POLSKA AKADEMIA NAUK

Original Papers

Polish Psychological Bulletin
2012, vol. 43(1), 40-49
DOI - 10.2478/v10059-012-0005-6

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Need for closure and cognitive structuring among younger and older adults

The paper reported two correlational studies. The aim of the Study 1 was to examine the hypothesis that age moderates the relationship between need for closure (NFC) and cognitive structuring. Results of the study revealed that aging with increased need for closure was associated with better recognition of irrelevant information than schema-relevant items, in testing hypotheses about the target person. These findings are interpreted as demonstrating the age-associated failure of cognitive abilities (i.e., low efficacy at fulfilling the need for closure), reducing tendency to behave according to the level of epistemic motivation. The results of Study 2 demonstrated that older participants are characterized by higher NFC but by lower EFNC than young participants. These results are consistent with the conclusion that the negative relationships between NFC and cognitive structuring demonstrated by the older participants in Study 1 can be attributed to their lower level of EFNC.

Keywords: *aging, need for closure, social information processing, cognitive structuring, efficacy at fulfilling the need for closure*

Age-related changes in cognitive structuring

Much research has indicated that aging is accompanied by decrements in information processing across a wide variety of tasks and situations. One of the domains in which age-related changes in performance are observed is cognitive structuring (e.g., Castel & Craik, 2003; Naveh-Bejamin, 2000; Hess, 2005; Klaczynski & Robinson, 2000). Researchers have claimed that cognitive structuring plays a significant role in diverse phenomena such as person perception and memory processes (e.g., Hastie et al., 1980; Lorenzi-Cioldi, Eagly, & Stewart, 1995; Moskowitz, 1993), stereotyping (e.g., Kruglanski & Freund, 1983; Bar-Tal & Guinote, 2002; Schaller et al., 1995), cognitive biases (Kruglanski & Ajzen, 1983), uncertainty (e.g., Bunder, 1962; Mayseles & Kruglanski, 1987; McCormick, 2002), stress and coping (Epstein & Meier, 1989; Wheaton, 1983; Clark, 1993; Bar-Tal & Spitzer, 1999; Elovainio & Kivimaki, 1999), and attitude behavior relationships (Jamieson & Zanna, 1989; Baldwin, 1992; Murray & Holmes, 1999). Cognitive structuring is defined as the "creation and use of abstract mental representations (e.g., schemata prototypes, scripts, attitudes, and stereotypes) — representations that are simplified generalizations of previous experience" (Neuberg & Newsom, 1993; p. 113).

It has been suggested that using such structures is a means of understanding one's world with a relatively minimal expenditure of cognitive resources, by specific attendance to schema-relevant information and avoidance of schema-irrelevant information. Because they are simple, relatively effortless, and automatic, such structures are best able to reduce an individual's cognitive load. Thus, such reliance on cognitive structuring may increase with age (Hess, 2001; Klaczynski & Robinson, 2000; Cornelis, Van Hiel, Roets, & Kossowska, 2009; Levy, 2008). Older individuals, having less cognitive capacity than younger adults, may tend to use more cognitive structuring, which is an easy default option (Bohner, Moskowitz, & Chaiken, 1995; Fiske, 1993a) and less taxing on their resources (Keinan et al., 1991). Thus there is an inherent assumption that cognitive structuring replaces more effortful processing among older adults by virtue of its being the easiest default option that is always available to people who need it (Klaczynski & Robinson, 2000).

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Cognitive structuring and epistemic motivation

Apart from this line of reasoning pointing to reduced cognitive capacity, however, there is evidence suggesting that the explanation of the age-cognitive structuring relationship may be connected with motivational changes associated with age. Epistemic motivation—specifically, need for closure—is the most widely employed explanation for the use of cognitive structuring (Kruglanski, 1989). However, need for closure has not received enough attention in the explanation of the effect of aging on the various phenomena connected with cognitive structuring.

