her leave without it, but did not call her back. Why?

---

Answer: she was returning an overdue library book.

Question 5: How can you throw a ball as hard as you can, and make it stop and return to you, without hitting anything and with nothing attached to it?

Answer: Go outside and throw it upwards.

Question 6: Five pieces of coal, a carrot and a scarf are lying on the lawn. Nobody put them on the lawn but there is a perfectly logical reason why they should be there. Why is that?

Answer: They were used to make a snowman, which has now melted.

Question 7: A woman had two sons who were born on the same hour of the same day of the same year. But they were not twins. How could this be so?

Answer: They were two of a set of triplets (or quadruplets etc.)

Question 8: What word is always spelled wrongly?

Answer: Wrongly.

Question 9: A woman lives on the tenth floor of a block of flats. Every morning she takes the lift down to the ground floor and goes to work. In the evening, she gets into the lift, and, if there is someone else in the lift she goes back to her floor directly. Otherwise, she goes to the eighth floor and walks up two flights of stairs to her flat. How do you explain this?

Answer: The woman is of small stature and couldn't reach the upper lift buttons.

Question 10: A man pushed his car. He stopped when he reached a hotel at which point he knew he was bankrupt. Why?

Answer: He was playing monopoly.

### **About you:**

The information below is for statistical purposes only.

Gender (choose one): male : female

Age range: 18 – 35 : 36 – 55 : 56 – 75 : 76+

---

Appendix 2: Cronbach's alpha tables (SPSS outputs)

**Table 2: Summary of reliability analysis, standard deviation, N values per section and scoring range**

Domain	$\alpha$	Mean	Std. Deviation	N	Score range
Personality	.499	150.45	10.25	44	1-5
Creative Ability	.934	156.66	28.08	50	1-5
Lateral Thinking Ability	.607	4.17	2.10	10	0-1
Combined	.893	311.29	32.58	104	Varied

SPSS outputs

**Personality Reliability Statistics**

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.499	.546	44

**Personality Scale Statistics**

Mean	Variance	Std. Deviation	N of Items
150.45	105.116	10.253	44

**Creative Ability Reliability Statistics**

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.934	.930	50

**Creative Ability Scale Statistics**

Mean	Variance	Std. Deviation	N of Items
156.66	788.597	28.082	50

**Lateral Thinking Ability Reliability Statistics**

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.607	.599	10

**Lateral Thinking Scale Statistics**

Mean	Variance	Std. Deviation	N of Items
4.17	4.392	2.096	10

**Combined Reliability Statistics**

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.893	.878	104

**Combined Variables Scale Statistics**

Mean	Variance	Std. Deviation	N of Items
311.29	1061.237	32.577	104



Appendix 3: Multiple Regression (SPSS outputs)

Table 3: Summary of Multiple Regression Analysis for Variables Predicting Creative Ability (N = 98)

Variable	Model 1: Creative Ability			
	B	SE B	$\beta$	Sig.
Openness	2.246	.369	.517	.0001
Agreeableness	-3.194	.914	-.306	.001
Extraversion	.726	.372	.184	.054
Conscientiousness	.708	.449	.139	.118
Neuroticism	.528	.383	.133	.172
<b>Creative Ability</b>				
	R <sup>2</sup>	.37		
	F	10.61 ***		

\*\*\* p < .001

Table 4: Summary of Multiple Regression Analysis for Variables Predicting Lateral Thinking Ability (N = 98)

Variable	Model 1: Lateral Thinking Ability			
	B	SE B	$\beta$	Sig.
Openness	.008	.033	.025	.805
Agreeableness	.094	.081	.121	.245
Extraversion	-.019	.033	-.063	.573
Conscientiousness	-.134	.040	-.353	.001**
Neuroticism	-.041	.034	-.138	.229
<b>Lateral Thinking Ability</b>				
	R <sup>2</sup>	.11		
	F	2.36*		

\* p > .001, \*\* p = .001,

Table 5: descriptive statistics, Pearson correlation values and statistical significance for predictor and dependent variables

