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Aspects of creativity in the everyday problem solving of older adults

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Aspects of creativity in the everyday problem solving of older adults

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Slide 1: Title

Slide 2: Introduction

Why look at aspects of creativity in the everyday problem solving of older adults? In our view, there are several reasons:

1. There is an increasing emphasis on "contextually relevant" assessments of older adults' problem solving capabilities in the research literature (e.g., Denney et al., 1992; Poon et al., 1989; Sinnott, 1989; Sternberg & Wagner, 1986; Willis, 1991). In contrast to traditional laboratory-based studies of cognition, everyday problem solving researchers try to understand the cognitive competence of individuals in their real-life environments.

2. The concepts of problem solving, creativity, and divergent thinking have been linked in the theoretical literature, but few empirical investigations of either creativity or problem solving in late life have actually examined these relationships (Guilford, 1950; Sternberg & Lubart, 1991; Voss & Means, 1989). By "divergent thinking", we are talking about psychometrician's approach to the study of creativity-relevant abilities, which generally refers to individuals' ability to produce many, varied and unusual responses to situations...

3. Ill-structured problems, or problems without clear goals or constraints, are considered the defining features of everyday cognitive tasks by some theoreticians (e.g., Wagner, 1986). Convergent thinking capabilities, which refer to subjects' abilities to find the "one correct answer" to structured problems, would seem to have little utility for such ill-structured problems. Despite this, most studies of older adults' problem solving capabilities, to date, have focused more on *convergent* than *divergent* production,. We should explicate that, in our view, problems demanding both convergent and divergent thinking can be found in

everyday life.

4. In contrast to other points in the life span, where creativity in academic, workplace, or leisure contexts may be more important, creativity in later adulthood may be increasingly focused on dealing with the challenges of everyday life. Finding novel ways of achieving important objectives in the face of age-associated physical losses, like self-care and home care activities required for the maintenance of independence, might be one example of the need for a kind of pragmatic creativity in late life (Baltes & Baltes, 1990).

Slide 3: Study questions

Thus, in today's presentation, we examine three specific questions:

1. Can aspects of creativity (particularly the concepts of fluency, flexibility, and originality, which have dominated the psychometric literature on this topic) be identified in older adults' responses to a measure of everyday problem solving?

2. If yes, how might creativity-relevant problem solving relate to, and differ from, other conceptions of problem solving competence?

3. Most studies of older adults' problem solving have proceeded with the goal of investigating "practical intelligence" in real-life contexts. Everyday problem solving and practical intelligence have tended to be used as interchangeable concepts. Here, we ask whether there is an empirical distinction between *intelligence* and *creativity* in the everyday problem solving performance of older adults.

Slide 4: Subjects

We investigated these questions within the context of a larger program of research on older adults' everyday problem solving competence. Subjects for this study were 111 healthy, well-educated older adults, including 67 females and 44 males. The average age of participants was 78 years of age, and subjects had an average of over 15 years of education.

Slide 5: Measures

Subjects received three measures of everyday problem solving, listed on the left side, drawn from the literature on the "real-life" cognitive competence of older adults. We will

consider these in greater detail in just a moment. In addition, subjects received 19 intellectual ability measures which can be represented and summarized as four broad, second-order ability factors: Fluid intelligence, represented as the ability to identify patterns and relations in a variety of stimuli; Crystallized intelligence, which here focused primarily on subjects' verbal knowledge; General Memory, assessed, for example, in memory span and working memory tasks, and finally, General Speed, which was assessed in measures requiring subjects to perform very simple cognitive tasks as quickly as possible (see Baltes et al., 1980; Cattell, 1971; Horn & Hofer, 1992).

It is important to note that, in contrast to the psychometric measures of intelligence, which were administered under speeded or timed conditions, all of the everyday problem solving measures were not timed; subjects could take as long as they wished to finish them.

Slide 6: Overview of everyday problem solving measures

Returning to the everyday problem solving measures, the next table provides a summary of the three task types given to subjects.

The first measure, called Practical Problems by Denney and Pearce (1989), gave subjects ten open-ended problems regarding instrumental and social dilemmas of everyday life. In an example problem, shown here, subjects were told about a retired couple that had just moved to a new town after living in the same place for 40 years, and were asked what the couple should do to adjust to their new environment. Subjects were told to generate as many solutions as they could for each problem, and their score was the number of safe and effective solutions they generated.

The second measure, called Situational Decision Making by Cornelius and Caspi (1987), included everyday problems similar to those of Denney & Pearce. The major difference was not content, but was that in this measure subjects were asked to rate the likelihood with which they would be inclined to use each of four possible solutions given for a problem; they didn't have to generate solutions. Subjects' score reflected the extent to which their response preferences related to an idealized response pattern produced by an independent

sample of judges.

