IMAGINATION *COGNITION* AND PERSONALITY

Consciousness in Theory • Research • Clinical Practice

CONTENTS

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EDITOR'S STATEMENT

This issue of *Imagination, Cognition and Personality* follows closely in content the previous one. Again we explore emotionality and temperament this time in middle childhood in a contribution from one of the Twentieth Century's great pioneers in emotion-research, Professor Carroll Izard of the University of Delaware and his collaborators. We turn next to a useful research study by Professor Martinez-Pons of Brooklyn College who has been pursuing the topic of emotional intelligence, a field of investigation first presented to psychological science in this *Journal.*

Our next article moves from study of normal individuals to a review by Kathrine Gapinski of Yale University of how our human capacity for imagery is employed in the psychotherapy or behavior modification of persons with obsessive compulsive disorder. Finally we conclude with the second important normative study by Dr. Leonard Giambra of Maryland on how imagery appears in the daydreams of adolescents through the very aged, an intriguing life-span study.

We conclude this issue with two thoughtful reviews by Dr. Nicholas Brink and Natalie Sollee respectively. The first review is of Ernest Hartmann's *Dreams and Nightmares: The New Theory of the Origin and Meaning of Dreams,* a work that comes one hundred years after Freud's seminal *The Interpretation of Dreams,* and which puts the earlier volume into a modern, scientific research-based perspective. The second review is of Sergio Della Sala's *Mind Myths: Exploring Popular Assumptions about the Mind and the Brain* which examines the many confusions about brain functioning that popular media have introduced into our current ideas about neural processes.

Jerome L. Singer

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TEMPERAMENT, COGNITIVE ABILITY, EMOTION KNOWLEDGE, AND ADAPTIVE SOCIAL BEHAVIOR*

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ABSTRACT

Few studies have related emotion knowledge to positive behavioral outcomes in middle childhood, and none of these included both temperament and cognitive ability in the analysis. In the present study of 166 seven-year-old children from economically disadvantaged families, we show that temperamental inhibition, cognitive ability, a traditionally studied index of emotion knowledge (emotion recognition), and emotion memories contribute to the concurrent prediction of adaptive social behavior. We also found that temperament and cognitive ability relate significantly to emotion recognition which, in turn, partially mediates the relations of inhibition and cognitive ability to adaptive social behavior. Emotion memories relate significantly to the behavioral outcome after removing the variance due to inhibition, cognitive ability, and emotion recognition. We argue that compared to memories tagged simply as good (pleasant) or bad (unpleasant) events, *discrete* emotion memories have greater adaptive value because they provide more

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useful information and have the capacity to facilitate the anticipation and management of emotion arousal.

The past two decades of research in developmental, personality and social psychology, as well as that in neuroscience make it abundantly clear that emotions influence cognition and behavior [1, 2]. The influence of emotions on basic perceptual processes [3-5], memory [6], [7, 8], and various forms of problem solving [9, 10] underscores the importance of research on the mechanisms that link emotion and cognition. Emotion knowledge, and particularly discrete emotion memories, may represent such a mechanism, perhaps one with special significance because it enables the utilization of emotion-specific information in social interactions. For example, in any social situation, the people and the context provide numerous emotion cues. Effective interpersonal behavior depends not only on the recognition and appropriate interpretation of these emotion cues but on memories that link events and specific emotion experiences [11-14]. Remembering that a particular event makes you sad, and not angry or generally distressed, cues connections to causes and consequences of sadness and possibilities for coping with it [13, 15].

Examining the role of emotion recognition and emotion memories in adaptative behavior requires consideration of the roles of temperament and cognitive ability. Behavioral scientists typically define emotion, temperament/personality, and cognitive ability in terms of adaptation, and they describe overlapping functions of the three constructs [12, 16-21]. In the present study, we propose that indexes of child temperament/emotionality, cognitive ability, and emotion knowledge make distinct contributions to adaptive social behavior and that emotion knowledge partially mediates the role of temperament and cognitive ability. To lay the foundation for testing these ideas, we review some of the evidence on the relations among temperament, cognitive ability, and emotion knowledge on adaptation.

EMOTIONALITY/TEMPERAMENT AND ADAPTATION

Both theory and research attest to the significance of emotion for adaptation [18, 20, 22, 23]. Lazarus and his colleagues see negative emotions as responses to stress and as factors that influence subsequent cognition and coping behavior. Others have made an equally good case for the role of positive emotions in motivating individuals to develop and expand their resources [15, 24, 25]. These and other theorists hold that the emotions have a major impact on subjective well-being, mental and physical health, and social functioning.

This view of the broad influence of emotions on adaptation has led a number of theorists to assume that emotions play a significant role in the development and organization of temperament and personality [14, 20, 23, 26-28]. Their empirical studies have shown robust relations between stable patterns of emotion

experiences and personality traits in adults [29, 30-32], cf. [33, 34]. Several studies have shown that specific aspects of temperament or trait emotionality (e.g., dispositional empathy) and emotion regulation (e.g., heart rate variability) relate to social behavior in preschool children [35-37]. Other studies have demonstrated the effects of children's temperament on various behavioral outcomes [38-43].

A few studies have found relations between dimensions of personality and behavioral outcomes in children and adolescents [44, 45]. Of special interest for the present study, researchers have conceptualized the temperamental trait of behavioral inhibition in terms of the emotions of fearfulness and shyness [46]. They found that about 15 percent of the children showed extreme inhibition or shyness to novel stimuli and unfamiliar persons. For a sizeable proportion of the extreme group, shyness or social anxiety proved a stable trait into middle childhood, a trait that significantly influences social behavior. Other investigators have identified a similar trait, termed sluggishness, and defined it in terms of shyness, fearfulness, paucity of verbal communication, passivity or withdrawal in novel situations, and lack of initiative [47]. These investigators found that children with high scores on their index of behavioral inhibition were rated in adolescence as less mature and lacking in confidence, enthusiasm, and sense of humor. Theory and research also suggest that child characteristics like temperamental inhibition may have an indirect effect on social functioning through their influence on the development of emotion knowledge [23, 48].

INTELLIGENCE AND ADAPTATION

Cognitive ability or intelligence accounts for some of the variance in behavioral outcomes. This relationship has proven a problem for determining the effects of emotion knowledge on adaptation and adaptive social behavior. Cognitive theorists define intelligence in terms of the capacities that enable adaptive action. For example, Sternberg defines intelligence as "the mental abilities necessary for adaptation to, as well as shaping and selection of, any environmental context" [21, p. 1036]. This definition places intelligence alongside emotions and temperament/personality as a major determinant of adaptation. Numerous studies have shown significant relations between various indexes of intelligence and adaptation, including studies relating intelligence specifically to social behavior [16, 21, 49-51].

As in several of the studies just cited, the measure of intellectual functioning in the present study focuses on aspects of academic or psychometrically measured intelligence. Theory and empirical evidence attests to the relation between cognitive ability and emotion knowledge [12, 52]. Common mechanisms of assessment (memory, language) virtually guarantee the correlation between these domains and necessitates the use of cognitive ability as a predictor or control variable in studies of the effects of emotion knowledge.

EMOTION KNOWLEDGE AND ADAPTATION

Emotion knowledge has been defined as a product of both the emotions and cognitive system [13]. Theorists consider emotion knowledge as a critical factor in adaptiveness [12] and as a component of emotional intelligence [53]. Before either differential emotions theory or the coining of the term emotional intelligence, Guilford [54] argued for a construct of socioemotional intelligence, defining it as awareness of the thoughts, feelings, and moods of self and others. Since that time, a number of theorists have embraced interpersonal-intellectual or social-cognitive skills as necessary for adaptation [16, 55]. Yet, the constructs of emotional intelligence and emotion knowledge need further conceptual and empirical delineation from the constructs of academic intelligence and temperament/emotionality.