Need for closure is defined as a need to have *any* answer on a given topic, as opposed to further ambiguity (Webster & Kruglanski, 1994). As such, it has been described as the tendency to reduce the feeling of discomfort experienced in the face of cognitive uncertainty through quick formulation of a hypothesis and its short validation (Webster & Kruglanski, 1994). It is well documented that the cognitive processes used by high need for closure individuals to reduce uncertainty are category-based, nonsystematic, and heuristic (Brewer, 1988; Fiske & Pavelchak, 1986). In contrast, individuals with low levels of need for closure prefer to reduce uncertainty by using piecemeal or individuation processes. This preference is manifested in vigilant behavior that is based on a systematic and effortful search for relevant information, its evaluation, and its unbiased assimilation (Kruglanski et al., 2009; Bar-Tal et al., 1997; Driscoll, Hamilton, & Sorrentino, 1991). Thus, it is important to note that need for closure is often—though not always explicitly—conceptualized as a dimension that at its high pole predisposes individuals to use cognitive structuring to achieve certainty, and at its low pole is associated not with indifference or low motivation to achieve certainty but with a strong tendency toward piecemeal processes.

It could be expected that this motivation, manifested as a tendency to preserve available resources and engage in activities that minimize drain on these resources (Kossowska, 2007; Kossowska, Orehek, & Kruglanski, 2010), may play a crucial role in how information is processed in older versus younger age. Older adults might conserve resources by simplifying their interactions with the environment and limiting both the quantity and complexity of information to which they attend. This may be manifested as a reliance on highly routinized and schematic behavioral patterns rather than constructing new, and perhaps more adaptive, ones on the spot (Hess, 2001).

Need for closure and efficacy at fulfilling this need

The notion that high need for closure predisposes people to use more simplified and effortless processing implies that cognitive structuring is an automatic, easy, default option (Fiske, 1993a), so that whenever individuals are motivated to achieve closure they indeed use the epistemic behavior consistent with their motivation. If this is the case, high need for closure is always manifested in the application of prior knowledge structure (i.e., expectations, opinions, schemata, or stereotypes) and the processing of information related to the schema. By contrast, individuals motivated to postpone closure will actually use their preferred processing mode only inasmuch as they have sufficient resources or ability to do so (e.g., Ford & Kruglanski, 1995; Pelham & Neter, 1995).

However, there are several lines of research suggesting that it might not always be the case. Cognitive closure is defined as a goal (Kruglanski et al., 2002) and there are premises in the literature that suggest that specific conditions might be needed to enable fulfilling this goal. For example, Bar-Tal and his colleagues (Bar-Tal, Kishon-Rabin, & Tabak, 1997; Bar-Tal & Guinote, 2002; Bar-Tal & Kossowska, 2010), have suggested that like in the case of fulfilling low need for closure, fulfilling *high* need for closure also depends on the individual's actual or perceived ability to act upon his/her epistemic motivation. That is, satisfying the need for closure, like satisfying the need to postpone closure, requires certain perceived or actual ability. We call this the efficacy to fulfill the need for closure and define it as the extent to which individuals perceive themselves as able to use cognitive structuring in accordance with their need for closure (Bar-Tal & Kossowska, 2010). Previous studies of Bar-Tal and colleagues revealed that there is an interaction effect between the need for closure (NFC) and efficacy at fulfilling this need (EFNC; Bar-Tal, et al., 1997; Bar-Tal & Guinote, 2002; Bar-Tal & Kossowska, 2010; Otten & Bar-Tal, 2002; Kossowska & Bar-Tal, submitted). Thus, while high EFNC individuals exhibit epistemic behavior consistent with their level of NFC, low EFNC individuals' epistemic behavior oppositely relate to their level of NFC: The higher their NFC the less they use cognitive structuring.

