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Review Article

Applying the Concept of Cognitive Style to Cognitive Aging

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Abstract

This review rethinks the concept of Cognitive Style (CS) as a renewed and promising approach to cognitive aging. After a brief introduction to CS, the paper outlines its characteristic features: field-dependence vs. independence, intuition vs. rule-based, internal vs. external locus of control and integrated vs. compartmentalization. The paper illustrates each dimension with examples from aging studies. Conclusions bring together various considerations about the future development of CS in aging.

ABBREVIATIONS

CS: Cognitive Style

INTRODUCTION

Cognitive Style (CS) can be defined as an individual's preferential mode of information processing, that is, the manner in which an individual consistently approaches information processing. The concept of CS has been debated in scientific psychology for over a century and, across the years; numerous theoretical conceptualizations have been advanced. In particular, the CS concept has been successful in education and professional contexts. The recent study by Kozhevnikov and colleagues [1] highlighted a renewed interest in CS and proposed a definition that suits cognitive aging as well. In particular, the authors defined CS as the way individuals adjust themselves to the external world based on specific cognitive abilities and personality traits. In this manner, CS is the result of an adaptive interaction process between individual predispositions (e.g., cognitive abilities) and external environmental requirements in which environmental factors can influence how people approach information processing. More specifically, environmental factors shaping CS may be considered as proximal when they refer to family, school and any job context depending on the individual's age and distal if they refer to socio-cultural values and, in general, cultural knowledge. For instance, if an individual is frequently exposed to classical music during childhood, he/she may develop a cognitive style that better suits music processing. In addition, he/she may look for environmental conditions (e.g., a music class) that best respond to his/her musical predisposition.

Typically, literature on CS identifies four main cognitive dimensions. Here we adopted the taxonomy proposed by Kozhevnikov and colleagues [1], even though aging appears to be an area in which conceptualization of CS has not been frequently adopted (Table 1) presents the typical CS of older adults:

Context dependent vs. Context independent

Individuals may be distinguished in terms of their dependence or independence regarding surrounding context (field-dependent vs. field-independent). A study by Wapner and Demick [2] reviewed existent literature on age-related effects of field-dependence/independence and found that field independence generally decreases during aging. In particular, older adults' perception becomes more strongly driven by the perceptual total field where its constituents are perceived as a unit. Differently, younger adults tend to focus more on distinct parts of the field, considering the constituents as separate from the organized ground. Moreover, the transition from independence to dependence has been shown to be modulated by a series of environmental vs. individual (e.g., cognitive abilities, personality) factors. These data support the framework proposed by Kozhevnikov and colleagues [1]. For example, environmental conditions such as living at home vs. nursing residence may lead to a different focus on field dimensions. In fact nursing residents are more field-dependent than older adults living at home [3]. In addition, creative older adults are more field-independent compared to less creative ones [4]. Finally, another study found that older adults who were more field independent were also more involved with others [5]. Altogether, these findings suggest a complex interaction between field-dependence vs. independence and age-related processes.

Rule-based vs. intuitive processing

According to dual-process theories of thinking [6,7], decisions can be based on intuition or be rule-based. Intuitive decisions are faster, effortless and automatic. In fact, the use of heuristics

Table 1: A summary of the general age-related differences in cognitive style.

Older Adults	Younger Adults
1. Context dependent i.e. greater reliance on internal frame of reference in processing information	*1. Context independent* i.e. greater reliance on external frame of reference in processing information
2. Intuition i.e. greater reliance on heuristics and affective decisions	*2. Rule-based* i.e. greater reliance on deliberative and rule-based thinking
3. External locus of control i.e. the external events are viewed as driving the change	*3. Internal locus of control* i.e. the self is viewed as a shaper of his/her own life
4. Integrated i.e. greater reliance on holistic processing (older adults perceive the whole: parts are fused together).	*4. Compartmentalization* i.e. greater reliance on sequential information and single parts (younger adults perceive a series of component parts).