Emotion knowledge has become a pivotal construct that organizes much of the developmental research on emotion-cognition relations. Theorists define emotion knowledge in terms of linkages or connectors between the emotions and cognitive systems [11, 12, 52]; cf. [13, 53, 56]. They have provided argument and evidence in support of the idea that emotion knowledge is fundamental to emotion communication and normal social relationships [12, 57-59].

Emotion Recognition

Most empirical studies of emotion knowledge have focused on emotion recognition, the ability to recognize and label emotion cues in facial expressions and social situations. Several studies have shown that emotion recognition relates to adaptive social behavior. One of four early studies on the topic found a significant relation between income level and emotion recognition but, after controlling for income level, no effect for ethnicity. Overall, these four studies showed that emotion recognition predicted academic achievement and social adjustment after controlling for various cognitive abilities [12].

A number of later studies replicated and extended these early findings and confirmed the relation between emotion recognition and different facets of social behavior. For example, preschool children's ability to recognize relations between specific situations or events and particular emotions correlated with peer likeability in middle-class children [60] and with peer competence and prosocial behavior in low-income children [48, 61]. Preschool children's ability to recognize and label emotion expressions correlated with peer social acceptance in middle-class children [62]. Moreover, indexes of emotion knowledge increased after participation in a program designed to increase understanding of emotions and emotion regulation [63]. These and other studies [64] provide substantial evidence of a relation between children's ability to recognize and label environmental and expressive emotion cues and their adaptive social behavior (see [52] for review). Although researchers have typically studied individual differences in emotion knowledge in terms of emotion recognition,

normative studies have investigated several other facets, including understanding of display rules, ambivalence, and the causes and consequences of emotion feelings [52, 65, 66].

Emotion Memory

We conceived emotion memory, like emotion recognition, as a facet of emotion knowledge. Emotion memory consists of representations of the events or cues that have activated emotion feelings. We see children's ability to relate events that have caused specific discrete emotion feelings as an index of their emotion memory. We propose that the efficacy of the other facets of emotion knowledge, including event-emotion relations, depend, at least in part, on the way the child represents and organizes emotion information in memory. We assume that emotion memories tagged by category provide useful information on the dynamics of specific emotions and that discrete emotion memories contribute to the development of adaptive social behavior. The present study is the first to examine this proposition.

Emotion Knowledge as Mediator

Theory and evidence suggest that emotion knowledge might function as a mediator in determining behavioral outcomes. Both the emotions and cognitive system contribute to the development of emotion knowledge [13, 23]. In turn, emotion knowledge, defined in terms of children's understanding of discrete emotions, their expressions, causes, and effects, significantly influences cognition and behavior [52]. Discrete emotions theory maintains that understanding of specific emotions and their functions enables emotion regulation, which in turn facilitates cognitive and behavioral coping strategies [12, 67, 68].

One study demonstrated that emotion knowledge functioned as a mediator of early child maltreatment on children's later social functioning [64]. The investigators indexed emotion knowledge in terms of the ability to match discrete emotion expressions with vignettes about fearful, and sad or angry situations. Their index of this fact of emotion knowledge, similar to our construct of emotion recognition, met the criteria that identified it as a mediator [69].

CONTEXT OF THE PRESENT STUDY

The data for the present study constitutes part of a large longitudinal project on emotional and social development in children from economically disadvantaged families. Assessments index family and environmental variables, emotionality and temperament, emotion knowledge, and behavioral outcomes.

For the longitudinal project, we recruited a sample of low-income families because research indicates that poverty or near-poverty conditions have an unfavorable influence on aspects of socioemotional development and increase risk

for children's social maladjustment and behavior problems [12, 70]. For example, peers reject greater numbers of economically-disadvantaged children than middle-income children [71]. The findings of these studies and the few others on the topic indicate the need for more research on emotional and social development in economically disadvantaged children [72].

The assessment battery for the longitudinal project requires two sessions of about one hour each. Some of the measures, including those for the present study, consists of fairly lengthy structured interviews that make considerable demands on the children's ability to concentrate and respond in a timely fashion. For these reasons, we included a measure of test session behavior that enabled us to control for inattention.

HYPOTHESES

We hypothesized that in middle childhood 1) temperamental inhibition, cognitive ability, and emotion knowledge contribute to the concurrent prediction of adaptive social behavior and 2) that emotion knowledge partially mediates the role of child characteristics on the behavioral outcome.

METHOD

Participants

We chose to work with children living below or near the poverty line because they represent an understudied population. We also expected they would show a wide range of scores on our indexes of emotion knowledge and adaptive social behavior [70] and enable a thorough study of their relations. Investigators initially contacted economically disadvantaged families by obtaining approval of the Parent Councils and teachers of all eight of the Head Start centers in northern Delaware and then distributing permission forms in the Head Start classrooms. We had partial data for 166 children and complete data from all sources (child, caregiver, teacher) on all variables for 130. (Most missing data resulted from failure of teachers to co-operate.) Forty-nine percent of the children were female. Seventy-four percent were African-American, 18 percent European-American, 6 percent Latin-American, and 3 percent represented other ethnic identities. At the time of the present study, the children were in first grade and had a mean age of 6.8 years (range: 71 to 89 months).

Procedure

Examines administered measures to the children, their caregivers, and their teachers during the spring semester of the year the children were in first grade. Specially-trained graduate students and laboratory staff administered the

assessment battery. Examiners met children and caregivers in separate rooms that provided privacy. They distributed and collected teacher questionnaires via mail late in the spring semester. We paid caregivers and teachers for their participation.

Measures

Family Income

When the children attended first-grade, 34 percent of children's families earned less than or equal to $10,000, 32 percent $10,000-20,000, 23 percent $20,001-30,000, and 11 percent $30,001 or greater. The mean family income was $16,980, the standard deviation $13,290, and the mean per capita income was $3,300. In 1994, the mean per capita income at the poverty line was about $3,600 [73]. Our index of economic adversity, earned family income, was derived from a demographic interview. It was used as a control variable, with the total dollar amount of income earned by the family as the unit variate.

Inattention

The Guide to the Assessment of Test Session Behavior [74] served as the basis of an observational measure of inattention. A videotape of the first testing session with each child was coded for relevant behaviors by trained observers. The GATSB contains twenty-nine items that assess specific types of test session behavior: Avoidance, Inattentiveness, and Uncooperativeness. The ten items loading on the Inattentiveness scale assess difficulty inhibiting behaviors that are inconsistent with the demands of testing (Cronbach's Alpha = .93). Examples of items on the Inattentive scale are: "Attempts to answer before questions are completed," "Interrupts when the examiner is speaking," and "Exhibits behavior typical of much younger children." Higher scores on the Inattentive scale indicate greater difficulty in regulating behavior during the testing situation.

The testing session lasted approximately one hour and fifteen minutes. The session included three self-report measures, two subtests from the Stanford-Binet Intelligence test, and one task requiring the child to put a puzzle together as quickly as possible.

Four independent coders rated the children's behaviors by watching videotapes of the test sessions. Children were randomly assigned to be rated by three of the four coders. Because reliability across the three coders was adequate (effective reliability = .91); [75], children's scores on each item were averaged across the three coders. Each child's total score, therefore, reflected their average score from the three coders. The index of inattention will serve as a control for possible contamination of the data by test session behavior.