It has been suggested that aging may be accompanied by decreased self-efficacy (Blazer, 2002; Welch & West, 1995). Negative self-efficacy beliefs are possible due to changes—both actual and perceived—in factors associated with health, cognitive ability, and social status. These perceptions may be generalized to other domains, such as efficacy at fulfilling the need for closure. Thus, it is possible that aging may moderate the effect of need for closure on cognitive structuring behavior. This hypothesis is consistent with research findings that demonstrate that self-efficacy judgments may act as a moderating agent between changes in specific contextual and personal factors associated with ageing (e.g., need for closure) and engagement in specific behaviors or activities as individuals adjust their behavior to be consistent with their current status (see also Heckhausen & Baltes, 1991; Hertzog, McGuire, & Lineweaver, 1998; Hultsch et al., 1987; Lachman, 1986; Lachman, Bandura,

Table 1
Descriptive statistics (Study 1).

	Younger group		Older group	
	M	SD	M	SD
STUDY 1				
RSPAN	32.1 [a]	6.8	19.1 [b]	5.7
NFC	3.07 [a]	.71	3.75 [b]	.52
A`	.90 [a]	.09	.82 [b]	.13
B"	.27	.43	.01	.45
Recognition of relevant items	7.97 [a]	1.90	7.28 [a]	2.53
Recognition of irrelevant items	4.27 [a]	1.24	3.44 [b]	1.63

[a] and [b] differ significantly $p < .001$
Positive *B"* scores indicate a tendency toward committing more omissions of relevant items while negative scores indicate more liberal bias with a tendency toward a more false alarms of relevant items. Thus, more positive *B"*, the less schematic information processing. *A'* indicates the level of discrimination between target stimuli and new items during recognition with higher *A'* scores indicating higher discrimination.
NFC – need for closure; RSPAN – working memory measure

Weaver, & Elliott, 1995; Lachman & McArthur, 1986).

Second important limitation on fulfilling the cognitive goal comes from the cognitive abilities possessed by an individual. Specifically, studies on self-regulation demonstrated that it was significantly influenced by working memory capacity. For example, Hoffman and colleagues (2008) shown that automatic tendencies had a stronger impact on self-regulatory behavior among individuals with a low WMC than in individuals with a high WMC. This pattern of results was also demonstrated with regard to the need for cognitive closure (Kossowska & Jasko, in press) such that individuals with high WMC were more able to act in line with their epistemic motivation than people with low WMC. Since working memory capacity is lower among older adults it might reduce their ability to act in accordance with their cognitive goals.

On the basis of those results it could be argued that the relation between epistemic goals such as NFC and cognitive functioning may not be that straightforward among older adults. The aim of the present study was to verify whether older adults would behave consistently with the level of their epistemic motivation or due to above-mentioned factors instead of using more cognitive structuring (e.g., processing more schema-relevant information) they may in fact use less cognitive structuring (e.g., processing irrelevant items) the higher their need for closure in comparison to younger adults.

Overview of the study

In the studies we investigated the processing of schema-relevant and schema-irrelevant information in an impression formation task. Many investigators over the years have used types of schema-related information as dependent variables in researching the structure and process of information organization (for reviews, see Alba & Hasher, 1983; Brewer, 1988; Fiske, 1993a; Dijksterhuis, van Knippenberg, Kruglanski, & Schaper, 1996). It has been shown that recall as well as recognition of schema-relevant information changes as a function of epistemic motivation (Bar-Tal & Kossowska, 2010).

Although many studies demonstrated that older adults had less memory for schema-irrelevant items and more false alarms for non-presented schema-relevant items (Chen, 2004; Hess & Tate, 1991; Hess, Donley, & Vandermaas,1989), there was no data in the literature on the relation between the epistemic motivation and cognitive structuring in this age group. We suspected that the specific pattern of this relation could be different among older adults than the one usually obtained with younger samples of participants. Due to lower efficacy to fulfill epistemic need, low WMC and other factors that decrease the self-regulatory behavior among older adults they could in fact present less cognitive structuring and less schematic processing when high in need for closure than younger adults (Isbell, 2004). The aim of the first study was to explore this possibility.