Variables	N =	Mean	SD	Openness	Agreeableness	Extraversion	Conscientiousness	Neuroticism
Openness	98	36.87	6.46					
Agreeableness	98	37.03	2.69					
Extraversion	98	25.55	7.12					
Conscientiousness	98	34.37	5.51					
Neuroticism	98	23.59	7.07					
Creative Ability	98	156.66	28.28	.513 ***	-.207 **	.070 *	.042 *	.139 *
Lateral Thinking Ability	98	4.17	2.10	0.12 *	.045 *	.016 *	-.294 **	-.039 *

\* p > .001, \*\* p = .001, \*\*\* p < .001

SPSS output: Descriptive Statistics

**Descriptive Statistics**

	N	Range	Minimum	Maximum	Mean	Std. Deviation
IV1 Openness Personality Trait	98	32	17	49	36.81	6.461
IV2 Agreeableness Personality Trait	98	15	30	45	37.03	2.688
IV3 Extraversion Personality Trait	98	30	9	39	25.55	7.118
IV4 Conscientiousness Personality Trait	98	28	16	44	34.37	5.514
IV5 Neuroticism Personality Trait	98	29	10	39	23.59	7.065
DV1 Total Creativity Scores	98	155	95	250	156.66	28.082
DV2 Total Lateral Thinking Scores	98	9	0	9	4.17	2.096
Valid N (listwise)	98					

SPSS outputs: Creative Ability

**Correlations**

		DV1 Total Creativity Scores	IV1 Openness Personality Trait	IV2 Agreeableness Personality Trait	IV3 Extraversion Personality Trait	IV4 Conscientiousness Personality Trait	IV5 Neuroticism Personality Trait
Pearson Correlation	DV1 Total Creativity Scores	1.000	.513	-.207	.070	.042	.139
	IV1 Openness Personality Trait	.513	1.000	.086	.004	.003	.162
	IV2 Agreeableness Personality Trait	-.207	.086	1.000	.199	.229	-.108
	IV3 Extraversion Personality Trait	.070	.004	.199	1.000	.010	-.424
	IV4 Conscientiousness Personality Trait	.042	.003	.229	.010	1.000	-.231
	IV5 Neuroticism Personality Trait	.139	.162	-.108	-.424	-.231	1.000
	Sig. (1-tailed)	DV1 Total Creativity Scores	.	.000	.020	.246	.342
IV1 Openness Personality Trait		.000	.	.199	.486	.489	.056
IV2 Agreeableness Personality Trait		.020	.199	.	.025	.012	.144
IV3 Extraversion Personality Trait		.246	.486	.025	.	.462	.000
IV4 Conscientiousness Personality Trait		.342	.489	.012	.462	.	.011
IV5 Neuroticism Personality Trait		.086	.056	.144	.000	.011	.
N		DV1 Total Creativity Scores	98	98	98	98	98
	IV1 Openness Personality Trait	98	98	98	98	98	98
	IV2 Agreeableness Personality Trait	98	98	98	98	98	98

IV3 Extraversion Personality Trait	98	98	98	98	98	98
IV4 Conscientiousness Personality Trait	98	98	98	98	98	98
IV5 Neuroticism Personality Trait	98	98	98	98	98	98

#### Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.605 <sup>a</sup>	.366	.331	22.968	1.993

- a. Predictors: (Constant), IV5 Neuroticism Personality Trait, IV2 Agreeableness Personality Trait, IV1 Openness Personality Trait, IV4 Conscientiousness Personality Trait, IV3 Extraversion Personality Trait
- b. Dependent Variable: DV1 Total Creativity Scores

#### ANOVA<sup>a</sup>

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	27963.197	5	5592.639	10.602	.000 <sup>b</sup>
	Residual	48530.691	92	527.508		
	Total	76493.888	97			

- a. Dependent Variable: DV1 Total Creativity Scores
- b. Predictors: (Constant), IV5 Neuroticism Personality Trait, IV2 Agreeableness Personality Trait, IV1 Openness Personality Trait, IV4 Conscientiousness Personality Trait, IV3 Extraversion Personality Trait

