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The relevance of logical thinking and cognitive style to everyday problem solving among older adults

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ABSTRACT

Adults are effective day-to-day problem solvers throughout their lifespan but the specific mechanism on how they solve everyday problems is not fully understood. The goal was to investigate the effects of logical thinking and cognitive style on the ability to solve everyday problems among older adults. What we test is the intuition that the person's cognitive style is related to solve day-to-day problems. However, we argued also that one needs a good dose of pragmatism, as measured by logical thinking. We administered an everyday problem-solving test alongside measures of cognitive styles and logical thinking to a sample of 210 community-dwelling older adults of Southeastern Italy. The results, by structural equation modeling, indicated that logical thinking mediates the relationship between cognitive style and everyday problem solving. We discuss the possibility that older adults who have preserved intact logical thinking abilities are more likely to see the multifaceted reality of everyday problems.

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1. Introduction

Adults are effective problem solvers throughout their lifespan (Artistico, Orom, Cervone, Krauss, & Houston, 2010; Artistico et al., 2011; Kimbler, Margrett, & Johnson, 2012; Sinnot, 2011). Gerontologists routinely found declines in everyday problem solving to be modest or null among older adults (Allaire & Mariske, 2002; Artistico, Cervone, & Pezzuti, 2003; Berg, Meegan, & Klaczynski, 1999; Berg, Strough, Calderone, Sansone, & Weir, 1998; Blanchard-Fields, 2007; Marsiske & Margrett, 2006; Pezzuti, Artistico, Tramutolo, Cervone, & Black, 2009). When analyzing how older individuals cope with everyday problems, researchers concluded that a mix of pragmatism (applying experience to logic) and basic cognitive abilities (broadly related to fluid and crystallized intelligence) underpin solution generation (Greiff et al., 2013; Nusbaum & Silvia, 2011; Sonnleitner, Keller, Martin, & Brunner, 2013). To date, however, the exact contribution of pragmatism and basic cognitive abilities remains elusive in everyday problem solving. Investigators have either not fully separated pure cognitive abilities from experience (Allaire & Mariske, 1999; Diehl, Willis, & Schaie, 1995), or measured only pragmatism alone (Sinnot, 1998). Our goal is to fill this gap by examining how cognitive style, a pure cognitive ability, as well as pragmatism (i.e. logical thinking about experiential knowledge) would uniquely contribute to solving day-to-day problems in a sample of community dwelling older adults.

1.1. Predicting everyday problem solving

Two basic cognitive abilities, fluid and crystallized intelligence, had been initially investigated to predict everyday problem solving. Both types of intelligence correlated positively with everyday problem solving, yet fluid intelligence was the most important predictor (Allaire & Mariske, 1999). Diehl et al. (1995), for instance, examined if participants were able to discern whether an image of a figure or an object had been rotated or presented as a mirror image (for some this is a partial assessment of fluid intelligence, cfr. Cattell, 1971). It was not clear, however, whether the object was familiar or not. Another part of the assessment, perhaps more problematic, asked participants to find a pattern within sets of images such as numbers or letters. Both tasks (perhaps the latter more) could have allowed participants to rely on rules they had previously learned about letters and numbers. At any rate, participants who scored higher on both tasks were also able to solve more effectively everyday problems than those who scored lower.

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Recently divergent thinking has received renewed attention with respect to creative problem solving (Lee & Therriault, 2013; Nusbaum & Silvia, 2011). Nusbaum and Silvia (2011) looked at one's ability to learn an intricate strategy on a divergent thinking test, which is a common method for measuring creative problem solving (since Guilford, 1967). The divergent thinking test involved having participants produce multiple solutions to a problem or devise numerous and unconventional uses for everyday objects. Nusbaum and Silvia's (2011) measures were not exclusively autonomous from everyday knowledge nonetheless they predicted the ability to solve everyday problems.

Both recent and previous work (Diehl et al., 1995; Nusbaum & Silvia, 2011) certainly harbingered an understanding of the importance of abstraction while reasoning about problem solving. Two questions, however, remain open. Can abstract reasoning be measured distinctly from everyday knowledge? And if so what is its exclusive contribution to everyday problem solving? The first answer is yes. One way to measure the distinct effect thinking in abstract from everyday knowledge is to look at one's cognitive style to problem solving (Witkin, 1950).

The assessment of the cognitive style requires the use of logical spatial abilities that are quite separate from everyday knowledge. Witkin (1950) long since concluded that people who were able to solve the test of locating an embedded unfamiliar figure within other distracting unfamiliar figures, had an analytic attitude that transcends the day-today experience nonetheless applicable to problem solving in real life (i.e. in educational settings). The second answer is what we aimed at clarifying by looking at the interplay between cognitive style and everyday problem solving.