Behavioral Inhibition

We assessed behavioral inhibition with the Behavioral Styles Questionnaire [76], completed by the children's caregivers. The BSQ contains 100 items rated on scales of 1 to 6 concerning a child's behavioral tendencies. Based on theoretical work by Thomas [43], the BSQ contains nine subscales: activity, rhythmicity of biological functions, initial approach-withdrawal, adaptability, intensity, mood, persistence, distractability, and sensory threshold. The present study focused on the three subscales related specifically to behavioral inhibition: adaptability (e.g., "the child needs a period of adjustment to get used to changes in school or at home," "the child has difficulty getting used to new situations"), approach (e.g., "the child is willing to try new things," "the child approaches children his/her age that he/she doesn't know"), and mood (items reflecting negative emotionality, e.g., "the child is annoyed at interrupting play to comply with a parental request"). Exploratory factor analysis of our BSQ data indicates that these three subscales load together to form the third of three factors. The aggregate of these three scales had moderately high internal reliability ($\acute{\alpha}$ = .64). We standardized and then aggregated children's scores on these three subscales to form a caregiver-based index of behavioral inhibition.

Cognitive Ability

We assessed cognitive ability by the Stanford-Binet, fourth edition [77] vocabulary and pattern analysis subtests. In the vocabulary subtest, items require the child either to name a picture, or an important part of it, or to define a given word. In the pattern analysis subtest, items require the child to arrange pieces in appropriate recesses on a form board or to assemble a specified pattern. Items on each subtest are arranged in order of increasing difficulty, with two items of approximately equal difficulty on each level. Performance on the vocabulary subtest, together with the child's chronological age, determines the entry level on the pattern analysis subtest. We standardized and aggregated the scores from the two subtests. The composite has a reliability of .90 [77].

Emotion Recognition: Recognizing and Labeling Emotion Cues in Expressions and Situations

We assessed two frequently studied components of emotion knowledge—children's ability to recognize and label emotion cues in facial expressions and provocative situations. In the emotion expression task, interviewers presented children with eighteen photographs of prototypical, cross-culturally validated facial expressions of emotion on African-American [78] and European-American faces [12]. The task consisted of six different emotions measured by three items each. Positive emotion expressions included joy and surprise, and negative expressions included sadness, anger, fear, and disgust. We randomized order of

emotion expressions within each set of six. At the start of the task, experimenters read a list of six emotion labels corresponding to the six categories of emotion. Experimenters then presented expressions in turn and asked children to produce the appropriate label. Interviewers repeated the list of emotion labels after every third trial. The scoring procedure, adopted from Denham [79], gave a score of 2 for correct emotion category labels, a score of 1 for an incorrect category of the right emotional valence (e.g., "sad" for a fearful facial display), and a score of 0 for an incorrect category of the wrong valence. The maximum total score was 36. The eighteen items had moderate internal reliability ($\acute{\alpha}$ = .50). Children's total scores indexed their ability to recognize discrete emotion cues or signals in facial expressions.

We assessed ability to recognize and label emotionally salient cues in provocative situations by a task requiring children to label the emotion of a protagonist in eighteen different stories. The content for the stories came from earlier research on emotion situation knowledge and theoretical descriptions of the functions of emotions [12, 15, 60]. A previous study established the validity of the vignettes in eliciting specific emotions. Fifth-grade children consistently chose the expected emotion label for each of the six emotion-eliciting events [80]. We examined six different emotions on three trials each. Positive emotions included joy and interest, and negative emotions included sadness, anger, fear, and shame. We randomized the order of emotions represented in the emotion-eliciting events within each set of six. At the start of the task, experimenters read a set of six emotion labels that corresponded to the six categories of emotion-eliciting events. After reading each two or three sentence vignette, interviewers asked children how the protagonist would feel. Experimenters repeated the choices after every third trial. Coding corresponded with that for emotion expression knowledge. The eighteen items had moderate internal reliability ($\acute{\alpha}$ = .50). Children's total scores indexed their ability to recognize and label discrete emotion cues in provocative situations.

Emotion expression knowledge correlated with emotion situation knowledge (r = .35, $p < .01$). These measures relate moderately and cohere conceptually as indexes of the child's ability to recognize and label emotion cues in expressive behavior and various contexts. We standardized and aggregated these two measures to represent an index of emotion recognition. Internal reliability ($\acute{\alpha}$) for the aggregated index was .62.

Emotion Memories

We assessed emotion memories with the differential emotions memory task [81]. This task requires children to describe three situations or events that caused them to experience the positive emotions of joy and interest and the negative emotions of sadness, anger, fear, guilt, and shame. Two independent raters then judged whether or not the descriptions of events could have elicited the emotion

(kappa = .80). Children's total scores for emotion memories ranged from 0 to 21. Scores for the seven emotions had high internal reliability ($\acute{\alpha}$ = .83). The child's total number of descriptions of events that matched the designated discrete emotions served as the index of emotion memories.

Adaptive Social Behavior

We assessed adaptive social behavior by teacher ratings on the socialization domain of the Vineland Adaptive Behavior Scales [82] and the Prosocial Scale of the Teacher Predictions of Peer Nominations [83], both completed by children's teachers. Educators and researchers often use the VABS to assess a child's adaptive behavioral functioning. Three subscales compose the socialization domain: 1) play and leisure activities (e.g., "plays with toys or other object alone or with others," "follows rules in simple games without being reminded"), 2) interpersonal relationships (e.g., "shows a relatively consistent preference for some friends over others," "labels happiness, sadness, fear, and anger in self"), and 3) coping skills (e.g., "keeps secrets or confidences for as long as appropriate," "responds appropriately when introduced to strangers"). Teachers score items from 0 (i.e., the child does not display the behavior) to 2 (i.e., the child usually displays the behavior). Children's total scores on the socialization domain indexed children's adaptive social behavior, alpha = .94.

Teacher Predictions of Peer Nominations (TPPN)

The TPPN [83] asks teachers to estimate the percentage of children in the class who would nominate a child as aggressive, rejected, hyperactive, prosocial, popular, and victimized. We included the first four of these scales in our overall assessment battery and, for the present study, chose the four-item prosocial scale as a complement to the socialization domain of VABS. The prosocial items include: "gets along well with others" and "does nice things to help other people." In a study of 174 children, the prosocial scale had a coefficient alpha of .89 and correlated with actual peer nominations .53, $p < .001$.

The scores from the VABS socialization domain and the Prosocial scale of TPPN correlated .51 ($p < .01$) and the pooled set of items from the two measures yielded a Cronbach alpha of .91. Given these statistics, we decided to standardize and aggregate the scores on VABS and TPPN to obtain a more robust index of adaptive social behavior.

RESULTS

Table 1 presents the raw score means and standard deviations of all the variables, including the separate components of the temperament and emotion recognition aggregates. The mean Stanford-Binet score was about two-thirds of

Table 1. Raw Score Means and Standard Deviations for All Variables

Variable	*M*	*SD*
Family Income	16.98	13.29
Inhibition[a]		
Adaptability	3.14	.72
Approach	3.01	.71
Mood	3.49	.75
Inattention	2.57	3.06
Cognitive Ability	31.51	6.18
Verbal	16.70	2.53
Patterns	14.82	4.92
Emotion Recognition	51.94	5.44
Expressions	27.65	3.82
Situations	24.31	2.80
Emotional Memories	13.06	5.57
Adaptive Behavior[a]		
VABS	60.27	18.21
TPPN	36.89	24.64

[a]These aggregates are in standard scores
Note: Family Income is expressed in thousands of dollars

a standard deviation below national norms for first-graders. The children showed moderate emotion expression knowledge (M = 27.7 out of 36) and slightly less emotion situation knowledge (M = 24.3 out of 36). On average, children produced a little more than half the possible number of emotional memories (M = 13.0 out of 21).