The final everyday problem solving measure was Willis' Everyday Problems Test. Here subjects were presented with 106 printed materials taken from the everyday world; for instance, recipes, medicine bottle labels, or insurance forms. Subjects had to answer two questions about information contained in each printed stimulus. There was one correct answer for each question, and subjects' scores were the number of correct answers.

As the bottom row of this table suggests, we see the three "everyday problem solving" measures as assessing very different aspects of everyday cognition. The first measure, by Denney and Pearce, seems closest to a fluency measure to us--asking subjects to generate as many ideas as possible. Given that fluency is considered an important divergent thinking ability in psychometric conceptions of creativity, we began to wonder whether other aspects of creativity might also be assessed by the Denney and Pearce measure. Note that the other two problem solving measures assess how much a subject corresponds to an idealized or correct response pattern--and thus seem cast more within a convergent production tradition.

Slide 7: Coding solutions for fluency, flexibility and originality

Within the psychometric tradition in creativity research, three divergent thinking abilities have received the most attention are fluency, flexibility, and originality. The origins of this measurement approach are most clearly linked with Guilford (1950). Theoretically, this focus on divergent thinking stresses individuals' ability to be different, original, unique--to search for and find answers which are not readily apparent. We operationalized each of these three divergent thinking abilities, fluency, flexibility and originality, in the open-ended responses to Denney & Pearce's semi-structured problems. It is important for us to underscore, here, that this creativity coding is not part of Denney and her colleagues "official scoring" of their measure; this is an alternative coding that we have implemented.

Fluency was closest to Denney and Pearce's own preferred scoring of their measure, or the number of safe and effective solutions. For this study, we operationalized fluency as the overall number of solutions generated, regardless of their effectiveness.

To arrive at an index of *Flexibility* , we first coded subjects' "way of solving problems", or their response style, in terms of four general coping strategies listed here, and taken from Cornelius and Caspi's work. The four styles included Problem-focus, passivity and dependence, avoidance and withdrawal, and cognitive analysis and reframing. Then, as our measure of flexibility, we counted the mean number of different response styles used by subjects.

Finally, we assessed *originality* in terms of the relative infrequency of subject responses. We decided that original solutions had to be both rare in frequency, and had to represent a rare style of response. The style of response used least by subjects in this study was cognitive analysis and reframing, and was exemplified by solutions that indicated the need to sit back, think about, evaluate, or plan a course of action. For example, in one problem from Denney & Pearce's measure, where a man with a heart condition and not a lot of money must figure out a way to get his lawn mowed, a rare cognitive analysis response was "Sit back and think about what you can barter, in return for having your lawn mowed".

Slide 8: Figure: Individual differences in fluency

Now, we'll look at some of the results. As the first figure shows, there were substantial individual differences in fluency. Over the ten problems, subjects generated an average 5.2 solutions per problem. [Incidentally, 5 of these 5.2 solutions, on average, were rated as effective. Fewer than 6% of all solutions were rated as ineffective]. The range in number of solutions generated for a problem ranged from none to 20!

Slide 9: Figure: Flexibility of response types

Turning to the next figure, we see that there was substantially less variability in solution flexibility. On average, subjects used only 2 different response styles (problem-focused action, and passive dependence). Over all ten problems in the Denney and Pearce measure, no individual subject used more than three of our four response styles.

Slide 10: Figure: Originality of generated solutions

The final aspect of divergent thinking that we coded the Denney and Pearce measure for

was originality--the number of infrequent, cognitive analysis solutions generated. Of the almost 6000 solutions generated overall, by our subjects, fewer than 100 were classified as original by our operationalization--just over 1%. Although relatively few solutions were considered rare, about a third of the sample--36 subjects--actually produced at least one original response.

Slide 11: Table: Correlations among problem-solving measures

Is there evidence that convergent and divergent production in everyday problem solving constitute different things? Our preliminary answer is yes. As this table shows, the two "convergent" problem solving measures in this study, Willis' and Cornelius & Caspi's were modestly but significantly correlated. Similarly, our three indices of divergent production, fluency, flexibility and originality, were also significantly and positively related to one another. You can also see that the traditional Denney & Pearce effectiveness coding of their measure is really an assessment of fluency, in that the number of effective solutions is almost perfectly correlated with the overall number of solutions generated. Most importantly, there is little evidence for commonality among convergent and divergent problem solving approaches. While the traditional Denney & Pearce effectiveness coding is slightly but significantly related to one of the other problem solving measures, beyond this there is effectively no association between convergent and divergent approaches to measuring everyday problem solving.