Study 1

Method

Participants

Two group of participants were included in Study 1. The group of young adults consisted of 98 participants (M_{age} = 22.16; age range: 21-23 years), who were students from the university in Krakow. The older adults were thirty five women and twenty men (M_{age} = 72.18; age range: 65-80 years**)** (see Table 1, for demographics and test scores). Older participants were included in the sample on condition that they were at least high school graduates, had no major health problems, and had a total of more than 25 points out of 30 in the Mini Mental State Examination (MMSE, Folstein, Folstein & McHugh, 1975). They were given a small incentive for their participation in the study.

Table 2
Correlation matrix (Study 1).

	RSPAN	NFC	*A'*	*B"*	Recognition for relevant items	Recognition for irrelevant items
Age group	-.70***	.60***	-.35***	-.28***	-.15	-.27**
RSPAN		-.42*** (-.06)	.22** (.00)	.22** (.02)	.01 (.03)	.08 (-.11)
NFC			-.26** (-.04)	-.08 (.08)	-.15 (-.03)	-.15 (.04)
A'				.04	.80*** (.80***)	.67*** (.61***)
B"					-.25** (-.52***)	-.09 (-.20*)

Partial correlation with control for age are presented in brackets
* p<.05; ** p<.01; ***p<.001
Positive *B"* scores indicate a tendency toward committing more omissions of relevant items while negative scores indicate more liberal bias with a tendency toward a more false alarms of relevant items. Thus, more positive *B"*, the less cognitive structuring. *A'* indicates the level of discrimination between target stimuli and new items during recognition with higher *A'* scores indicating higher discrimination.
NFC – need for closure; RSPAN – working memory measure

Material and Procedures

We used four of the five subscales of the 32 items Polish version (Kossowska, 2003) of Webster & Kruglanski's scale (1994): Preference for order and structure in the environment, Predictability of future contexts, Affective discomfort occasioned by ambiguity, and Closed-mindedness. We excluded one subscale, Decisiveness, because it has been recognized as tapping ability to achieve cognitive closure but not motivation (Roets & Van Hiel, 2007). Respondents rated 27 items on a six-point scale (from 1 = completely disagree, to 6 = completely agree). The mean score of all items was calculated (*Cronbach* α = 0.84). The higher the mean score, the higher the need for closure (NFC).

To test whether cognitive abilities are responsible for age-related changes in cognitive structuring, we administered the short version of the RSPAN working memory test prepared by Daneman & Carpenter (1980) (Polish version by Dąbrowska, 2009). We decided to test working memory, i.e., the ability to preserve information in a temporary short-term store while processing is carried out, as it has been postulated as the important source of age differences in various aspects of cognition (Verhaeghen & Salthouse, 1997).

Participants were presented with ten series of short unconnected sentences. The number of sentences in a set was incrementally increased from 3 at the beginning to 7 in the final set. The tasks were to evaluate whether the sentence read by the experimenter was true or false and to memorize the last word of each sentence. After each set was read, participants wrote down all the remembered words. The number of correctly recalled words served as index of working memory span.

To measure the way in which information is processed we carried out a task previously tested and validated in studies by Bar-Tal and Kossowska (2010). Respondents were asked to imagine that they have just met a friendly person. The aim of this instruction was to create a hypothesis about the target person. Then they were given 15 information segments regarding the target person's behavior. Participants were asked to imagine that they wanted to verify whether their first impression (that the person is friendly) was correct by examining the list of behaviors. They were to rate on 5-points scale in what extent the certain behavior was consistent with the behaviors of the friendly person. The list consisted of five prototypical items, i.e., items consistent with the impression, five diagnostic items, i.e., items inconsistent with the impression, and five items irrelevant to the impression. For instance, a prototypical item was 'Volunteered to care for lonely older people', an inconsistent item was 'Refused to talk with fellow passengers on an organized trip', and an irrelevant item was 'Reads *Gazeta Wyborcza'* (a Polish daily newspaper). Performance of this task was expected to activate the schema of the friendly person. Then participants completed a filler task. Next they were given the list of 30 behaviors, from which they were ask to choose those behaviors that had appeared in the original list. The list consisted of 15 previously seen stimuli and 15 new descriptions. We calculated number of schema-relevant (consistent and inconsistent) and irrelevant information recognized correctly. Additionally, results of the recognition test were analyzed using the signal detection approach (Donaldson, 1992; Radvansky, Curiel, Zwaan, & Copeland, 2001). Correct recognitions for schema-relevant information were counted as hits and incorrect recognitions for schema-relevant items were considered false alarms. Two statistics were computed. *A'* indicates the level of discrimination between target stimuli and new items during recognition with higher *A'* scores indicating higher discrimination. *B"* is a measure of recognition bias. Positive *B"* scores indicate a conservative tendency toward committing more