Table 2 presents the inter-correlations for all variables. Emotion recognition and emotion memories have some different correlates. For example, inhibition does not relate significantly to emotion memories but correlates –.24 ($p < .01$) with emotion recognition. Emotion recognition and emotion memories have similar relations with inattention, but only the former correlates significantly (.31, $p < .01$) with cognitive ability. One of the components of emotion recognition, emotion labeling, does not correlate with emotion memories.

In a preliminary analysis, we regressed the index of adaptive social behavior on the two control and the four predictor variables. We entered the two control variables, family income then inattention, prior to the measures based on child performance. Because neither of these control variables accounted for significant variance in adaptive social behavior, we excluded them from the remaining analyses.

A hierarchical regression (Table 3) examined the first hypothesis. First, we entered the measures of child characteristics, temperamental inhibition followed

Table 2. Correlations between the Variables

	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Family Income													
2. Inhibition	−.19*												
3. Adaptability	−.20**	.83**											
4. Approach	−.09	.67**	.33**										
5. Mood	−.15*	.77**	.55**	.21**									
6. Inattention	−.05	.14	.19*	−.01	.14								
7. Cognitive Ability	−.04	−.06	−.14	.05	−.04	−.15*							
8. Verbal	.01	−.10	−.15*	.02	−.09	.03	.74**						
9. Patterns	−.07	.01	−.07	.06	.02	−.22**	.86**	.30**					
10. Emotion Recognition	.10	−.24**	−.27**	−.12	−.15	−.17*	.31**	.28**	.23				
11. Expressions	.16*	−.22**	−.23**	−.16*	−.11	−.12	.24**	.19**	.18*	.81**			
12. Situations	−.01	−.16*	−.20**	−.03	−.13	−.13	.26**	.25*	.19**	.81**	.32**		
13. Emotion Memories	.17*	−.06	−.08	−.07	.03	−.22**	.05	.05	.03	.23**	.30**	.07	
14. Social Behavior	.14	−.23**	−.27**	−.14	−.10	−.21**	.26**	.19*	.20*	.28**	.29*	.17*	.26**

*$p < .05$
**$p < .01$

by cognitive ability. Next, we entered the indexes of emotion knowledge, the traditional measure, emotion recognition, followed by the new measure, emotion memories. Both temperamental inhibition and cognitive ability produced a significant increment (ΔR^2) in the variance explained in adaptive social behavior. When entered after inhibition and cognitive ability, the traditional index of emotion knowledge (emotion recognition) produced a ΔR^2 of only .025 ($p < .056$), accounting for only 2.5 percent of the variance in adaptive social behavior. Even though entered last, emotion memories produced a significant ΔR^2, about equal in magnitude to that for inhibition and cognitive ability. In the final model, the betas for cognitive ability and emotion memories reached significance (*ps* < .01), but the betas for inhibition and emotion recognition did not (*ps* < .12 and .20), respectively.

Next, we tested our second hypothesis that emotion knowledge partially mediates the roles of temperamental inhibition and cognitive ability in adaptive social behavior. Emotion recognition, but no emotion memories, met the statistical criteria for identifying a mediator [69]. Emotion memories did not relate significantly to either inhibition or cognitive ability and thus failed the first criteria of a mediator: R^2s = .053 and .048 for the relation of emotion memories to inhibition and cognitive ability respectively, *F*s < .50.

Emotion Recognition as Mediator of the Role of Behavioral Inhibition in Adaptive Social Behavior

Demonstrating that emotion recognition mediates the relation of behavioral inhibition to adaptive social behavior required three regression analyses. The first regression analysis showed that the predictor variable (behavioral inhibition) relates significantly to the mediator (emotion recognition), $\Delta R^2 = .05$, $\beta = -.24$, $p < .003$. The second regression analysis (Table 4) shows that the predictor

Table 3. Hierarchical Regression with Inhibition, Cognitive Ability, Emotion Recognition and Emotion Memories as Predictors of Adaptive Social Behavior

Variable	*B*	*SE B*	β
1. Inhibition	–.11	.07	–.14
2. Cognitive Ability	.04	.01	.24**
3. Emotion Recognition	.12	.10	.12
4. Emotion Memories	.08	.03	.26**

Note: a = $p < .10$, *$p < .05$, **$p < .01$
ΔR^2 for variables 1-4 = .06**, .08**, .02[a], .06**, respectively
R^2 (model) = .22, $F(4,125) = 8.97$**
Statistics are from the final model

variable relates significantly to the criterion variable (adaptive social behavior), $\Delta R^2 = .05$, $\beta = -.23$, $p < .006$. The third regression analysis shows that emotion recognition partially mediates the relation of behavioral inhibition to adaptive social behavior. Emotion recognition predicts a concurrent index of adaptive social behavior, after removing the variance due to behavioral inhibition. When entered last in the regression equation, emotion recognition produced ΔR^2 = of .05, a β of .23, $p < .008$.

For an approximate test of the significance [69] of the effect of emotion recognition as a mediator of the relation between inhibition and adaptive social behavior, we calculated the product (ab) of the regression coefficients of the path (a) from the mediator (emotion recognition) to the predictor variable and the path (b) from the mediator to the criterion variable (adaptive social behavior). We then calculated the standard error of ab and divided ab by its standard error, yielding $z = 2.58$, $p < .01$.

Emotion Recognition as a Mediator of the Relation of Cognitive Ability to Adaptive Social Behavior

Demonstrating that emotion recognition mediates the relation of cognitive ability to adaptive social behavior required three regression analyses. The first regression analysis showed that the predictor variable (cognitive ability) relates significantly to the mediator (emotion recognition), $\Delta R^2 = .10$, $\beta = .31$, $p < .001$). The second regression analysis (Table 5) showed that the predictor variable relates significantly to the criterion variable (adaptive social behavior), $\Delta R^2 = .07$, $\beta = -.26$, $p < .001$. The third regression analysis in this series shows that emotion recognition partially mediates the relation of cognitive ability to adaptive social behavior. Emotion recognition predicts a concurrent measure of adaptive

Table 4. Hierarchical Regressions Examining Emotion Recognition as a Mediator of the Effect of Temperamental Inhibition on Adaptive Social Behavior

Variable	*B*	*SE B*	β
Equation 2			
Inhibition	–.19	.07	–.23**
Equation 3			
Inhibition	–.12	.07	–.15[a]
Emotion Recognition	.25	.09	.23**

Note: a = $p < .10$, *$p < .05$, **$p < .01$
For results of equation 1, see text.
For equation 2, $R^2 = .05$, $F(1,139) = 8.01$**
For equation 3, $R^2 = .10$, $F(2,134) = 7.10$**. For each predictor $\Delta R^2 = .05$*

Table 5. Hierarchical Regressions Examining Emotion Recognition as a Mediator of the Effect of Cognitive Ability on Adaptive Social Behavior

Variable	*B*	*SE B*	β
Equation 2			
Cognitive Ability	.04	.01	.26**
Equation 3			
Cognitive Ability	.03	.01	.21*
Emotion Recognition	.26	.08	.25**

Note: *$p < .05$, **$p < .01$
For results of equation 1, see text.
For equation 2, $R^2 = .08$, $F(1,148) = 10.71$**
For equation 3, $R^2 = .13$, $F(2,143) = 10.90$**. $\Delta R^2 = .08$**, .06**, for cognitive ability and emotion recognition, respectively.

social behavior, after removing the variance due to behavioral inhibition. When entered last in the regression equation, emotion recognition yielded $\Delta R^2 = .04$, β of .25, $p < .004$.