Slide 12: Table: Correlations with age and intelligence

We'll look at one last table now. Here, we took another approach to examining similarity and differences among the convergent and divergent approaches to problem solving. We looked at the correlations of all of the problem-solving measures with age and our four factors of intelligence. As you can see, only the Willis measure shows a significant, negative association with cross-sectional age in this study. The Willis measure is also associated with all the intellectual ability factors assessed. The other convergent thinking measure, from Cornelius and Caspi, is less substantially correlated with intellectual ability, but (congruent with Cornelius & Caspi's own work) the association with fluid intelligence is significant.

On the other hand ,the picture from our divergent thinking indices of problem solving i very different. Over each of our indicators, there is absolutely no indication of any relationshi with any of our factors of psychometric intelligence.

Slide 13: Conclusions

To wrap things up: In this presentation we have tried to show that more than one broa class of intellectual abilities may be represented in the current literature on older adults' everyday problem solving. Specifically:

1. Drawing on a psychometric approach to creativity, we have tried to show that it is possible to identify aspects of divergent production (fluency, flexibility, and originality) in the everyda problem solving of older adults.
2. When we classify approaches to the measurement of everyday problem solving as either convergent or divergent, there seems to be little or no apparent relationship between the two approaches. Furthermore, traditional factors of psychometric intelligence are associated with what we have identified as "convergent production" measures, but not with any of our indicators of "divergent production".

What do we make of these findings? To date, the research on everyday problem solving in late life has often connected itself, following Sternberg & Wagner's (1986) edited volume, with the concept of "practical intelligence". We would like to argue that there may be more to cognition in everyday contexts than this: in today's presentation, we have tried to show that there may also be a "practical creativity". Indeed, our findings regarding the Denne and Pearce measure bear some similarity to research reported by Poon and colleagues (1992) regarding their Georgia Centenarian Study. Using another measure created by Nancy Denney and others, they also found no negative effect of cross-sectional age in advanced old age, prompting them to suggest that Denney's measure may be assessing "resourcefulness". Intuitively, "resourcefulness" seems to bear some conceptual similarity to a notion of "practica creativity"--the ability to fluently search for and generate useful ideas that are original and flexible. It seems to involve figuring out how to achieve important objectives in new ways,

using the resources at hand. The ability to come up with new ways of doing things when old ways no longer work, or compensation, is an important component of Baltes & Baltes (1980) model of successful aging.

Clearly, these are general speculations from an exploratory investigation, and would need to be followed up. The lack of relationship between convergent and divergent problem solving may be a partial function of restricted range in our divergent thinking indicators, especially originality. On the other hand, an indicator like originality, with its emphasis on rarity, can never be normally distributed!

Finally, these results suggest to us that global conceptions of everyday problem solving are unlikely to be very useful. Just as multidimensional conceptions of laboratory cognition have an important place in psychometric ability research, so too must we consider the potential multidimensionality of everyday cognitive tasks. Everyday competence encompasses the full breadth and diversity of individuals' daily worlds; we must allow for the possibility, in our measures and our theories, that everyday cognition may subsume a "problem space" that includes the full reach of the "big triad" discussed by Sternberg (1989) and others: wisdom, intelligence, and creativity.

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Slide 2

Why look at aspects of creativity in the everyday problem solving of older adults?

> there is an increasing emphasis on "contextually-relevant" assessments of older adults problem solving capabilities

> problem solving, creativity, and divergent thinking have been linked in the theoretical literature, but few empirical investigations of creativity or problem solving in late life have examined these relationships

> most studies of older adults' problem solving to date have focused on *convergent* rather than *divergent* production

> in contrast to other points in the life span, where creativity in academic or workplace contexts may be more important, creativity in late life may be increasingly focused on dealing with everyday challenges

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Study questions

Can aspects of creativity (fluency, flexibility, originality) be identified in the solutions to everyday problems generated by older adults?

How might creativity-relevant problem solving relate to other conceptions of problem solving competence?

Is there an empirical distinction between *intelligence* and *creativity* in the everyday problem solving performance of older adults?