Table 3
Regression coefficients (Study 1).

Dependent variables	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Adj. R^2
	B	Std. Error	Beta			
Schema-Relevancy Index						.49
(Constant)	.698	.033		20.02	.00	
RSPAN	.000	.001	-.03	.22	.83	
Recognition of irrelevant items	-.047	.004	-.71	11.63	.00	
NFC	-.001	.001	-.15	1.32	.19	
Age	.057	.02	.29	2.33	.02	
NFC x Age	-.004	.002	-.23	2.36	.02	
*B"*relevant						.11
(Constant)	.041	.051		.816	.416	
RSPAN	.006	.006	.117	1.039	.301	
NFC	.009	.004	.249	2.274	.025	
Age	-.372	.118	-.381	-3.148	.002	
NFC x Age	.022	.008	.271	2.864	.005	

Positive *B*" scores indicate a tendency toward committing more omissions of relevant items while negative scores indicate more liberal bias with a tendency toward a more false alarms of relevant items. Thus, more positive *B*", the less cognitive structuring
NFC – need for closure; RSPAN – working memory measure

omissions of relevant items while negative scores indicate more liberal bias with a tendency toward more false alarms of relevant items. Thus, more positive *B"* indicates less schematic information processing.

Participants in the group of younger adults completed the questionnaire during group sessions. Older adults were contacted individually. We assumed that the individual sessions would be less stressful and more comfortable for older participant. Participants were told that the aim of the study was to explore how people assessed others' personalities. At the end they were debriefed.

Results

Older adults presented higher NFC than younger adults; $F_{(1,151)} = 82.77$; $p < .001$; $\eta^2 = .36$. They remembered fewer words in the RSPAN task; $F_{(1,144)} = 130.96$; $p < .001$; $\eta^2 = .48$. They recognized fewer irrelevant items from the list; $F_{(1,151)} = 12.12$; $p = .001$; $\eta^2 = .075$ in comparison to the younger group. They discriminated less between previously seen stimuli and new ones as indicated by lower *A'* scores; $F_{(1,151)} = 21.24$; $p < .001$; $\eta^2 = .12$. They were less inclined to make omission mistakes with lower *B"* scores for relevant items than younger participants; $F_{(1,152)} = 12.26$; $p < .001$; $\eta^2 = .076$ (see: Table 1 for test scores and Table 2 for the correlation matrix).

To test whether NFC influenced cognitive structuring differently in groups of older and younger adults, three hierarchical regression analyses were performed. Two independent variables (NFC and age dummy, coded -0.5 young adults / 0.5 older adults) were entered in the first step and the effect of the interaction between the two variables was assessed in the second step. NFC was centered before the cross-products were computed (Dunlap & Kemery, 1987). The RSPAN[1] was included as a covariate variable in both analyses. In addition, the recognition of irrelevant items was included as a covariate variable when the recognition of schema relevant information score was used as dependent variable in order to control for a general performance in the recognition task.