For an approximate test of the significance [69] of the effect of emotion recognition as a mediator of the relation between cognitive ability and adaptive social behavior, we calculated the product (ab) of the regression coefficients of the path (a) from the mediator (emotion recognition) to the predictor variable and the path (b) from the mediator to the criterion variable (adaptive social behavior). We then calculated the standard error of ab and divided ab by its standard error, yielding $z = 2.46$, $p < .025$.

To strengthen our claim of identifying emotion recognition as a mediator, we tested several alternative models examining whether other variables played a role in mediating the relations of factors associated with positive social behavior. We found that 1) temperament does not mediate the relation of emotion knowledge to the outcome measure, beta = –.14, $p > .095$, 2) temperament does not mediate the relation of cognitive ability to social behavior (the first equation in this analysis shows that the temperament index does not relate to cognitive ability, $F(1,164) = .539$, $p > .46$), 3) because temperament does not relate to cognitive ability, the latter cannot mediate the effects of the former, 4) Finally, adaptive social behavior does not mediate the relation of temperament to emotion recognition, $z = 1.38$, $p > .16$.

DISCUSSION

The lack of a significant effect of family income does not necessarily contradict previous research showing the adverse role of economic disadvantage on

socioemotional development. In effect, we controlled for economic conditions by selecting a sample of low income families. The null results for the control variable of inattention eliminates children's test session behavior as a confound and lends support to the internal validity of the study.

The results partially confirm our first hypothesis by showing that inhibition, cognitive ability, and emotion knowledge made contributions to the concurrent prediction of adaptive social behavior. We have to qualify the findings for inhibition and emotion knowledge. In the final model of our first regression analysis, the effect (beta) of inhibition only approached significance ($p < .12$) and only one component of emotion knowledge, emotion memories, had a significant relation to the outcome variable. The emotion memories component of emotion knowledge had a significant relation to adaptive social behavior after removing the variance due to inhibition, cognitive ability, and emotion recognition. Although emotion recognition did not have a significant relation to adaptive social behavior after controlling for indexes of both emotionality and intelligence, it partially mediated the relations of temperamental inhibition and cognitive ability to social behavior. Temperament and cognitive ability relate to emotion recognition which, in turn partially mediates their relations to social functioning. Analyses of the data in terms of alternative mediator models produced no significant results. Overall, the results show the importance of examining, and possibly removing or controlling for, the effects of child characteristics in studies of emotion knowledge and social behavior.

In summary, the present study makes several distinct contributions. 1) We used a wide range of measures to study emotion knowledge and social behavior in an understudied population, children from economically disadvantaged families. 2) We showed for the first time that studies of the relations of emotion knowledge and social behavior should include a relevant index of temperament, as well as cognitive ability. 3) We found evidence consistent with our theoretical framework and *a priori* hypothesis that emotion recognition partially mediates the relations of both temperament and cognitive ability to positive social behavior in children living in poverty or near-poverty conditions. The failure of several post hoc alternative mediator models strengthens our claim of mediator status for emotion recognition. The identification of emotion recognition as a process variable offers another perspective for understanding and facilitating the development of adaptive social behavior and socioemotional competence. 4) We introduced a new measure that enabled us to show that emotion memories account for a significant amount of variance in adaptive social behavior, about as much as indexes of temperament and cognitive ability.

Temperament, Cognitive Ability, and Adaptive Social Behavior

We had good reason to expect that temperament and cognitive ability would relate significantly to social behavior. High scores on the temperament trait of

inhibition might lead children to perceive others, especially unfamiliar persons, as unfriendly or threatening [46, 48, 61]. Moreover, as noted earlier, a sizeable body of research shows that the related constructs of emotionality, temperament, and personality significantly influence individual and social behavior [35, 46, 47]; for reviews, see [15, 17, 18, 20, 32, 42, 85, 86]. The same holds for the broad construct of intelligence and for the narrower constructs of academic intelligence and verbal ability [16, 21, 49]. Low cognitive ability, particularly verbal ability, places children at risk for behavior problems [49].

Emotion Recognition and Adaptive Social Behavior

Emotion recognition relates conceptually and logically to emotion communication, the encoding and decoding of emotion signals in social contexts. Previous research has shown that indexes of children's ability to recognize emotion cues in facial expressions and provocative situations relates to social behavior [12, 48, 61] (see [52] for review) and that a breakdown in emotion communication affects social relationships adversely [87-89]. Several other studies show that emotion recognition relates positively to empathy and prosocial behaviors [36, 61, 79, 90, 91]. This body of research indicates that children with greater emotion recognition abilities more often experience empathy and the motivation to engage in prosocial behavior. Therefore, in our initial regression analysis we expected somewhat stronger results for emotion recognition, the traditional index of emotion knowledge.

Several reasons may contribute to this discrepancy. Methods of measurement, ages of children, and population demographics have differed across studies. Furthermore, our indexes of the predictor variables of temperamental inhibition and cognitive ability accounted for 60 percent of the 14 percent of explained variance in adaptive social behavior before the emotion recognition aggregate entered the regression equation. Thus, the results of our initial regression analysis, as well as theory and previous research [64], suggested that emotion recognition might have a role as a mediator.

In our mediator models, emotion recognition, in the role of mediator, predicted concurrent adaptive social behavior. These models showed that the traditional index of emotion knowledge (recognition of emotion cues in facial expressions and provocative situations) partially mediated the relations of temperamental inhibition and cognitive ability to adaptive social behavior.

Emotion Recognition as a Mediator of the Relation of Temperament to Social Behavior

Our data do not specify the processes by which emotion recognition mediates the relation between inhibition and adaptive social behavior, but our findings are consistent with others that help explain such mediation. Family environments that are moderately emotionally expressive and accepting of children's emotions

afford children the opportunity to explore their own and others' emotional reactions and develop links between cues, situations, and emotional experiences [61, 67, 92]. Inhibited children may tend to avoid emotion-laden interactions with family members and peers. This avoidance may leave these children with less emotion information and possibly delayed in developing relations between situational activators, emotion expressions, emotion labels, and emotion feelings. Research has shown that greater social withdrawal corresponds with more limited emotion recognition abilities in children [48].

Inhibition and emotion recognition probably influence each other reciprocally. Temperament manifested as inhibition has roots in emotions such as shyness and fearfulness [46, 47]. The ability to detect and interpret emotion cues in social situations might help the child decrease the frequency of these emotions or diminish their intensity. For example, greater emotion decoding skills would facilitate children's interpretation of peers and adults as friendly and sociable, quite frequently a correct interpretation. These skills may be particularly salient in middle childhood as children make the transition to first-grade and greatly increase the frequency of encounters with unfamiliar peers and adults. In other ways as well, greater emotion decoding skills may give children the confidence and competence to initiate and sustain social interactions.

Emotion recognition may also facilitate emotion communication and social relationships because it minimizes flawed or inappropriate emotion-expressive behavior. If children lack the ability to recognize and interpret the expressive behavior of others, they are more likely to encode inappropriate expressions in response. Because of their motivational power, inappropriate expressions stemming from children's misinterpretations of others' expressions will lead to socially dysfunctional behavior. Equally important, children who lack ability in emotion recognition and related motivation essential for social communication and empathic responses will be deficient in these major contributors to good peer relations and socially competent behavior. Emotion recognition and emotion communication comprise the fundamentals of empathy and sympathy. The capacity to experience empathy relates positively to prosocial behavior and negatively to behavior problems [36, 91].