#### Coefficients<sup>a</sup>

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	137.049	37.524		3.652	.000		
	IV1 Openness Personality Trait	2.246	.369	.517	6.090	.000	.958	1.044
	IV2 Agreeableness Personality Trait	-3.197	.914	-.306	-3.499	.001	.901	1.109
	IV3 Extraversion Personality Trait	.726	.372	.184	1.953	.054	.777	1.287
	IV4 Conscientiousness Personality Trait	.708	.449	.139	1.576	.118	.886	1.129
	IV5 Neuroticism Personality Trait	.528	.383	.133	1.377	.172	.742	1.348

- a. Dependent Variable: DV1 Total Creativity Scores

SPSS outputs: Lateral Thinking Ability

**Correlations**

	DV2 Total Lateral Thinking Scores	IV1 Openness Personality Trait	IV2 Agreeableness Personality Trait	IV3 Extraversion Personality Trait	IV4 Conscientiousness Personality Trait	IV5 Neuroticism Personality Trait
Pearson Correlation	1.000	.012	.045	.016	-.294	-.039
IV1 Openness Personality Trait	.012	1.000	.086	.004	.003	.162
IV2 Agreeableness Personality Trait	.045	.086	1.000	.199	.229	-.108
IV3 Extraversion Personality Trait	.016	.004	.199	1.000	.010	-.424
IV4 Conscientiousness Personality Trait	-.294	.003	.229	.010	1.000	-.231
IV5 Neuroticism Personality Trait	-.039	.162	-.108	-.424	-.231	1.000
Sig. (1-tailed)	.	.455	.331	.437	.002	.351
IV1 Openness Personality Trait	.455	.	.199	.486	.489	.056
IV2 Agreeableness Personality Trait	.331	.199	.	.025	.012	.144
IV3 Extraversion Personality Trait	.437	.486	.025	.	.462	.000
IV4 Conscientiousness Personality Trait	.002	.489	.012	.462	.	.011
IV5 Neuroticism Personality Trait	.351	.056	.144	.000	.011	.
N	98	98	98	98	98	98
IV1 Openness Personality Trait	98	98	98	98	98	98
IV2 Agreeableness Personality Trait	98	98	98	98	98	98
IV3 Extraversion Personality Trait	98	98	98	98	98	98
IV4 Conscientiousness Personality Trait	98	98	98	98	98	98
IV5 Neuroticism Personality Trait	98	98	98	98	98	98

**Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.337 <sup>a</sup>	.114	.066	2.026	2.118

a. Predictors: (Constant), IV5 Neuroticism Personality Trait, IV2 Agreeableness Personality Trait, IV1 Openness Personality Trait, IV4 Conscientiousness Personality Trait, IV3 Extraversion Personality Trait

b. Dependent Variable: DV2 Total Lateral Thinking Scores

**ANOVA<sup>a</sup>**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	48.433	5	9.687	2.360	.046 <sup>b</sup>
	Residual	377.618	92	4.105		
	Total	426.051	97			

a. Dependent Variable: DV2 Total Lateral Thinking Scores

b. Predictors: (Constant), IV5 Neuroticism Personality Trait, IV2 Agreeableness Personality Trait, IV1 Openness Personality Trait, IV4 Conscientiousness Personality Trait, IV3 Extraversion Personality Trait

