

The new and the best: Ambiguity tolerance and creativity motivation

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ABSTRACT

Tolerance for ambiguity correlated positively with creative motivation but was not related to need for achievement across samples of 106 high school students (14 - 19 years) and 135 university students (19 - 34 years). Tolerance for ambiguity and creative motivation related however differently to author's measure of attitudes towards ambiguity tolerant - ambiguity intolerant behaviours. Participants filled in also Bulgarian adaptations of Torrance's Creative Motivation Scale; Norton's Measure of Ambiguity Tolerance, and a Bulgarian scale for measuring need for achievement. Creative motivation items that differentiated individuals with high and low tolerance for ambiguity and high and low need for achievements were identified.

PURPOSE

The aim of this study is to specify the relation of tolerance for ambiguity to creativity motivation, through an analysis of the relationship between ambiguity tolerance, creative motivation and need for achievement.

METHOD

PARTICIPANTS

School sample

31 boys and 75 girls enrolled in a high school specialised in applied arts
Aged 14 to 19 (M = 16,59; SD = 1,29)

There is no significant difference in the mean age of boys and girls

University sample

45 men and 90 women from 4 different universities in Sofia
(Theater and Cinema Academy + Arts Academy = 40 students; Pharmaceutical Faculty of the Medical University = 65 students; Physics Faculty of Sofia University = 30 students).

Aged from 19 to 34 (M = 22,44; SD = 2,14), with a median age = mode of 22.

There is no significant difference in the mean age of men and women.

DESIGN

High school sample

CM Scale by Torrance – children’s form
Bulgarian adaptation of Norton’s MAT
Bulgarian questionnaire for measuring NACH

University sample

CM Scale by Torrance – adults’ form
Bulgarian adaptation of Norton’s MAT
Bulgarian questionnaire for measuring NACH
Attitudes towards AT – AInT Behaviours

INSTRUMENTS

Creative Motivation Scale (Torrance, 1990)

28 items; children’s form and adults’ form

Bulgarian form of the Creative Motivation Scale (Stoycheva, Stetinski, Popova, 2006)

18 items, 16 straight and 2 reversed indicative items

Cronbach’s Alpha from 0,78 to 0,84 for four samples of high school students, university students and adult samples

Test – retest correlations from 0,77 to 0,81 for an interval of 1,5 month and 0,67 for an interval of 3 months

Measure of Ambiguity Tolerance MAT-50 (Norton, 1975)

54 items indicative of intolerance and 7 items indicative of tolerance of ambiguity

Bulgarian adaptation of MAT-50 / BG-3 (Stoycheva, Stetinski, Bajdekova, 1998)

47 items indicative of intolerance and 5 items indicative of tolerance of ambiguity

Cronbach’s Alpha from 0,84 to 0,88 for high school students and university students samples

Test – retest correlations from 0,78 to 0,81 for an interval of 3 months

Bulgarian questionnaire for measuring need for achievement (Paspalanov, 1984; Paspalanov, Stetinski, 1988)

Measures predisposition to behaviour related to high standards of activity and success

26 test items (22 straight and 4 reverse items) and 16 fillers

Reliability 0,78 - Gulliksen’s formula

High school students with outstanding accomplishments score higher than their peers without such accomplishments (see also Stoycheva., Zhelyazkova, 1992). Innovators scored higher than engineers. Eminent musicians, painters, actors and university lecturers in arts and architecture outscored skilled workers.

Scale for measuring attitudes towards ambiguity tolerant – ambiguity intolerant behaviours (Stoycheva, 1998; 2003)

Consists of 7 AT and 7 AInT items which are thematically related, have moderately high social desirability and were clearly recognised as indicative of ambiguity tolerance (AT) or ambiguity intolerance (AInT).

Examples:

Strictly follows the norms and the rules set at home and at school (*AInT Behaviours*)

Prefer situations with no strict rules and no prescribed ways of doing things (*AT Behaviours*)

Alpha Cronbach from 0,62 to 0,67 for AInT items, 0,63 to 0,74 for AT items, and 0,62 to 0,74 for all items I samples of high school students, their teachers and their parents (Stoycheva, 1998).

In the present study university students were asked to indicate the importance they assign to these 14 behaviours on a 4 point rating scale from “it is important” to “it is not important”. Higher score indicates higher importance. AT and AInT items are treated separately to make two different scores – importance assigned to AT behaviours and importance assigned to AInT behaviours.