Table 3 shows that the interaction terms turned out to be significant for the recognition of relevant items (adj. R^2=.49, β=-.19, t=2.89, p=.01) and *B"* (adj. R^2=.11, β=.27, t=2.86, p=.005). To interpret the source of the interactions, the regression lines for NFC on the recognition of relevant items (and then *B"* scores for relevant items) were calculated separately for older and younger adults. The results of a simple slope analysis indicated that the relation between NFC and the recognition of relevant items for older participants was significant and negative (unstandardised b = -.067; t = 2.98; p = .003), but it was non-significant for younger participants (b = .009; t = 0.66; p = .513). Similarly, the results of a simple slope analysis indicated that the relation between NFC and *B"* for relevant items for

1 We tested also alternative hypothesis that RSPAN x age interaction influences cognitive structuring, however we did not find any significant results. Moreover, we tested moderational mediation model of NFC x age mediated by RSPAN – but again we did not find any significant results. If we find significant moderational mediation model significant it means that working memory capacity is responsible for inconsistency in need for closure behavior. In the light of the results we however had to drop this explanation.

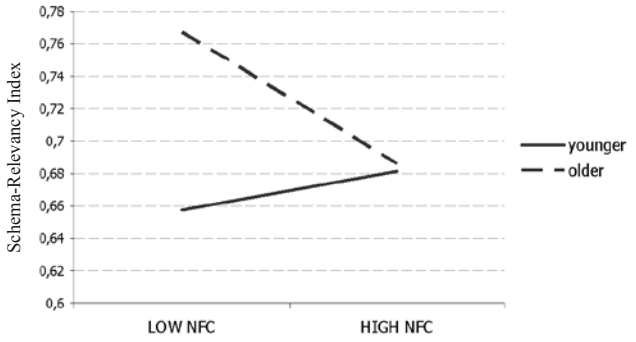

Figure 1. Regression lines of Schema-Relevancy Index on NFC in groups of younger and older adults.

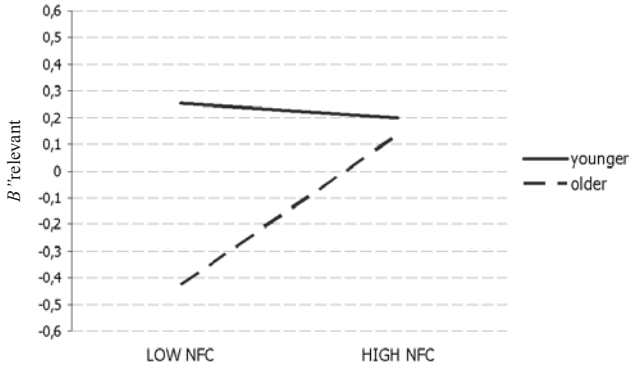

Figure 2. Regression lines of B"relevant on NFC in groups of younger and older adults.

older participants was significant and positive (b = .02; t = 3.38; p = .000) whereas it was non-significant for younger participants (b = -.002; t = 0.51; p = .61). The interaction lines are presented in Figures 1 and 2.

Regression analysis conducted on the *A'* revealed that only the group variable was a significant predictor with older adults scoring lower on this measure than younger adults (adj. R^2=.09, β=-.31, t=2.59, p=.01). Neither NFC (β=-.05, t=.51, p=.61) nor RSPAN (β=-.00, t=.03, p=.98) were significant predictors of *A'*.

Discussion

In Study 1 we we explored the relation between NFC and use of schematic information processing. The results of this study confirmed our hypothesis: Increased NFC after controlling for the level of memory for irrelevant stimuli was related to less memory for relevant stimuli among older, but not younger adults. In addition, NFC of older adults was positively related to their tendency to omit schema-relevant information as indicated by *B"* measure. Lack of effect of NFC on *A'* scores shows that discrimination between previously seen and new stimuli was not affected by NFC. Main effect of age indicates that ability to discriminate stimuli decreases with age but this relation is not dependent on epistemic needs. We did not expected to be the case though. It is not the general accuracy that is affected by the NFC but the tendency to use more schematic information and therefore should be reflected in the type of mistakes as reflected by *B"* measures. Obtained results could be interpreted as pointing at the tendency of older adults to use less cognitive structuring with the increase of their NFC.