**Coefficients<sup>a</sup>**

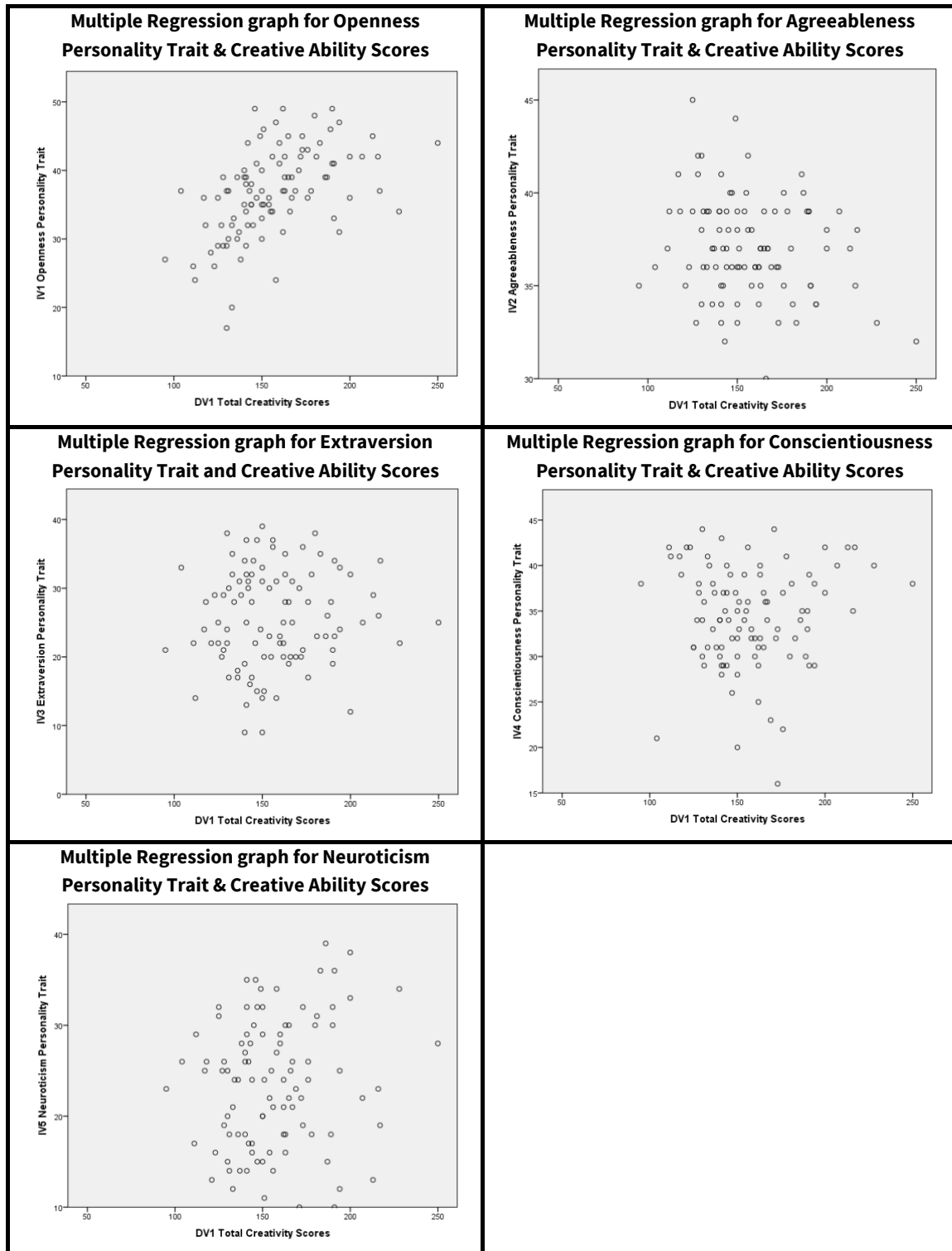
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	6.435	3.310			.055		
	IV1 Openness Personality Trait	.008	.033	.025	.958	.805	.958	1.044
	IV2 Agreeableness Personality Trait	.094	.081	.121	.901	.245	.901	1.109
	IV3 Extraversion Personality Trait	-.019	.033	-.063	.777	.573	.777	1.287
	IV4 Conscientiousness Personality Trait	-.134	.040	-.353	.886	.001	.886	1.129
	IV5 Neuroticism Personality Trait	-.041	.034	-.138	.742	.229	.742	1.348