RESULTS

1. Tolerance for ambiguity is related positively to creative motivation but is not related to need for achievement

Based on: (a) correlational analysis (Table 1) and (b) comparison of the mean CM scores of groups of subjects with different levels of TFA (Table 2)

Table 1. Pearson’s correlations between tolerance for ambiguity, creative motivation and need for achievement

| | <i>High school sample</i> | <i>University sample</i> |
|------------|---------------------------|--------------------------|
| TFA - CM | 0, 32 ** | 0, 38 *** |
| TFA – NACH | 0, 10 | - 0, 12 |
| CM – NACH | 0, 37 *** | 0, 26** |

** $p < 0,01$; *** $p < 0,001$.

All possible subjects were included for each pair of variables here, and in all subsequent analyses.

These results are supported by data obtained in earlier studies of university students and adults who were then tested with the Bulgarian form of MacDonald’s AT-20 scale for measuring ambiguity tolerance (MacDonald, 1970; Stoycheva, 2003). In these samples a positive relation of tolerance for ambiguity to creative motivation was observed as well: for university students ($n = 117$, $r = 0, 34^{***}$); for adults of varying age and education (17 to 69 years old, $n = 279$, $r = 0, 45^{***}$) (Stoycheva, Stetinski, Popova, 2006)

The lack of relation between TFA and NACH has been observed in an earlier study too: high school students with high and low TFA were compared on several cognitive and personality measures, and no significant difference between the NACH scores of the two groups was found (Stoycheva, 1998)

Table 2. Descriptive statistics for the creative motivation scores in students with different levels of ambiguity tolerance

| <i>High school</i> | Low TFA n = 35 | Average TFA n = 41 | High TFA A n = 30 |
|----------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| F = 5,08 ** Df (2,103) | M = 51,69 SD = 7,31 39 - 66 | M = 55,44 SD = 6,16 42 - 66 | M = 56,67 SD = 6,61 40 - 69 |
| <i>University</i> | Low TFA n = 33 | Average TFA n = 45 | High TFA n = 31 |
| F = 8,25 *** Df (2,106) | M = 49,73 SD = 8,36 30 - 68 | M = 54,22 SD = 7,32 40 - 68 | M = 57,42 SD = 7,26 43 - 76 |

** p < 0,01; *** p < 0,001.

Groups of subjects with low, average and high TFA, defined through half a standard deviation above or below the mean TFA score for the respective sample, were compared.

Homogeneous variances

Scheffe's post hoc multiple comparisons test - High school sample: high > low
University sample: high, average > low

1a - The content of the creative motivation items that differentiated individuals with high and low tolerance of ambiguity further specifies the relationship between TFA and CM (Table 3)

Groups of subjects with high and low TFA, scoring at least half a standard deviation above or below the mean TFA score for the respective sample

Table 3. Creative motivation items' that differentiate students with high and low tolerance of ambiguity

| | P < 0, 05 | P < 0,01 | P < 0,001 |
|--|-----------|----------|-------------|
| <i>High school</i> CM Items' number | 15 | 13 | 10,11 |
| <i>University</i> CM Items' number | 9,26,27 | 5 | 6,10,11, 19 |

Items 10 and 11:

Don't pay attention to wild ideas

Dislike getting into things where I don't know what's going to happen

Item 13:

Get excited about trying out a new idea that may have no practical value

Items 5, 6 and 19:

I enjoy work in which I must keep trying new approaches.

I am fascinated by new ideas, whether or not they have practical value.

I enjoy tackling a job that involves many as yet unknown difficulties.

Summary:

Items' content revolves around the readiness and willingness to get involved with the new, the unknown, the uncertain.

2. Creative motivation and need for achievement are positively related

Based on: (a) correlational analysis (see Table 1 above)

Results indicated 7 % shared variance between the two variables in the sample of university students and 14 % shared variance in the sample of high school students.

2a - The content of the creative motivation items that differentiated individuals with high and low need for achievement (Table 4) and of the need for achievement items that differentiated individuals with high and low creative motivation (Table 5) further specifies the relationship between CM and NACH

Groups of subjects with high and low NACH or CM, scoring at least half a standard deviation above or below the mean NACH or CM score for the respective sample, were compared.

