

# Changes in typing performance as a behavioral consequence of intolerance of uncertainty

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# Acknowledgements

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# Background

# Intolerance of uncertainty

- Anxiety focuses on a potential threat
- Intolerance of uncertainty (IU)
  - Catastrophic interpretation of ambiguous information
  - Possibility of negative event occurring unacceptable regardless of probability

# Intolerance of uncertainty

- Dimensional and associated with clinical and non-clinical anxiety
- IU greater in anxiety disorders
  - Social anxiety disorder
  - Obsessive-compulsive disorder
  - Generalized anxiety disorder
  - Panic Disorder

# Intolerance of uncertainty

- IU believed to manifest itself in two ways
  - Inhibition (behavioral)
    - *“The smallest doubt can stop me from acting”*
  - Prospectively (cognitive concern over possibilities)
    - *“Unforeseen events upset me greatly”*
- Only two studies have examined IU and behavior

# Intolerance of uncertainty

- Ladouceur et al. 1997
  - Decide what color most marbles are in a bag
    - IU associated with need for more evidence



# Intolerance of uncertainty

- Luhmann et al. 2011
  - Chose immediate or delayed reward
    - IU associated with smaller and even less probable but immediate reward



# Aims

- Expand beyond behavioral research that has utilized tasks requiring higher-order cognitive processing
- Determine if prospective and inhibitory IU differ in their associations with behavior

# Aims

- Examine association between IU and typing performance
  - Common, complex, automated behavior
- Typing speed
  - Slower speed
- Typing errors
  - Fewer errors

# Methods

# Participants

- 40 participants from University of Regina
- 30 women, 10 men
- Mean age = 25
- 31 Caucasian
- 31 full-time students

# Questionnaires

- Intolerance of Uncertainty Index, short form (IUS-12)
  - IUS-12 inhibitory
  - IUS-12 prospective
- Several other related measures that could be associated with anxiety and impact performance

# Questionnaires

- Positive and Negative Affect Schedule, Expanded Form (PANAS-X)
- The State-Trait Anxiety Inventory: Form Y – Trait (STAI-T)

# Measures

- State anxiety visual analogue scale
- Physiological measures
  - Skin conductance
    - Palmar surface of the middle phalanges of the second and third fingers of the non-dominant hand
  - Heart rate
    - Index finger of non-dominant hand

# Typing task

- “Transcribe as quickly as possible”
  - Using only dominant hand
- “Make a few mistakes as possible”



# Typing task

- Lasted five minutes
- *“The bush was alive with excitement. Mom Koala had a brand new baby and the news spread quickly. The monkeys in the highest trees heard of it and laughed. In their holes the rabbits came running with their big brown eyes open wide.....”*

# Data analysis

- Number of words
- Number of errors
  - Unneeded spaces
  - Missing spaces
  - Misplaced or inappropriate letters within words
  - Wrongful insertion of punctuation
- Ratio of errors per typed word

# Data analysis

- Correlations
- Four hierarchical regressions to determine unique effect of IU on typing
  - Two predicting typing speed
    - IUS-12 total scores
    - IUS-12 subscale score
  - Two predicting errors ratios
    - IUS-12 total scores
    - IUS-12 subscale score

# Data analysis

- Four hierarchical regressions
  - First step
    - STAI-T
    - PANAS

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- Four hierarchical regressions
  - First step
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    - Self-reported state anxiety
    - Physiological arousal

# Data analysis

- Four hierarchical regressions
  - First step
    - STAI-T
    - PANAS
  - Second step
    - Self-reported state anxiety
    - Physiological arousal
  - Third Step
    - IUS-12 total OR IUS-12 subscales

# Results

Table 1. Correlation matrix.

|                        | IUS-12             | 1                  | 2                  | 3     | 4     | 5     | 6                 | 7    | 8    |
|------------------------|--------------------|--------------------|--------------------|-------|-------|-------|-------------------|------|------|
| 1. IU-Prospective      | .96 <sup>**</sup>  | --                 |                    |       |       |       |                   |      |      |
| 2. IU-Inhibitory       | .93 <sup>**</sup>  | .79 <sup>**</sup>  | --                 |       |       |       |                   |      |      |
| 3. Typing speed        | -.54 <sup>**</sup> | -.52 <sup>**</sup> | -.50 <sup>**</sup> | --    |       |       |                   |      |      |
| 4. Error ratio         | -0.07              | -0.02              | -0.13              | 0.06  | --    |       |                   |      |      |
| 5. STAI-T              | .56 <sup>**</sup>  | .55 <sup>**</sup>  | .50 <sup>**</sup>  | 0.08  | -0.30 | --    |                   |      |      |
| 6. PANAS-NEG           | 0.25               | 0.18               | .31 <sup>*</sup>   | 0.09  | 0.16  | -0.09 | --                |      |      |
| 7. State anxiety       | .51 <sup>**</sup>  | .47 <sup>**</sup>  | .41 <sup>**</sup>  | -0.17 | -0.08 | -0.23 | .31 <sup>*</sup>  | --   |      |
| 8. Skin<br>conductance | 0.08               | 0.03               | 0.13               | -0.05 | 0.17  | 0.06  | .31 <sup>*</sup>  | 0.14 | --   |
| Heart rate             | 0.19               | 0.13               | 0.24               | 0.24  | 0.16  | -0.19 | .42 <sup>**</sup> | 0.12 | 0.24 |



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Table 2. Regressions predicting typing speed.