Subjects

111 older adults
- > 67 females
- > 44 males

Mean age = 77.8 years (SD = 5.6, range = 68-94)

Mean education = 15.2 years (SD = 2.4, range = 7-22)

Most subjects rated their health, hearing and vision as "good" or "very good"

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Overview of everyday problem solving measures

	Denney & Pearce	*Cornelius & Caspi*	*Willis*
Example problem	"A retired couple has just moved to a new town...What should they do to adjust...?"	"You have a landlord who refuses to make expensive repairs... because...they are too costly."	Subject is presented a medication label, and is asked to determine the correct dosage for a child.
Solution format	Generate as many solutions as possible	Rate likelihood of using given solutions	Select or generate one answer
Scoring	# of safe & effective solutions generated	Correlation between subject & judge ratings	# of correct answers
Major feature?	Fluency	Social consensus	Reasoning & document literacy

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Measures

Everyday Problem Solving

> Denney & Pearce (1989)

> Cornelius & Caspi (1987)

> Willis (1990)

Tasks were untimed

Intelligence factors

> Fluid Intelligence

> Crystallized Intelligence

> General Memory

> General Speed

Tasks given under timed conditions

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The Denney & Pearce measure: Coding solutions for fluency, flexibility, & originality

Fluency

> Total number of solutions generated by subjects

Flexibility

> Number of <u>different</u> response styles used

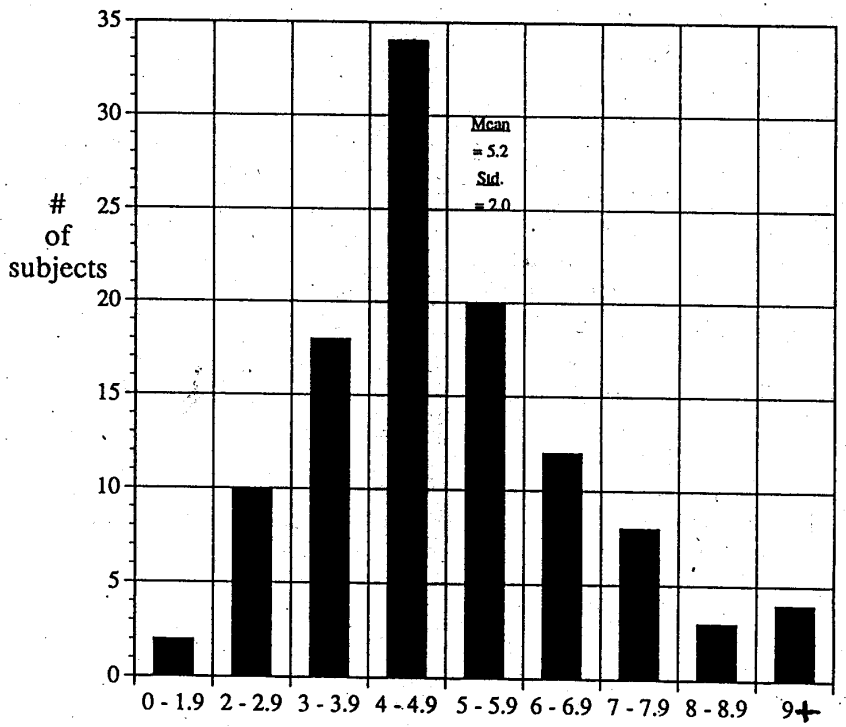
- **Problem focus**
  self-initiated, overt behaviors (direct action, purchase of services)
- **Passivity or dependence**
  the absence of self-initiated behaviors; reliance on others to solve problem
- **Avoidance or withdrawal**
  cognitive avoidance, denial, emotional suppression, attention to other things
- **Cognitive analysis**
  attempts to understand situation better, to use logical analysis, reinterpretation

Originality

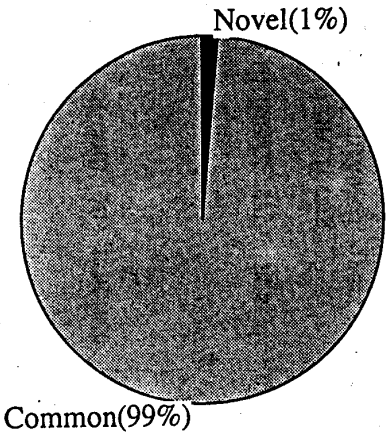
> Relative infrequency of <u>solution</u>

> Relative infrequency of <u>response style</u>

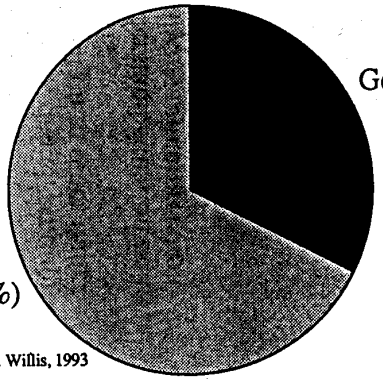
The Denney & Pearce measure: Individual differences in solution fluency