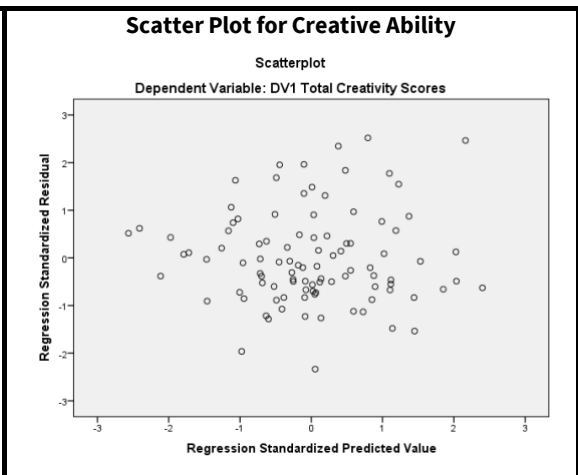
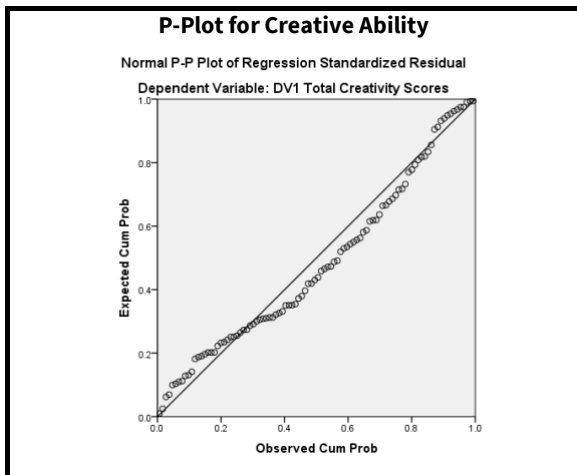
a. Dependent Variable: DV2 Total Lateral Thinking Scores

Appendix 4: Assumptions tables and graphs (SPSS outputs)

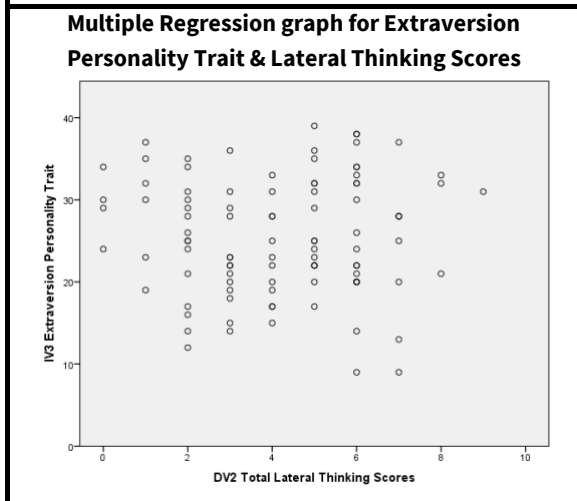
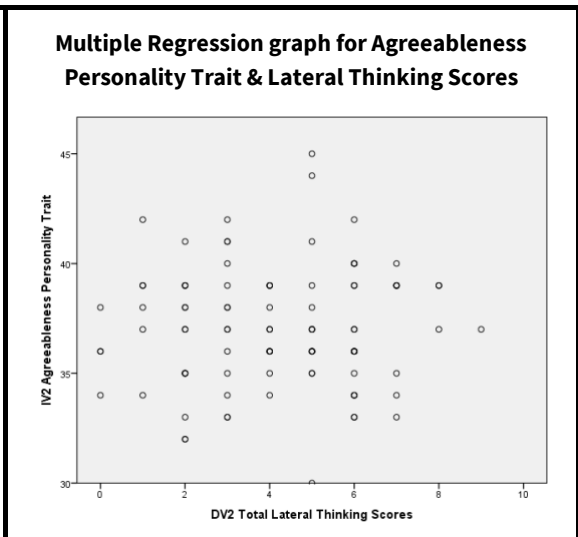
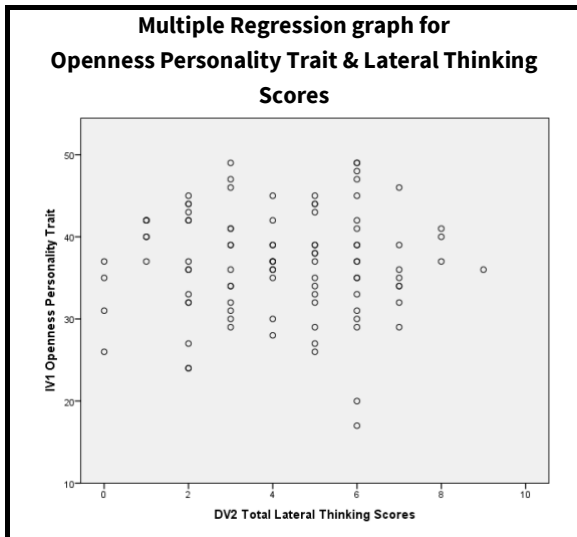
SPSS correlation scatter graph outputs