Emotion Recognition as a Mediator of the Relation of Cognitive Ability to Social Behavior

Because emotion recognition represents inter-system *connections* between emotions and cognition, and not simply the two separate systems, it should make a distinct contribution to the processes in adaptive social behavior after controlling for indexes of academic intelligence-verbal and spatial-visual abilities. Recognition of emotion cues in facial expressions and social situations apparently provides special information that helps determine appropriate social behavior.

Such emotion information is special because it bridges the emotions and cognitive system [13].

Theorists and researchers agree that intelligence alone cannot explain empathy, sympathy, and prosocial behavior [12, 90, 93]; cf. [53]. They maintain that these critical factors in social interactions and relationships have an emotion component. We propose that emotion recognition provides information essential to the emotion-feeling component of empathy. Inability to recognize the cues in expressive behavior and hence a lack of understanding of the affective state of others preclude the sharing of emotion through vicarious experience.

Emotion Memories and Adaptive Social Behavior

Emotion memories related significantly to adaptive social behavior after removing the variance due to temperament, cognitive ability, and a traditional index of emotion knowledge (emotion recognition). In our sample of economically disadvantaged children in middle childhood, emotion memories had a direct effect (beta in the final model, Table 3) stronger than that of emotion recognition and temperamental inhibition and about equal to that of cognitive ability.

We assume that discrete emotion memories are not affective information that represents events or experiences simply as good (pleasant) or bad (unpleasant), but images, symbols, and thoughts that can *activate* emotion-specific arousal and emotion motivation [13, 81]. Although one cannot store emotion arousal in memory, one can store representations of symbols or cues that readily activate specific emotions. Effective management and use of these cues in emotion regulation and social interactions require their appropriate categorization and organization in memory. When these conditions are met, emotion memories may activate emotion-specific arousal sufficient to increase attention to relevant features of the social context but not arousal intense enough to cause dysregulation. Researchers agree that intense arousal impedes adaptive behavior [92]. Evidence shows that frequent experiences of strong negative emotion in toddlers predict trait neuroticism at 3.5 years of age [94].

Children may also use memory-based emotion-specific arousal to help them anticipate the impact of threatening situations. Such anticipation would enable rehearsal of possible coping strategies in a safe and secure context. Opportunity, during mild emotion arousal, to rehearse the role a threatening situation might demand of them should provide children a strong advantage in emotion regulation and coping behavior [95]. For example, anticipation and rehearsal of encounters that elicit the powerful emotions of fear or shame might benefit the child in two ways. They may help the child avoid some threatening situations, modulate arousal when threat becomes unavoidable, and thus increase the likelihood of adaptive social behavior.

Discrete emotion memories make it possible to access representations of events and experiences in terms of a specific category. This makes the information

associated with that category available for discourse with parents or peers. Recalling an event as happy or sad, rather than simple as pleasant or unpleasant, provides useful information regarding causes, consequences, and behavioral strategies.

Limitations and Implications

The relatively low internal reliability coefficients for the two measures of emotion recognition probably reduced the magnitude of their relations to the other variables in the study. The low reliability probably resulted in part from the scatter of items across discrete emotions that have quite distinct meanings and functions. Computations of alphas with different items omitted showed no way to improve reliability. Nevertheless, the measures do show substantial criterion validity in the present study and others [48].

Our results raise a number of issues that require further research. At the same time, they provide information for planning programs designed to facilitate the development of emotion knowledge and adaptive social behavior.

Research

The present study concerned economically disadvantaged children, whose performance on a measure of academic aptitude was below average compared to the standardization sample but consistent with the performance of other low SES and ethnically diverse samples [96, 97]. The similarity in the thrust of the present findings, two sets of previous studies involving children of low-income families [12, 61], and several studies of middle-class children [52], suggests that, for children of comparable developmental levels, our principal findings generalize across economic conditions.

Although our study adds to a substantial body of research on relations of children's understanding of emotions to social behavior (see [52] for a review), we still lack suitable individual differences measures for several key facets of emotion knowledge, e.g., understanding of emotion feelings and emotion management techniques. Also, we have just begun the study of the role of emotion memories in the development of socioemotional competence.

Applications

Our findings support a degree of optimism regarding programs for facilitating the development of adaptive social behavior and preventing behavior problems through training and experience related to facets of emotion knowledge. The findings suggest that these promising programs might benefit from attempts to differentiate and address the roles of temperament, cognitive ability, and various facets of emotion knowledge in the development of adaptive social behavior.

The present findings imply that planners of prevention programs should give some thought to ways of fostering children's opportunities to organize emotion cues in memory. Existing literature offers a couple of possibilities. A number of studies have demonstrated the benefits of discourse about feelings for children's socioemotional development [63, 67, 91]. Others have shown the value of emotion coaching or parental guidance in helping children understand, label, and manage their emotions [68]. We suggest that discourse about feelings and emotion coaching might facilitate the effective organization of emotion cues in memory. Moreover, emotion socialization techniques that facilitate the development of emotion recognition may also lay the foundation for the representation of emotion-eliciting events and their organization in memory in terms of discrete emotion categories.

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EMOTIONAL INTELLIGENCE AS A SELF-REGULATORY PROCESS: A SOCIAL COGNITIVE VIEW

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ABSTRACT

One hundred adults were surveyed to test a self-regulation (SR) model of emotional intelligence (EI). The social cognitive SR concepts of motivation, goal setting, strategy usage, and self-evaluation were integrated with the EI components of the tendencies to be in touch with, sort out and regulate one's moods and emotions into a self-regulation model of EI. Factor and path analyses disclosed the model's construct validity as well as its power in explaining affective state. The findings were discussed in the light of social cognitive theory, and recommendations were made for further study.

In their treatment of psychological well-being, social scientists have repeatedly cited emotional regulation as an important area for study. For example, Salovey, Mayer, Goldman, Turvey, and Palfai [1] posited *regulating one's moods and emotions* as a central element of emotional intelligence, and in related work Fox [2] edited a text on the *regulation of emotion*—and Gross [3] suggested a need for the study of *emotion regulation* and its consequents to gain a full understanding of the dynamics involved in emotional soundness.

Although regulation has been a major focus of theorization about emotional health, to date descriptions of one's ability to manage one's emotions have been restricted to general statements about strategies that one can use for the purpose, and some writers have suggested a need for theoretical work that defines in greater detail what is meant by the term *regulation* [4]. The point is important because, upon reflection, there is little reason to expect strategy availability alone to insure

the active regulation of one's moods or emotions. It would seem possible to have a broad array of strategies at one's disposal, but to lack the motivation necessary to use them or the ability to self-monitor to insure one's effectiveness in their utilization. Under such circumstances, one should not necessarily be expected to effectively use such strategies for the purpose of emotional control. This conjecture would seem particularly relevant to theorization about *emotional intelligence* (EI), a postulated sphere of psychological functioning [1] in which one is seen as proactively seeking to come in touch with, sort out and regulate one's emotions and moods. It is an examination of an expanded view of the role of regulation in emotional intelligence that serves as the locus of the present study.