Note. These CS dimensions cannot be rigidly applied to aging

is assumed to correspond to this mode as well as affectively charged-decisions. Differently, decisions based on rules are more deliberate, effortful, based on reasoning and involve a scrupulous analysis of information. Numerous studies have shown that deliberate and more analytic processes decrease with age, as does the corresponding use of more effortful and time-consuming strategies [8]. For example, a study by Racine and colleagues [9] found that older adults were particularly impaired with rule-based category learning, especially when the tasks were complex and placed high demands on cognitive control mechanisms. However, recent literature on affective processing and aging highlight preserved emotional functions across the life-span. This suggests that older adults may tend to use more intuitive, affective and heuristic-based decisions. In fact, a series of studies have shown that the use of heuristics and fallacies (e.g., availability, that is, frequencies and probabilities are judged by thinking of examples; sunk-cost fallacy, that is, continuing to invest in a hopeless project because otherwise what has been invested will be lost) increases with age [10]. In addition, intuitive and affective-based decisions are more frequently used by older adults than their younger counterpart [11]. Again, general resources (cognitive and affective) and environmental requests (e.g., task complexity, contextual factors) shape the way older adults approach information processing.

Internal vs. external locus of processing

Individuals can believe that their lives depend on their own choices, efforts, and actions or that events are determined by uncontrollable forces outside their influence. Lachman [12] reviewed a series of research findings that highlighted how older adults show a diminished internal locus of control. These data are explained in terms of a series of factors embedded in the aging process per sé (e.g., physical changes, cognitive decline, etc.) and a general reduction in autonomy that do not favour the view that older adults can still exert some control over those changes. However, due to the extreme inter-individual variability, this claim must be taken with caution. Previous studies, in fact, have shown that internal locus of control is associated with cognitive functioning and that, for instance, older adults who perceived having more control over their lives also showed fewer memory declines [13] and vice-versa [14]. One can also expect locus of control to be influenced by contextual factors such as institutionalization: institutionalized older adults may show lower levels of internal control when compared to home residents.

Integration vs. Compartmentalization

This dimension describes the tendency to encode, maintain and retrieve information as a simultaneous already integrated whole (holistic view) vs. a series of sequential or serial pieces. Research has shown a strong older adult preference towards holistic processing. This holistic mode of processing can be explained in terms of preserved multisensory integration brain circuits that integrate single pieces of information into a holistic percept. As shown by Freiherr and colleagues [15], despite the fact that single sensory systems deteriorate during aging, multisensory integration processing in aging is still efficient, especially when emotional information is involved. Some studies from the aging and verbal/visuo-spatial working memory tradition have also shown that older adults tend to build and use more global and holistic representations during text comprehension than younger adults [16]. In addition, a study by Dror and colleagues [17] showed that during a mental rotation task, older adults used holistic representations and processing more than younger adults. That is, they rotated each image as a single undifferentiated unit rather than a collection of segments linked together. Another informative study in this regard, is Oosterman's study [18]. In this study, the authors distinguished between a simultaneous vs. sequential visuo-spatial task and found that only older adults performed worse on the sequential compared to the simultaneous condition. However, the most compelling evidence about the age-related preference towards holistic processing can be found in face processing literature. In particular, older adults rely on holistic face processing more than younger adults [19]. This data is further supported by Meinhardt-Injac's study [20] which showed that older adults rely on global viewing strategies for faces at the expenses of inner face details.

DISCUSSION AND CONCLUSION

The CS concept can be considered as a renewed approach to cognitive aging. Here we reviewed a series of aging studies that point to the hypothesis that older adults adapt themselves (e.g., tend to consistently use a specific information processing approach) to environmental requests based on available cognitive resources, that are, generally less efficient due to aging. Embracing Kozhevnikov et al. (2014)'s approach, cognitive styles during aging may be considered as a way in which older individuals adapt to cognitive loss and face new environmental requests (e.g., from home to a new residence, from larger to restricted social networks, from work to retirement, etc.) by

focusing on different processing dimensions. To sum up, older adults become more dependent on context, think intuitively, believe that little can be done to combat the aging process and prefer holistic processing. However, aging researchers know that when it comes to aging processes, the picture is not so net. One reason is that each dimension may follow a different pattern of development that interacts with the level of cognitive functioning. This means that, generally speaking, older adults may show a preferential and consistent focus on a style of processing. However, a series of modulating factors may intervene to shape their processing mode leading older adults to assume an unclear position on this continuum.