Table 4. Creative motivation items that differentiate students with high and low need for achievement

| | P < 0, 05 | P < 0,01 | P < 0,001 |
|--|------------------|---------------|-----------|
| <i>High school</i> CM Items' number | 6,11,13,15,21,22 | 19, 20 | 27 |
| <i>University</i> CM Items' number | 7,9,19,22 | | 27 |

Item 27:

I usually put a great deal of energy and zeal into my work

Items 19 and 20

Enjoy getting into things that involve unknown difficulties,

I get excited when an idea I am working on begins to work out

Table 5. Need for achievement items that differentiate students with high and low creative motivation

| | P < 0, 05 | P < 0,01 | P < 0,001 |
|--|-----------|----------|-----------|
| <i>High school</i> NACH items number | 5, 27 | 15, 19 | 38 |
| <i>University</i> NACH items number | 19,31,33 | 5, 15 | |

Item 15:

I often take up several things to do at the same time without considering the time they will take me to do

Items 19 and 38:

It is not hard for me to give up something that can be achieved only with great efforts
I always interfere if a certain question is being incompetently discussed even if I am not personally involved

Item 5:

I usually get enthusiastic when I talk about my work and my plans

Summary:

Items' content indicates that creative motivation and need for achievement share a particular way of doing things that is characterised by great energy, enthusiasm, time and effort investment, and personal involvement with one's work

3. How ambiguity tolerance, creative motivation and need for achievement relate to the importance assigned to ambiguity tolerant - ambiguity intolerant behaviours?

Based on: (a) bivariate and partial correlations of TFA, CM and NACH to scores for the importance of AT and AInT behaviours (Table 6)

Table 6. Correlations of TFA, CM and NACH with AT and AInT scores

| | | |
|-------------|----------------------|------------------------|
| <i>TFA</i> | <i>AT Behaviours</i> | <i>AInT Behaviours</i> |
| | 0,25 ** | - 0,60 *** |
| | 0,12 | - 0,57 *** |
| <i>CM</i> | <i>AT Behaviours</i> | <i>AInT Behaviours</i> |
| | 0,52 *** | - 0,40 *** |
| | 0,44 *** | - 0,26 * * |
| <i>NACH</i> | <i>AT Behaviours</i> | <i>AInT Behaviours</i> |
| | 0,19 * | 0,10 |
| | 0,24 * * | 0,17 |

p < 0,05; * * p < 0,01; * * * p < 0,001.

In gray are given partial correlations (first order correlations), controlling for the relationship between AT and AInT scores ($r = -0,32$; $p < 0,01$)

3.1. Tolerance for ambiguity is inversely related to the importance assigned to ambiguity intolerant behaviours

Based on: (a) bivariate and partial correlations of TFA to scores for the importance of AT and AInT behaviours (see Table 6 above), and (b) comparisons of the mean AInT scores of groups of subjects with different levels of TFA (Table 7 through analyses of variance.

Table 7. Importance assigned to AInT behaviours by university students with low, average and high TFA

| | N | Mean | Std. Deviation | Minimum | Maximum |
|-------------|-----|---------|----------------|---------|---------|
| Low TFA | 35 | 21,5714 | 3,6725 | 14,00 | 28,00 |
| Average TFA | 45 | 18,3333 | 3,6118 | 10,00 | 26,00 |
| High TFA | 32 | 15,3750 | 3,7222 | 9,00 | 22,00 |
| Total | 112 | 18,5000 | 4,3558 | 9,00 | 28,00 |

Homogenous variances

Scheffe's test: High < average < low

AT was introduced in the model as a control variable (covariate) in order to remove its effect beforehand and then to verify whether the factor TFA is still significantly related to the dependent variable AInT after the variation due to the covariate has been removed.