Dependent Variable 1: Creative Ability

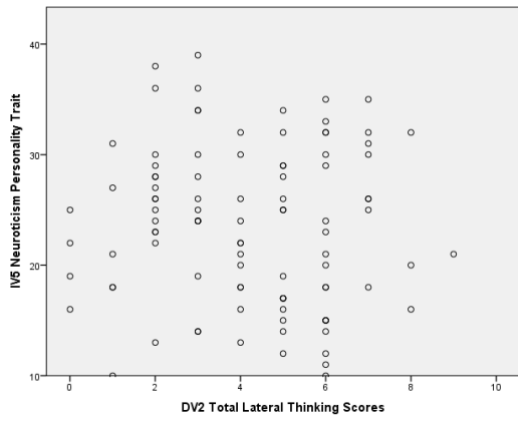




Dependent Variable 2: Lateral Thinking Ability

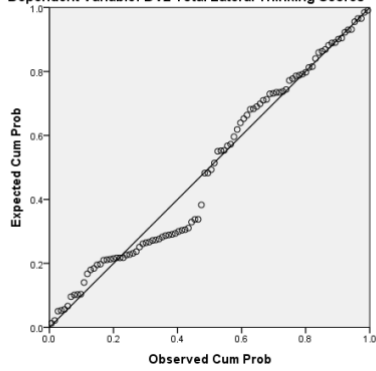


**Multiple Regression graph for Neuroticism Personality Trait & Lateral Thinking Scores**

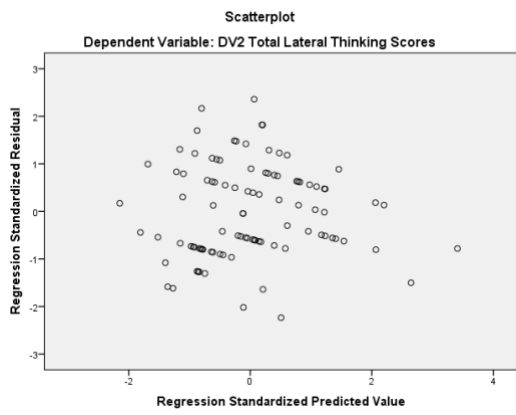


**P-Plot for Lateral Thinking Ability**

Normal P-P Plot of Regression Standardized Residual  
Dependent Variable: DV2 Total Lateral Thinking Scores