It should be noticed that the results were obtained when controlling for cognitive ability, which means that the way people process information cannot be sufficiently explained by cognitive resources that decreases with age. The effects of the study cannot be also sufficiently explained by mere NFC. It seems that the strategy of information processing depends on NFC but there are also other factors that have an impact on it. One of those factors could be self-efficacy to fulfill epistemic needs. This possibility should be farther explored in future research. While the effect of NFC on cognitive structuring in older group is consistent with the study hypothesis, the pattern obtained in the younger group requires an explanation. It is possible that the combine effect of both younger age as well as an easy memory task produced ceiling effect which was associated with no difference in responding to the needs implied by the level of NFC.

Study 2

Study 1 demonstrated that older participants' epistemic behavior is negatively related to their NFC. This phenomenon could be explained by the assumed lower level of EFNC characterizes older people. According to Bar-Tal and Kossowska (2010), although the results of Study 1 are consistent with this assumption, and there is no reasonable alternative theoretical explanation, it is still important to examine the validity of this assumption. Study 2, therefore, examines the effect of age on participants' level of NFC and EFNC. It is hypothesize that while older age group is characterized by higher NFC than the younger one, The latter group has higher EFNC score than the former.

As a part of a larger study on inluences of need for closure on epistemic behavior among older and younger adults we measured levels of NFC and EFNC in groups of younger and older adults. Therefore we could compare the impact of age on both NFC and EFNC. According to the interpretation of results obtained in the Study 1 we should find higher NFC but lower EFNC among older adults.

Method

Participants

Participants represented two age groups who were recruited through community ads and paid them $10 (30 PLN). The first consisted of 129 students from the

university in Krakow (54 woman and 75 man; M_{age} = 21.72, age ranged from 19 to 26). The second group consisted of 98 older adults (49 woman and 49 man; M_{age} = 67.76, age ranged from 60 to 72). Older participants were included in the sample on condition that they were at least high school graduates, had no major health problems, and had a total of more than 25 points out of 30 in the MMSE.

Material and Procedures

To measure NFC we used the same scale as in Study 1 (Cronbach's α = .87, M = 3.54). To measure the Efficacy to Fulfill Need for Closure (EFNC) we administered the scale constructed and validated by Bar-Tal & Kossowska (2010). This scale consists of nine items rated on a six-point scale (from 1 = completely disagree, to 6 = completely agree). All items represent efficacy (rather than epistemic motivation such as preferences or wishes) and epistemic behavior corresponding to the need for closure. An example of an item demonstrating high efficacy is: "I do not bother with simple matters, I usually know what to do at once". An example of an item demonstrating low efficacy is: "I tend to postpone important decisions to the last moment, and even then I have problems making them". The overall mean score of all items was calculated (Cronbach α = .79, M = 3.36). A higher score on the scale implies higher EFNC.

In this study cognitive ability was assessed by processing speed measure as the WAIS-R Digit-Symbol Substitution Subtest (Wechsler, 1997). Performance was assessed by the total number of items correctly answered within the allotted time period. We used this measurement as instead RSPAN used in Study 1, because it seems to fare quite well to account for adult age differences in measures of cognitive functioning and because the proportion of age-related variance in cognitive performance that is related to working memory capacity is also shared to a large extent with processing-speed measures (Salthouse & Meinz, 1995).

Participants were asked to complete the questionnaire during an individual session they attended voluntarily. They randomly received one of two possible packets of questionnaires (the order of the scales was counterbalanced). Later, they were debriefed.

Results & Discussion

The results revealed that older adults presented higher NFC than younger adults: $F_{(1,102)} = 20.28$; $p < .001$; $\eta^2 = .14$, and they were able to copy fewer symbols in a given time: $F_{(1,102)} = 215.91$; $p < .001$; $\eta^2 = .68$.

To examine the study hypothesis we performed a two way within between ANOVA with the two age groups as a between factor and the cognitive – motivational varibales (NFC versus EFNC) a within factor. The ANOVA yielded a significant interaction ($F(1,225) = 32.71$, $p < .01$, η^2=.20).

Table 4
The level of NFC and EFNC as a function of age group.

	Younger group	Old group
NFC	3.36 ±0.64	3.78 ±0.66
EFNC	3.65±0.67	2.99 ±0.84

NFC – need for closure; EFNC – efficacy at fulfilling need for closure

Table 4 shows the cells mean.