In addition, the extreme variability of the aging process *per se* (inter- and intra-individual differences) and the fact that aging is a multidimensional phenomenon with gains and losses renders generalization unwarranted. Nevertheless, we believe that the conceptualization of CS as an information processing approach sensitive to environmental factors raises a number of interesting issues for geropsychologists, such as providing older adults with an enriched and stimulating context that offers the possibility of choosing which dimension best suits the task at hand. Thus, despite the debate concerning the CS concept per sé, when applied to cognitive aging, it may foster understanding of the way older adults adapt to changes. The relevant aspect of CS is the related idea that cognitive aging is a dynamic process and CS can be considered as a result of how the aging mind faces this challenging period. Further studies will have to explore the complexity of interactions between individual and contextual variables.

Finally, like cognitive training programs that sustain and slow down age-related cognitive decline, developing new CS-based training, that may ultimately foster older adults well-being, may be useful. We expect new studies in this direction, and we hope that classical cognitive training studies as well begin to assess transfer effects on CS. Again, understanding CS will help geropsychologists to maximize the potential of older adults in both healthy and pathological aging.

REFERENCES

1. Kozhevnikov M, Evans C, Kosslyn SM. Cognitive style as environmentally sensitive individual differences in cognition: A modern synthesis and applications in education, business, and management. Psychological Science in the Public Interest. 2014; 15: 3-33.
2. Wapner S, Demick J. Field dependence-independence. Cognitive Style across the life Span. Hillsdale NJ: L. Erlbaum Associates.1991.
3. Markus EJ, Nielsen M. Embedded-Figures Test scores among five samples of aged persons. Percept Mot Skills. 1973; 36: 455-459.
4. Crosson CW. Age and field independence among women. Exp Aging Res. 1984; 10: 165-170.
5. Panek PE. Age differences in field dependence/independence. Exp Aging Res. 1985; 11: 97-99.
6. Evans JS. Dual-processing accounts of reasoning, judgment, and social cognition. Annu Rev Psychol. 2008; 59: 255-278.
7. Osman M. An evaluation of dual-process theories of reasoning. Psychon Bull Rev. 2004; 11: 988-1010.
8. Peters E, Dieckmann NE, Weller J. Age differences in complex decisionmaking. In: Warner SK, Willis SL, editors. Handbook of the Psychology of Aging. 7. Elsevier Academic Press; San Diego, CA: 2010. 133–148.
9. Racine CA, Barch DM, Braver TS, Noelle DC. The effect of age on rule-based category learning. Neuropsychol Dev Cogn B Aging Neuropsychol Cogn. 2006; 13: 411-434.
10. Strough J, Karns TE, Schlosnagle L. Decision-making heuristics and biases across the life span. Ann N Y Acad Sci. 2011; 1235: 57-74.
11. Mikels JA, Cheung E, Cone J, Gilovich T. The dark side of intuition: aging and increases in nonoptimal intuitive decisions. Emotion. 2013; 13: 189-195.
12. Lachman ML. Perceived control over age-related declines: Adaptive beliefs and Behaviors. Current Directions in Psychological Sci. 2006; 15: 282-286.
13. Infurna FJ, Gerstorf D. Linking perceived control, physical activity, and biological health to memory change. Psychol Aging. 2013; 28: 1147-1163.
14. Agrigoroaei S, Neupert SD, Lachman ME. Maintaining a Sense of Control in the Context of Cognitive Challenge: Greater Stability in Control Beliefs Benefits Working Memory. GeroPsych (Bern). 2013; 26: 45-49.
15. Freiherr J, Lundström JN, Habel U, Reetz K. Multisensory integration mechanisms during aging. Front Hum Neurosci. 2013; 7: 863.
16. Radvansky GA. Aging, memory, and comprehension. Current Directions in Psychological Science. 1999; 8: 49–53.
17. Dror IE, Schmitz-Williams IC, Smith W. Older adults use mental representations that reduce cognitive load: mental rotation utilizes holistic representations and processing. Exp Aging Res. 2005; 31: 409-420.
18. Oosterman JM, Morel S, Meijer L, Buvens C, Kessels RP, Postma A. Differential age effects on spatial and visual working memory. Int J Aging Hum Dev. 2011; 73: 195-208.
19. KonarY, Bennett PJ, Sekuler AB. Effects of aging on face identification and holistic face processing. Vision Research. 2013; 88: 38-46.
20. Meinhardt-Injac B, Persike M, Meinhardt G. Holistic processing and reliance on global viewing strategies in older adults' face perception. Acta Psychol (Amst). 2014; 151: 155-163.

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