Social cognitive theorists have proposed a model of self-regulation (SR) that lends itself readily to a detailed description of emotional intelligence as a self-regulatory process. Social cognitive theory provides a perspective of SR which, while addressing the important matter of strategy usage, also stipulates processes without which the likelihood of the effective use of such strategies is lowered. This position specifically posits such additional elements as *motivation* to provide the volition necessary to begin the enactment of the strategy and to persist in its use, and *self-evaluation* to assess personal effectiveness in strategy utilization.

The purpose of this study was to develop and test a model of emotional intelligence that integrates self-regulation principles propounded by social cognitive theorists with concepts suggested by EI proponents. The reason for the study was a felt need for a description of emotional intelligence that provides a detailed account of EI's self-regulatory features. The study was conducted in two phases: model development and model validation.

MODEL DEVELOPMENT

Two steps were taken to develop the model for investigation. First, formulations were generated of *emotional intelligence* (EI) and *self-regulation* (SR) on the basis of the work on EI and SR that has appeared in the literature. Then, the two formulations were integrated into one cohesive model of emotional intelligence as a self-regulatory process.

Model Components

Model Components Gleaned From the Literature on Emotional Intelligence

Three processes of EI identified by Salovey et al. were used as key elements of the present model: Being in touch with one's moods and emotions, sorting out one's moods and emotions, and managing one's emotions and moods [1]. Salovey et al. [1] and Martinez-Pons [5, 6] showed the construct validity of this view of EI, and Martinez-Pons [5, 6] demonstrated this conceptualization's power

in explaining depression symptomatology, life satisfaction and adaptive forms of goal orientation in adults and adolescents. The component of the present model comprised of these three processes was termed *emotional engagement* (EE).

Model Components Gleaned From the Social Cognitive Literature on Self-Regulation

According to social cognitive theorists, a person who is self-regulated is one who is *motivated* to succeed at some task, sets realistic *goals* relative to the task, uses specific *strategies* in seeking these goals, *self-evaluates* to assess strategy effectiveness, and *adjusts* his or her strategy performance to insure success [7]. In the area of academic learning behavior, Martinez-Pons demonstrated this conceptualization's power in predicting school achievement, and the same predictive power was hypothesized for the area of emotional intelligence relative to psychological functioning [8]. For the present model, self-monitoring and strategy adjustment were conceptualized as a unitary feedback loop in which information gained through self-monitoring is used to adjust or replace the strategy before continuing in efforts at task completion.

Model Formulation

The social-cognitive model of emotional intelligence developed for investigation, entitled the Self-Regulation Model of Emotional Intelligence (SRMEI), appears in Table 1. The major columns in this Table contain the SR and EE processes culled from the literature, and the cells represent the intersections of the categories of SR and EE.

Table 1. Self-Regulation Model of Emotional Intelligence (SRMEI)

	Emotional Engagement		
Self-Regulation	Being in Touch with One's Moods and Emotions	Sorting Out One's Moods and Emotions	Managing One's Moods and Emotions
Motivation	a	b	c
Goal Setting	d	e	f
Strategy Usage	g	h	i
Self-Evaluation[1]	j	k	l

[1]Self-monitoring for strategy effectiveness and strategy adjustment as necessary.

A significant feature of the SRMEI is that it focuses attention on key areas of interaction between the social-cognitive view of self-regulation and emotional engagement processes advanced in the EI literature. In this way, the model serves as a heuristic for the identification or development of methodology for the assessment of EI as a self-regulatory process. For example, *Cell a* represents motivation to be in touch with one's moods and emotions, and an instrument based on the SRMEI would include items addressing this element of EI; *Cell e* represents goal setting in sorting out one's moods and emotions, and an instrument based on the SRMEI would include items addressing this element of emotional intelligence; and *Cell i* represents strategy usage in the management of one's moods and emotions—and an instrument based on the SRMEI would include items addressing this element of EI.

In addition to the model's cellular makeup, a sequential structure was assumed among the *motivation, goal setting,* and *strategy usage* components of the SRMEI, in that order, since on the basis of SR theory, it was deemed that goal setting in EI is unlikely to occur without motivation, and that effective strategy usage for emotional management is unlikely to happen in the absence of well-defined goals. The sequential structure stipulated among the components of the SRMEI is depicted in Figure 1.

Thus, the first phase of this study involved the development of a construct descriptive model of emotional intelligence incorporating elements of self-regulation found in the social cognitive literature. The second phase involved the model's validation.

MODEL VALIDATION

The validation of the SRMEI was conducted in two parts. First, the model's construct validity was evaluated by examining the cohesiveness of the *EISRS*'s items in reflecting a unitary construct of emotional intelligence, and by testing the SRMEI's proposed sequential structure. Then, the model's power in explaining various forms of affective state was evaluated.

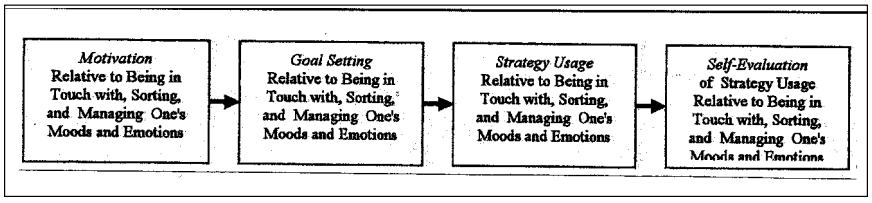

Figure 1. Sequential structure of the self-regulation model of emotional intelligence.

Participants

One hundred adults residing in a large metropolitan area and ranging in age between nineteen and sixty-one years (M = 31.21, SD = 14.02) participated in the study. The ethnic composition of the sample as forty-three White, non-Hispanic; twenty-eight Black; thirteen Hispanic; five Asian; and six self-described as "other" (there were 5 non-responses to the ethnicity research query). The socioeconomic background of the participants ranged between lower-middle and middle class. Twenty-two were male and seventy-six were female (there were 5 non-responses to the gender research query).

Instrumentation

SRMEI Components

The processes represented by the cells of the SRMEI (see Table 1) were assessed with the *Emotional Intelligence Self-Regulation Scale (EISRS),* a fifty-two item experimental questionnaire developed for the study. The items of the *EISRS* appear in Table 2, along with the internal reliability alpha ( ) coefficients for the various item groupings. The prompts and response formats for the different item sets appearing in this table are described in the following paragraphs.

Table 2. Emotional Intelligence Self-Regulation Scale (*EISRS*) Items.
Each Group's Internal Consistency Reliability Alpha (A) Coefficient
is Shown Along with the Group's Response Mode.
The Prompts and Response Scales are Described in the Text.

MOTIVATION RELATIVE TO BEING IN TOUCH WITH ONE'S MOODS AND EMOTIONS α = .75
(*Degree of agreement*)
I can maintain better control of my life if I keep in touch with my moods and emotions.
I am able to overcome any distractions that arise as I try to keep in touch with my moods and emotions.
I find it worthwhile to spend the time and effort necessary to keep in touch with my moods and emotions.
MOTIVATION RELATIVE TO SORTING OUT ONE'S MOODS AND EMOTIONS α = .78
(*Degree of agreement*)
I am able to maintain better control of my life if I am able to sort out my moods and emotions.
I am able to overcome any obstacles that arise as I try to sort out my moods and emotions.
I find it worthwhile to spend the time and effort necessary to sort out my moods and emotions.

Table 2. (Cont'd.)

MOTIVATION RELATIVE TO REGULATING ONE'S MOODS AND EMOTIONS
α =.76
(*Degree of agreement)*
I can maintain better control of my life if I can effectively manage my moods and emotions.
I am able to overcome any obstacles that arise as I try to manage my moods and emotions.
I find it worthwhile to spend the time and effort necessary to manage my moods and emotions.