**Scatter Plot for Lateral Thinking Ability**





## Appendix 5: Participant + Independent and Dependant Variables Means

### Participant & Variables Report

Gender of participant	Participant age group		IV1 Openness Personality Trait	IV2 Agreeableness Personality Trait	IV3 Extraversion Personality Trait	IV4 Conscientiousness Personality Trait	IV5 Neuroticism Personality Trait	DV1 Total Creativity Scores	DV2 Total Lateral Thinking Scores
Male	18 - 35	Mean	39.0000	31.6667	29.3333	34.0000	27.3333	167.0000	4.0000
		N	3	3	3	3	3	3	3
		Std. Deviation	2.00000	1.15470	2.51661	4.58258	1.15470	23.00000	1.00000
		Minimum	37.00	31.00	27.00	30.00	26.00	144.00	3.00
	Maximum	41.00	33.00	32.00	39.00	28.00	190.00	5.00	
	36 - 55	Mean	36.5714	30.3571	27.0714	32.0000	25.4286	154.6429	4.2857
		N	14	14	14	14	14	14	14
		Std. Deviation	2.70937	3.17701	3.22166	2.88231	4.41526	27.00885	1.89852
		Minimum	32.00	26.00	21.00	26.00	19.00	128.00	1.00
	Maximum	41.00	35.00	35.00	37.00	34.00	213.00	6.00	
	56 - 75	Mean	36.5000	32.0000	29.5000	33.5000	24.0000	173.5000	5.5000
		N	2	2	2	2	2	2	2
		Std. Deviation	2.12132	2.82843	.70711	6.36396	4.24264	19.09188	.70711
		Minimum	35.00	30.00	29.00	29.00	21.00	160.00	5.00
	Maximum	38.00	34.00	30.00	38.00	27.00	187.00	6.00	
	Total	Mean	36.9474	30.7368	27.6842	32.4737	25.5789	158.5789	4.3684
N		19	19	19	19	19	19	19	
Std. Deviation		2.61351	2.88371	3.05601	3.35606	4.00438	25.58280	1.70654	
Minimum		32.00	26.00	21.00	26.00	19.00	128.00	1.00	
Maximum	41.00	35.00	35.00	39.00	34.00	213.00	6.00		
Female	18 - 35	Mean	36.0833	29.4167	26.2917	32.0000	26.9167	159.8333	3.9167
		N	24	24	24	24	24	24	24
		Std. Deviation	5.38853	3.14735	3.45756	2.82843	2.71736	26.12456	2.12473
		Minimum	23.00	22.00	21.00	27.00	22.00	117.00	1.00
	Maximum	43.00	38.00	34.00	39.00	32.00	228.00	8.00	
	36 - 55	Mean	35.8696	29.5435	27.1087	31.7174	25.6957	154.8913	4.0435
		N	46	46	46	46	46	46	46
		Std. Deviation	5.62379	3.13196	3.81941	3.47475	3.20326	31.96889	2.31859
		Minimum	22.00	25.00	19.00	20.00	20.00	95.00	.00
	Maximum	47.00	41.00	36.00	42.00	34.00	250.00	9.00	
	56 - 75	Mean	35.8889	29.3333	25.7778	31.1111	24.0000	153.2222	5.1111
		N	9	9	9	9	9	9	9
		Std. Deviation	3.01846	2.39792	3.34581	3.40751	3.57071	17.54835	1.45297
		Minimum	32.00	26.00	23.00	26.00	16.00	136.00	3.00
	Maximum	41.00	33.00	33.00	37.00	28.00	194.00	8.00	
	Total	Mean	35.9367	29.4810	26.7089	31.7342	25.8734	156.2025	4.1266
N		79	79	79	79	79	79	79	
Std. Deviation		5.26805	3.02918	3.65202	3.25304	3.18799	28.78451	2.18601	
Minimum		22.00	22.00	19.00	20.00	16.00	95.00	.00	
Maximum	47.00	41.00	36.00	42.00	34.00	250.00	9.00		
Total	18 - 35	Mean	36.4074	29.6667	26.6296	32.2222	26.9630	160.6296	3.9259
		N	27	27	27	27	27	27	27
		Std. Deviation	5.18325	3.06343	3.46575	3.01705	2.57923	25.48929	2.01773
		Minimum	23.00	22.00	21.00	27.00	22.00	117.00	1.00
	Maximum	43.00	38.00	34.00	39.00	32.00	228.00	8.00	
	36 - 55	Mean	36.0333	29.7333	27.1000	31.7833	25.6333	154.8333	4.1000
		N	60	60	60	60	60	60	60
		Std. Deviation	5.08226	3.13464	3.66245	3.32475	3.48346	30.66338	2.21474
		Minimum	22.00	25.00	19.00	20.00	19.00	95.00	.00
	Maximum	47.00	41.00	36.00	42.00	34.00	250.00	9.00	
	56 - 75	Mean	36.0000	29.8182	26.4545	31.5455	24.0000	156.9091	5.1818
		N	11	11	11	11	11	11	11

	Std. Deviation	2.79285	2.56196	3.35749	3.77793	3.46410	18.71072	1.32802
	Minimum	32.00	26.00	23.00	26.00	16.00	136.00	3.00
	Maximum	41.00	34.00	33.00	38.00	28.00	194.00	8.00
Total	Mean	36.1327	29.7245	26.8980	31.8776	25.8163	156.6633	4.1735
	N	98	98	98	98	98	98	98
	Std. Deviation	4.87290	3.02832	3.55078	3.26893	3.34093	28.08197	2.09578
	Minimum	22.00	22.00	19.00	20.00	16.00	95.00	.00
	Maximum	47.00	41.00	36.00	42.00	34.00	250.00	9.00