Tests of Between-Subjects Effects

Dependent Variable: AInT

| Source | Type III Sum of Squares | df | Mean Square | F | Sig. |
|-----------------|-------------------------|-----|-------------|---------|------|
| Corrected Model | 648,252 | 3 | 216,084 | 16,051 | ,000 |
| Intercept | 1576,613 | 1 | 1576,613 | 117,112 | ,000 |
| AT | 28,774 | 1 | 28,774 | 2,137 | ,147 |
| TFA Level | 509,237 | 2 | 254,619 | 18,913 | ,000 |
| Error | 1427,021 | 106 | 13,462 | | |
| Total | 39908,000 | 110 | | | |
| Corrected Total | 2075,273 | 109 | | | |

R Squared = 0,312 (Adjusted R Squared = 0,293)

3.2. Creative motivation is positively related to the importance assigned to ambiguity tolerant behaviours

Based on: (a) bivariate and partial correlations of CM to scores for the importance of AT and AInT behaviours (see Table 6 above), and (b) comparisons of the mean AT scores of groups of subjects with different levels of CM (Table 8) through analyses of variance.

| | | |
|-----------|---------------|-----------------|
| <i>CM</i> | <i>AT Beh</i> | <i>AInT Beh</i> |
| | 0,52 * * * | - 0,40 * * * |
| | 0,44 * * * | - 0,26 * * |
| | | - 0,11 |

In blue are given partial correlations controlling for the relationship between AT and AInT scores. In rose is given the partial correlation controlling for the relationship with TFA

Table 8. Importance assigned to AT behaviours by university students with low, average and high CM

| | N | Mean | Std. Deviation | Minimum | Maximum |
|------------|-----|---------|----------------|---------|---------|
| Low CM | 42 | 17,3333 | 3,2585 | 11,00 | 23,00 |
| Average CM | 44 | 20,7045 | 3,3172 | 13,00 | 27,00 |
| High CM | 41 | 22,0488 | 3,0162 | 16,00 | 28,00 |
| Total | 127 | 20,0236 | 3,7426 | 11,00 | 28,00 |

Homogeneous variances

Scheffe's test: High, average > low

The effect of the CM level on AT scores was examined and showed to be still significant after controlling for the effect of AInT which covary with the dependent variable, i.e. with the AT scores.

Tests of Between-Subjects Effects

Dependent Variable: AT

| Source | Type III Sum of Squares | df | Mean Square | F | Sig. |
|-----------------|-------------------------|-----|-------------|---------|------|
| Corrected Model | 578,985 | 3 | 192,995 | 20,128 | ,000 |
| Intercept | 3472,335 | 1 | 3472,335 | 362,133 | ,000 |
| AInT | 74,640 | 1 | 74,640 | 7,784 | ,006 |
| CM Level | 353,654 | 2 | 176,827 | 18,441 | ,000 |
| Error | 1160,215 | 121 | 9,589 | | |
| Total | 52140,000 | 125 | | | |
| Corrected Total | 1739,200 | 124 | | | |

R Squared = 0,333 (Adjusted R Squared = 0,316)

The effect of the CM level on AInT scores was examined after controlling for the effect of:
 1) AT which is related with the dependent variable, i.e. with the AInT scores,
 2) TFA which also co-varies with the dependent variable.

After the effect of AT and of TFA on AInT scores is removed, CM Level is no more a factor that is significantly related to the dependent variable, i.e. AInT scores.

Tests of Between-Subjects Effects

Dependent Variable: AInT

| Source | Type III Sum of Squares | df | Mean Square | F | Sig. |
|-----------------|-------------------------|-----|-------------|---------|------|
| Corrected Model | 691,763 | 4 | 172,941 | 14,486 | ,000 |
| Intercept | 1795,160 | 1 | 1795,160 | 150,364 | ,000 |
| AT | 34,968 | 1 | 34,968 | 2,929 | ,090 |
| TFA | 476,694 | 1 | 476,694 | 39,928 | ,000 |
| CM Level | 15,067 | 2 | 7,534 | ,631 | ,534 |
| Error | 1217,751 | 102 | 11,939 | | |
| Total | 38106,000 | 107 | | | |
| Corrected Total | 1909,514 | 106 | | | |

R Squared = 0,362 (Adjusted R Squared = 0,337)

3.2a - The content of the ambiguity tolerant behaviours to which individuals with high and low CM assign different importance further specifies the relationship between CM and attitudes towards ambiguity tolerant behaviours (Table 9)

Groups of subjects with high and low CM, scoring at least half a standard deviation above or below the mean CM score for the sample of university students, were compared.