1.2. Cognitive style and everyday problem solving

Cognitive style is about what individuals perceive when processing information coming from the environment (Ausburn & Ausburn, 1978). There are two types of mutually exclusive individualized cognitive styles. They both refer to dependence or independence to/from "a field," that is, a physical or a psychological space in which the action of solving the problem takes place. The field dependent subject is someone who cannot disengage himself from the organized structure of the perceptive field. Consequently, field dependent individuals show a global cognitive style characterized by the tendency to experience ambiguous stimuli as being vague or ill defined without attempting to structure them into a more coherent picture. The field independent individual views ambiguous stimuli as ill defined but not as a hindrance to problem solving.

Most everyday problems are ill-defined in that one of the crucial elements of their definition (beginning state, end state, and means) is usually missing (see Artistico et al., 2010; Artistico, Pinto, Douek, Black, & Pezzuti, 2013; Allaire & Mariske, 2002; Reitman, 1964 for extensive review of the conceptual definition of everyday problems). Messick (1976) posited cognitive style as the use of habitual strategies by the individual who is problem solving. Similarly, Witkin, Moore, Goodenough, and Cox (1977) characterized cognitive styles as individual differences in the way people approach problems. Kozhevnikov (2007) suggested that the cognitive styles one adopts would then lead to heuristics that individuals use to process information about their environment when dealing with everyday problems that are ambiguous.

During older adulthood, when perception and spatial abilities generally decline, there is a "shift" or a modification of perceptive–cognitive style from independent to dependent. Karp (1967) and Crosson (1984) described a consistent increase of field dependent cognitive style among older adults. Markus and Nielsen (1963), studying the concept of field dependency among older adults, found that age is positively associated with a field dependent cognitive style. Usai, Chattat, Cucinotta, Savorani, and Ellena (2001) more recently stated that the change in cognitive style is a process, beginning around the age of 65, continuing until 80 years of age, and is then suspended in old age. In principle, even if less likely, older adults who possess a field independent cognitive style may be better at solving problems than those who possess a field dependent cognitive style (Usai et al., 2001).

1.3. Logical thinking & cognitive style

Pascual-Leone (1969) already suggested that conceptually, the connection between cognitive style and logical thinking is strong; the more the ability to use advanced logical thinking, the better the chances to maintain an independent cognitive style. The ability to use logical thinking is viewed as a progression of developmental stages in which individuals "graduate" from one stage to the next, acquiring better problem solving skills. Problem solving is more analytical at each subsequent stage because it progressively accommodates cognitive processes with one's experiential knowledge. Logical thinking (formal thought) has been said to be a good operational definition of pragmatism (Sinnot, 1998). Sinnot (1998) showed that one's capacity for logical thinking, predicts the ability to solve day-to-day problems, especially in the arena of interpersonal relations. With the use of logical thinking, one can understand reality and make inferences to solve day-to-day problems when they tend to be ambiguous.

Everyday problems are mostly ill defined or ambiguous (see Allaire & Mariske, 2002; Artistico et al., 2013; Reitman, 1964 for a theoretical discussion of ill defined problems). The capacity to generate more than one solution to ill-defined problems is important (see[3]). For example, if improving one's finances is the problem, considering the external contingencies (market crash, recession) as well as internal contingences (the person affected by the problem is furthering his education) will lead to several alternative solutions. Alternative solutions uttered in response to hypothetical problem vignettes have a real life value. Patrick and Strough (2004) documented that an older person who provided alternative solutions to everyday problems (i.e., what would you do to reduce the impact of severe weather conditions to your health?) then used similar solutions to make decision weeks later (in that case to seriously consider relocation during retirement).

A field independent person will assess all the ambiguities of the problem to "her advantage." For instance if one needs improving one's finances there will be room for ambiguities (i.e., how much? Is there a goal or short-term deadline to meet?). The field independent person, we argue, will use these ambiguities to structure the problem heuristically. Once ambiguities are encountered she can decide to disambiguate them by (re)defining the problem and consequently propose alternative solutions. By drawing upon logical thinking one can transcend the simple stipulation of a problem and resolve its contradictory elements in life (Sinnot, 1998). Logical thinking enables "shifting gear," metareviews the scenario of a problem, and provides multiple solutions using pragmatism (Sinnot, 2011).

Little is known, however, about the way logical thinking and cognitive style relate to each other. Also, because cognitive style declines in aging and logical thinking is not necessarily reached among older adults (cfr., Lawson, 1985). We believe thatthe key is to look at the interplay between pragmatism and cognitive efforts individuals make. In fact, in research that examines cognitive expertise (Salthouse, 1984), being able to visually represent written information (i.e. looking ahead of a text while typing) is often viewed as an example of pragmatism (Baltes & Baltes, 1990), whereby experience enables the orchestration of all the activities and in turn produces a compensatory effect in performance (to finish a typing task with adequate speed and accuracy).

Pretz (2008) found that the efficacy of participants' problem solving strategy (intuitive or analytical) depended on their level of expertise, measured by seniority among college students. Analytical strategies are operationally characterized as the ones that extract relevant pieces

[3] We are aware that other investigators studied well-defined everyday problems (see Marsiske & Margrett, 2006 for an overview). We are mainly concerned with the nuances of ill-defined problems when solution generation hinges on participants' mental representations of such nuances.

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