**Counterfactual thinking: the role of personality and reasoning on responsibility attribution**

**Theoretical background**

Counterfactual thinking refers to the creation of mental alternatives to actual past events. In particular, it is a form of mental simulation in which one or more occurrences that precede the main event are hypothetically mutated, resulting in a different imagined outcome of that event (Byrne, 2007; Kahneman & Tversky, 1982). Psychological research suggests that counterfactuals can greatly affect the way individuals attribute responsibility (e.g., Chockler & Halpern, 2004; Markman & Tetlock, 2000). In the judicial context, some studies have shown that individuals are more likely to attribute responsibility for the outcome to the actor on whom the counterfactual thought is focused (Catellani & Bertolotti, 2014). Moreover, the direction of counterfactuals (upward or downward, that is when people imagine better, rather than worse, alternative events) affects retrospective outcome evaluation and, in turn, increases responsibility attributions (Gambetti et al., 2017; Savani & King, 2015).

Very little attention has been given to the question of how individual differences, such as personality traits and logical-deductive capabilities, influence counterfactual thinking. To date researchers have generally ignored the question of whether there are some people who are more likely to engage in counterfactual thinking than others. The previous limited research suggests that specific components of personality, such as optimism (e.g., Kasimatis & Wells, 1995), self-esteem (e.g., Sanna, Carter, & Small, 2006), impulsivity (Schmidt & Van der Linden, 2009) and perfectionism (Sirois, Monforton, & Simpson, 2010), have an important role in the direction, magnitude and/or content of counterfactual thoughts. For example, individuals with high self-esteem or greater levels of optimism tend to generate more downward counterfactuals, whereas people with low self-esteem or greater levels of pessimism tend to generate more upward counterfactuals (Roese & Olson, 1993). However, as far as we know, broad dimensions of personality or logical-deductive capabilities have not been given much consideration in this regard. Only recently, Allen et al. (2014), using a non-experimental design, showed that openness related negatively to upward counterfactuals whereas neuroticism related positively.

**Aims and Hypotheses**

Given that personality (Allen et al., 2014; Sanna et al., 2006) and logical-deductive capability might have a role in counterfactual thinking, the main aim of this research project is to investigate the impact of these specific individual differences on counterfactuals about responsibility attribution. Specifically, we hypothesized that logical-deductive capabilities and the five personality dimensions (i.e., extraversion, anxiety, self-control, tough-mindedness and independence), both measured by the 16PF-5 (Cattell, Cattell & Cattell, 2002), contribute to the direction, magnitude and/or content of counterfactual thoughts. The present research project sought to test this hypothesis empirically using a real and complex scenario about a given event, in line with recent studies (e.g., Gambetti et al., 2017; Catellani & Bertolotti, 2014).

**Methods**

According to a-priori power analysis, performed using G\*Power 3.1 (Faul, Erdfelder, Lang, & Buchner, 2007), we need a minimum sample size of 250 to detect small effects with 95% power and an alpha level of .05 (two-tailed) in the planned tests. Participants will take part in the study as volunteers and will be recruited via adverts on social networks and university notice boards. After obtaining informed consent and asking a few questions to collect demographic information (age, gender, education level and professional position), the 16PF-5 (Cattell et al., 2002) and a medical malpractice case (Catellani et al., 2020) will be administered. After reading the case, participants will be asked to state: *a)* whether the event could have been better or worse on a scale from 0 to 100 (counterfactual direction); *b)* the antecedents of the event that can be hypothetically mutated (counterfactual magnitude); *c)* to what extent the physician, the patient or external causes are to be considered responsible for the damage experienced by the patient on a scale from 0 to 100 (counterfactual content). Participants will be engaged for about one hour either by an online survey, using Qualtrics software, or face to face in the laboratory, depending on current Covid-19 prevention guidelines. Data will then be analyzed using the SPSS 23.0 package.

The tutor agrees to request approval of the research project from the ethics committee of the University of Bologna.

**Expected results and Implications**

We expect that the relationship between the individual differences examined in this research project and responsibility attribution may be mediated by counterfactual thoughts.

As regards the direction of counterfactual, in line with past observations (Roese, 1997; Allen et al., 2014) and given that the scenario used has a negative outcome, we predict that participants will report a greater occurrence of upward counterfactuals than downward counterfactuals. We also expect that greater levels of anxiety (as found for neuroticism by Allen et al., 2014) and tough-mindedness (as found for perfectionism by Sirois et al., 2010) could be linked to a greater occurrence of thoughts about factors that could improve outcomes. We presume a significant positive effect of accommodation (low independence) and extraversion, which are both linked to optimism (Sharpe et al., 2011), on downward counterfactuals and of logical-deductive capabilities on both downward and upward counterfactuals. We also expect that extraversion and logical capabilities will increase the number of counterfactuals.

As regards the content, we hypothesise that responsibility attribution to the physician will prevail among participants, in particular those with high anxiety, accommodation and tough-mindedness.

The way in which personality and reasoning capabilities will be found to be related to counterfactual thinking may provide a better understanding of the nature and the function of counterfactuals.

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**Plan of activities**

The project activities will be concerned with scientific and methodological aspects.

As regards the former, in the first two months of the research project the research fellow will perform an accurate literature review about the following topics:

- personality traits and logical-deductive capabilities in counterfactual thinking;

- responsibility attribution and counterfactual thoughts.

Starting from the third month of the research project the research fellow will carry out the following activities:

- preparation of experimental material that will be used for the study (3rd month);

- recruitment of participants and data analyses (4th-8th month);

- discussion of the data obtained and preparation of a paper (9th-12th month).