The Bonferroni a posteriori test shows that the younger group's NFC is significantly lower than that of the older, but the later group's EFNC is significantly higher than that of the former. Thus, the study hypothesis is confirmed.

The results obtained in Study 2 offer an initial support for the hypothesis that the inconsistency found in the older group between their NFC and their information processing may be explained by their lower level of EFNC. Moreover, the fact that the older group is also characterized by higher NFC than that of the younger one, is also consistent with the conclusion of Study 1 because Bar-Tal's and colleagues model postulate that the lower the individual's EFNC relative to his/her NFC, the higher the chances of use of information processing that is inconsistent with the individual's epistemic need.

General Discussion

In the study we found age differences in the way that need for closure influences cognitive structuring. Specifically, we found that under high need for closure older adults recognized less relevant information than irrelevant items, which is not the case among young participants. For older adults, the results were opposite to that predicted by their motivation: higher NFC was associated with less schema-irrelevant information recognized. This effect could be interpreted as demonstrating that older adults have too low EFNC to fulfill their higher NFC. Consistent with this interpretation, the results of Study 2 showing that older adults are characterized by higher NFC, but at the same time by lower EFNC than their younger counterparts.

In general, the results of the study demonstrate that for low EFNC individuals (which is probably the case in older adults), higher NFC is associated with more effortful processing and more extensive collection of information. Thus, among older adults need for closure is not related to the conservation of scarce cognitive resources but to a greater use of ineffective and effortful processing. This behavior is not adaptive for older adults, even if they use a more effortful and systematic manner of information processing, which is usually considered rational and functional. The adaptive epistemic behavior should be consistent with their motivational orientation.

A better understanding of the cognitive-motivational factors associated with age-related changes in cognitive structuring may help to form a more optimistic view of

the effect of aging on cognition. Rather than emphasizing deterministic factors such as loss of resources and objective deterioration of abilities as an explanatory framework, the present approach suggests that a combination of the effect of epistemic needs and the efficacy to fulfill it (rather than the objective ability) may explain the effect of age on cognitive structuring. Indeed, although we found a very strong effect of age on cognitive capabilities, the later did not affect the cognitive structuring behavior.

More importantly, the present approach is optimistic because both factors (i.e. epistemic motivation and the efficacy to fulfill it) may be determined by situational forces and prone to trainings instead of being stable, trait-like characteristics. Studies performed within the lay epistemic theory demonstrated very often that epistemic motivation can be manipulated (Ford & Kruglanski, 1995; Kruglanski & Freund, 1983; Kruglanski & Webster, 1996; Mayseles & Kruglanski, 1987; Webster, Richter, & Kruglanski, 1996). It seems that efficacy at fulfilling need for closure can be situationally affected too. In our previous study (Bar-Tal & Kossowska, submitted) we demonstrated that positive mood may increase efficacy. Also, Otten and Bar-Tal (2002) demonstrated that the efficacy to fulfill the need for closure may be manipulated by exposing the participants to a success or failure task requiring cognitive structuring. Thus, the variety of phenomena related to cognitive structuring, which have thus far been explained by objective and unchangeable factors such as loss of memory in older age (Chen, 2004; Chen & Blanchard-Fields, 2000; Hess & Slaughter, 1991; Hess & Tate, 1991; Hess, Donley, & Vandermaas, 1989), could be explained by less deterministic and more manageable factors.

To conclude, the present paper has demonstrated that there is an interaction between age and epistemic motivation on cognitive structuring behavior. We have suggested that this interaction can be explained by the effect of age on the efficacy to fulfill epistemic need. It has to be remembered, however, that although the results are consistent with this explanation, future research should demonstrate more directly the hypothesized link between age and the efficacy to fulfill the need for closure.

Acknowledgments

Research was supported by grant MNiSW N N106 040534 awarded to Grzegorz Sędek and grant MNiSW N N106 023238 awarded to Małgorzata Kossowska.

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