Table 9. AT Behaviours that differentiate students with high and low creative motivation

| AT Behaviours | P < 0, 05 | P < 0,01 | P < 0,001 |
|---------------|-----------|----------|--------------------|
| Items' number | | | <i>1,4,7,12,14</i> |

- 5 out of 7 items: put oneself to test by experimenting in different situations
 willing to participate in new endeavours and to take risks
 enjoys unexpected situations and surprises
 original and non-traditional in one's tastes and preferences
 apt to non-traditional profession

Summary:

Items on which there was no significant difference deal with criteria and rules and refer to complex tasks one might not succeed to solve or prescribed ways of doing things (meeting standards).

Items on which there was a difference deal with non-traditional choices, new endeavours, unexpected outcomes and varieties of experimentation, i.e. deal with *one's involvement with the exploration of the new, uncommon, unknown that is positively experienced*

3.3. Need for achievement is not related to the importance assigned to ambiguity tolerant – intolerant behaviours

Based on: (a) bivariate and partial correlations of NACH to scores for the importance of AT and AInT behaviours (see Table 6 above), and (b) analysis of variance.

| | | |
|-------------|---------------|-----------------|
| <i>NACH</i> | <i>AT Beh</i> | <i>AInT Beh</i> |
| | 0,19 * | 0,10 |
| | 0,24 * * | 0,17 |
| | 0,12 | |

In blue are given partial correlations, controlling for the relationship between AT and AInT scores. In red is given the partial correlation controlling for the relationship with CM

After the effect of AInT and of CM on AT scores is removed, NACH level is no more a factor that is significantly related to the dependent variable, i.e. AT scores.

Tests of Between-Subjects Effects

Dependent Variable: AT

| Source | Type III Sum of Squares | df | Mean Square | F | Sig. |
|-----------------|-------------------------|-----|-------------|--------|------|
| Corrected Model | 564,636 | 4 | 141,159 | 14,270 | ,000 |
| Intercept | 200,031 | 1 | 200,031 | 20,221 | ,000 |
| AInT | 66,232 | 1 | 66,232 | 6,695 | ,011 |
| CM | 199,497 | 1 | 199,497 | 20,167 | ,000 |
| NACH Level | 57,305 | 2 | 28,653 | 2,896 | ,059 |
| Error | 1127,717 | 114 | 9,892 | | |
| Total | 49854,000 | 119 | | | |
| Corrected Total | 1692,353 | 118 | | | |

R Squared = 0,334 (Adjusted R Squared = 0,310)

CONCLUSIONS

Ambiguity tolerance contributes to creative motivation

- (1) The ability to withstand the discomfort of an ambiguous situation and to cope with induced uncertainty contributes to one's willingness to embark on the exploration of new possibilities, unusual ideas and uncommon pathways
- (2) People high in tolerance for ambiguity assign little importance to ambiguity intolerant behaviours and therefore are not afraid to undertake creative initiatives that are uncertain and unpredictable
- (3) The positive attitude towards ambiguity tolerance, as it is manifested in the importance assigned to ambiguity tolerant behaviours, strengthens individual's creative motivation as individuals with high creative motivation tend to value experimentation, are not afraid to take risks and try out new things, and welcome non traditional avenues
- (4) Creative motivation is positively related to tolerance of ambiguity both as a behavioural disposition to tolerate the discomfort of an ambiguous situation and as a positive attitude towards ambiguity tolerant behaviours. There is more to creative motivation than tolerance for ambiguity. It is not enough to be able to withstand the discomfort of an ambiguous situation; it is further necessary to have a genuine interest in the exploration of new ideas, to be willing to get involved with uncommon pathways and to value such endeavors and experiences. Not just to be free from, but also to be driven for.

Ambiguity tolerance in not related to achievement orientation

Tolerance of ambiguity may empower the intrinsically motivated exploration of novel, unusual or complex stimuli and situations. In this way ambiguity tolerance contributes to the creative process.

However, ambiguity tolerance is not related to the search for high standards of achievement in the results of the creative work.

Creative motivation and need for achievement are related yet different aspects of creativity motivation

Creative motivation empowers the individual to engage in a search of the new, unfamiliar, unusual and seeming unpromising ideas and possibilities. It provides intrinsically motivated engagement in creative pursuits.

Need for achievement empowers individual's striving for the best, in the search for high standards of achievement in the results of the creative work. It brings in the drive and makes possible the expenditure of energy needed to work out the best possible solution as well as try out as much and as long as necessary despite failure.

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