Percentage of SOLUTIONS classified as novel



Percentage of SUBJECTS generating novel solutions



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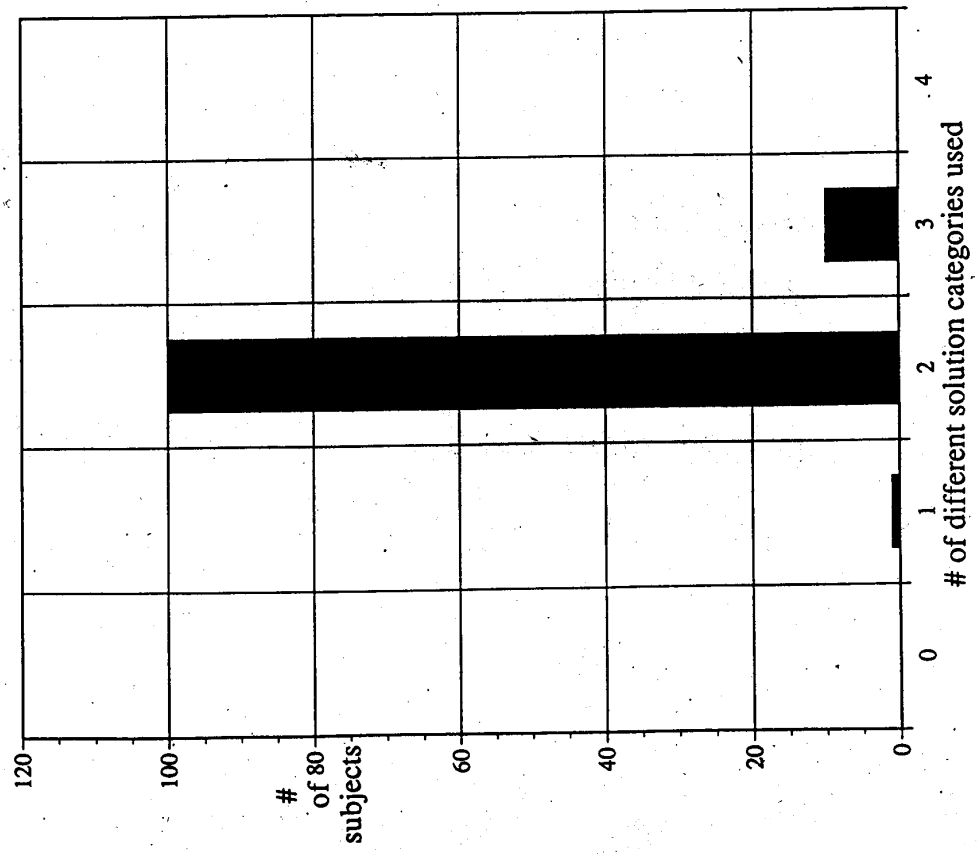
The Denney & Pearce measure: Flexibility of response types



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Individual difference correlates of convergent & divergent problem solving

	Age	Fluid Intelligence	Crystallized Intelligence	General Memory	General Speed
Convergent					
Willis	-0.41***	0.70***	0.63***	0.53***	0.46***
Cornelius & Caspi	0.02	0.22*	0.15	0.17+	0.05
Divergent (Denney & Pearce)					
Effectiveness	-0.12	0.05	0.15	0.01	0.00
Fluency	-0.12	0.03	0.13	0.00	-0.01
Flexibility	-0.05	0.05	0.12	0.05	0.05
Originality	0.09	-0.11	0.00	-0.03	-0.09

Note: + $p < .10$, * $p < .05$,*** $p < .001$

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Relationships among convergent & divergent problem-solving measures

	Convergent		*Divergent*		
	Willis	Cornelius & Caspi	Effectiveness	Fluency	Flexibility
Convergent					
Willis					
Cornelius & Caspi	0.23**				
Divergent (Denney & Pearce)					
Effectiveness	.16+	.18*			
Fluency	.16+	.17+	0.99***		
Flexibility	.10	.15	0.40***	0.41***	
Originality	-.05	.04	0.17+	0.19*	0.47***

Note: + $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$

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Conclusions

Within a psychometric approach to creativity, it is possible to identify aspects of creativity (fluency, flexibility, originality) in the everyday problem solving of older adults.

There is little or no apparent relationship between divergent thinking aspects of problem solving and traditional convergent thinking approaches. Neither other everyday problem solving measures nor traditional factors of intelligence show significant relationships to aspects of problem solving creativity in this study.

"Resourcefulness" may be a component of successful aging.

Global conceptions of everyday problem solving may not be not useful. There is a need for a multidimensional conception of cognition in everyday contexts.