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|--|----------|---------|---------------|
| <b>Step 1 (<math>R^2 = 0.05</math>, adj <math>R^2 = 0.00</math>, <math>\Delta F = 0.94</math>)</b> |          |         |               |
| STAI-T   | -1.25    | -.26    | -.20          |
| PANAS-NEG  | 1.22     | .25     | .20           |

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| <b>Step 2 (<math>R^2 = 0.13</math>, adj <math>R^2 = 0.00</math>, <math>\Delta F = 1.03</math>)</b> |          |         |               |
| STAI-T   | -.80     | -.20    | -.13          |
| PANAS-NEG  | .79      | .18     | .13           |
| State anxiety  | -.63     | -.13    | -.10          |
| Skin conductance   | -.68     | -.12    | -.11          |
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| <b>Step 3 (<math>R^2 = 0.48</math>, adj <math>R^2 = 0.39</math>, <math>\Delta F = 22.94^{**}</math>)</b> |                |             |               |
| STAI-T   | .77            | .16         | .10           |
| PANAS-NEG  | .25            | .05         | .03           |
| State anxiety  | .38            | .06         | .05           |
| Skin conductance   | -.78           | -.11        | -.10          |
| Heart rate   | <b>2.31*</b>   | <b>.33</b>  | <b>.30</b>    |
| IUS-Total  | <b>-4.79**</b> | <b>-.75</b> | <b>-.60</b>   |

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| <b>Step 3 (<math>R^2 = 0.48</math>, adj <math>R^2 = 0.37</math>, <math>\Delta F = 11.16^{**}</math>)</b> |               |             |               |
| STAI-T   | .65           | .14         | .08           |
| PANAS-NEG  | .33           | .06         | .04           |
| State anxiety  | .41           | .07         | .05           |
| Skin conductance   | -.75          | -.10        | -.10          |
| Heart rate   | <b>2.05*</b>  | <b>.30</b>  | <b>.26</b>    |
| IUS-Prospective  | <b>-1.74*</b> | <b>-.41</b> | <b>-.22</b>   |
| IUS-Inhibitory   | <b>-1.76*</b> | <b>-.39</b> | <b>-.22</b>   |

Table 3. Regressions predicting typing errors ratio.

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| <b>Step 2 (<math>R^2 = 0.17</math>, adj <math>R^2 = 0.00</math>, <math>\Delta F = 0.86</math>)</b> |          |         |               |
| STAI-T   | .98      | .25     | .16           |
| PANAS-NEG  | .06      | .01     | .01           |
| State anxiety  | -1.29    | -.27    | -.21          |
| Skin conductance   | .88      | .15     | .14           |
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| Heart rate   | .47         | .09         | .08           |
| <b>Step 3 (<math>R^2 = 0.19</math>, adj <math>R^2 = 0.04</math>, <math>\Delta F = 0.91</math>)</b> |             |             |               |
| STAI-T   | 1.22        | .33         | .20           |
| PANAS-NEG  | -.08        | -.02        | -.01          |
| State anxiety  | -1.03       | -.22        | -.17          |
| Skin conductance   | .89         | .16         | .15           |
| Heart rate   | .55         | .10         | .09           |
| IUS-Total  | <b>-.84</b> | <b>-.18</b> | <b>-.14</b>   |

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| STAI-T   | .91           | .25         | .15           |
| PANAS-NEG  | .23           | .05         | .04           |
| State anxiety  | -.93          | -.20        | -.15          |
| Skin conductance   | .98           | .17         | .16           |
| Heart rate   | .69           | .13         | .11           |
| IUS-Prospective  | .96           | .28         | .15           |
| IUS-Inhibitory   | <b>-1.70*</b> | <b>-.47</b> | <b>-.27</b>   |

# Discussion

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- Total IU, prospective IU, and inhibitory IU strongly associated with typing speed
  - But not typing errors



# Potential explanations

- IU leads to catastrophic interpretations during even mundane tasks (similar to GAD)
  - Increased perceived need to control for consequences (e.g., negative evaluation of experimenter)

# Potential explanations

- IU leads to catastrophic interpretations during even mundane tasks (similar to GAD)
  - Increased perceived need to control for consequences (e.g., negative evaluation of experimenter)
- IU associated with broader pattern of behavioral inhibition/hesitation
  - Similar to checking in OCD

# Discussions

- No systematic differences between prospective and inhibitory IU
  - Perhaps different tasks are needed to demonstrate how these differ

# Implications

- Slower typing without fewer errors is inefficient
  - Could prove maladaptive if contributing to negative consequences (e.g., work performance)
  - Serve to exacerbate or maintain anxiety

# Implications

- Treatments that target IU (e.g., Robichaud & Dugas, 2006) could potentially lead to behavioral changes
- Impact of IU on behavior could inform basic cognitive science (e.g., speed-accuracy tradeoffs)

# Limitations and future directions

- Other constructs could be considered (e.g., perfectionism)
- Only a male experimenter
- Need to generalize to clinical samples
- Only one behavioral task was used
  - Other day-to-day tasks could be used
  - Incentives

# Conclusion

- Novel finding: IU associated with poor typing performance
- May warrant consideration in contemporary models of anxiety
- More research is needed to explore the impact of IU on behavior

# Thank you!