GOAL SETTING RELATIVE TO BEING IN TOUCH WITH ONE'S MOODS AND EMOTIONS
α = .81
(*Frequency*/*consistency of enactment*)
in general, to be in touch with your moods and emotions
to know how you are feeling at any point in time
to be aware when you are switching between one emotion and another
to be able to tell how your behavior is being affected by your emotions
to be able to tell *how strongly* you feel about something

GOAL SETTING RELATIVE TO SORTING OUT ONE'S MOODS AND EMOTIONS
α = .92
(*Frequency*/*consistency of enactment*)
in general, to sort out the various moods and emotions you are experiencing at any given time.
to be able to tell the number of moods and emotions you are experiencing
to tell how the moods and emotions you are experiencing differ from each other
to determine how the strength of each mood or emotion affects the strengths of the others
to determine how your different moods and emotions interact to affect your general state of mind

GOAL SETTING RELATIVE TO MANAGING ONE'S MOODS AND EMOTIONS
α = .815
(*Frequency*/*consistency of enactment*)
in general, to effectively manage your moods and emotions
to increase or decrease the strength of a mood or emotion to enable you to regain or maintain your "peace of mind"
to increase or decrease the strength of the mood or emotion to enable you to more efficiently perform a task
to stop a negative mood or emotion from worsening to enable you to maintain or regain "peace of mind"
to stop a negative mood or emotion from worsening in order to arrest deterioration of your performance on some task
to compensate for the negative effect of some mood or emotion to enable you to regain your peace of mind

Table 2. (Cont'd.)

STRATEGY USAGE RELATIVE TO BEING IN TOUCH WITH ONE'S MOODS AND EMOTIONS $\alpha = .89$
(*Frequency/consistency of enactment*)
taking "time out" to reflect about how you are feeling
asking yourself, "how am I feeling now?"
ascertaining your feelings by noting your heartbeat, breathing and other bodily processes
avoiding the suppression or "squelching" of your moods and emotions
being on the alert for early signs of emotional distress
ascertaining your feelings by noting how you are behaving
observing others' reactions to your behavior to determine how your moods and emotions are affecting you

STRATEGY USAGE RELATIVE TO SORTING OUT ONE'S MOODS AND EMOTIONS $\alpha = .90$
(*Frequency/consistency of enactment*)
developing a clear idea of the range of moods and emotions you are capable of experiencing
naming the different moods and emotions you are experiencing at any given time
noting what action the different moods or emotions seems to elicit on your part
noting what happens just before you begin experiencing each mood or emotion
noting what is happening during the time that you are experiencing each mood or emotion
noting how each mood or emotion is affecting your ability to think clearly

STRATEGY USAGE RELATIVE TO MANAGING ONE'S MOODS AND EMOTIONS $\alpha = .82$
(*Frequency/consistency of enactment*)
challenging the thought precipitating a negative mood or emotion (e.g., reinterpreting a negative situation "to see its bright side")
modifying a situation eliciting a bad mood or emotion (e.g., turning down a loud radio or TV)
talking about your feelings with someone
imagining a pleasant experience to offset a negative feeling
working on a hobby
thinking of good things you have done
actively avoiding situations that depress you
taking action to prevent things that depress you from taking place
doing things at which you are good in order to help you feel better about yourself
helping others in need of help to help you overcome a feeling of depression

GENERAL SELF-EVALUATION (SELF-MONITORING AND STRATEGY ADJUSTMENT) $\alpha = .94$
(*Frequency/consistency of enactment*)
checking to make sure that you are properly using the strategy
checking to insure that the strategy you are using is having its desired effect
adjusting your behavior to better use the strategy
switching to a more effective strategy if you notice that the one you are using is not working well

The *motivation* items of the *EISRS* were developed partly on the basis of Bandura's social cognitive theory, which posits that motivation involves *self-efficacy* (SE) and *outcome expectations* (OE) [9]. SE involves one's confidence of being able to successfully complete a task, and OE involves one's expectation of positive or negative consequences of successful task completion. According to this view, a person with a high degree of self-efficacy and a high expectation of positive consequences of success is more likely to want to embark on a course of action than a person with a low degree of self-efficacy or a negative outcome expectation. A third element was added to the motivation items of the *EISRS: cost estimate* (CE) [10], or one's projection of what it would cost in terms of time, effort, etc., to complete the task—or one's willingness to make the investment in time or resources necessary for task completion. For the motivation items, the respondents were asked to show how much they agreed with statements addressing SE, OE, and CE. The response format for this subscale of the *EISRS* ranged between 1 (*completely disagree*) and 7 (*completely agree*). As shown in Table 2, one set of motivation items was developed separately for each of the EE components of being in touch with, sorting out and managing one's moods and emotions.

For the *goal setting* items of the *EISRS,* the respondents were asked to show how often they set clear goals for coming in touch with, sorting out, and managing their moods and emotions. The response format for this subscale ranged between 1 (*I never try to reach or maintain this* goal) and 7 (*I'm always trying to reach or maintain this* goal). As shown in Table 2, one set of motivation items was developed separately for each of the EE components of the SRMEI.

For the *strategy usage* items of the *EISRS,* the respondents were asked to show how often they use given techniques to help them in coming in touch with, sorting out, and managing their moods and emotions. As shown in Table 2, one set of strategy usage items was developed separately for each of the EE components. For the EE component of emotional management, the items focused on strategies suggested in the literature [11-13] for general emotional control (6 items were included to address this area) and also, more specifically, for the control of depression (4 items were included to address this area). The reason depression was selected as a strategy target was that it has been identified as the one single emotion people try most intensely to overcome [14], and it was deemed important to examine its relation, in the context of the present theoretical work, to strategies specifically suggested for combating it. For each strategy item, the respondents were asked to show how often they use the technique in question, and they responded using a scale ranging between 1 (*"I never do this at all"*) and 7 (*"I'm always doing this—this is part of my daily routine"*).

Self-evaluation was conceptualized as dual behavior involving *self-monitoring* and *strategy adjustment.* For this part of the *EISRS,* the respondents were asked to show how often they check their effectiveness in using some strategy as they attempt to come in touch with, sort out or control their moods and emotions—and how often they adjust their strategy-usage behavior if they see

the need for doing so. As shown in Table 2, self-evaluation items were not developed separately for cells *j, k,* and *l* of the SRMEI; rather, they were developed to address self-evaluation in strategy usage in general, collapsing across the three EE components of the SRMEI. This approach was taken because the same wording seemed to apply with equal relevance to strategy usage within the three EE components (recommendations for more detailed examination of self-evaluation for each of the EE components are made in the *Discussion* section). The response format of the self-evaluation subscale of the *EISRS* ranged between 1 (*"I never do this"*) and 7 (*"I always do this"*).

Four *EISRS* scores were developed for use in the investigation. They were generated by summing the items corresponding to each of the first three *self-regulation* rows of the SRMEI appearing in Table 1: *motivation* (M; 9 items, corresponding to cells *a, b,* and *c*), *goal setting* (GS; 16 items, corresponding to cells *d, e,* and *f*), and *strategy usage* (SU; 23 items, corresponding to cells *g, h,* and *i*); and by summing the self-monitoring and strategy adjustment items constituting *self-evaluation* (SEV; 4 items). The internal consistency reliabilities of the M, GS, SU, and SEV subscores were .90, .89, .90, and .94, respectively. The construct validation of the *EISRS* is described below, under *Method of Data Analysis.*

Depression

Depression was assessed with the *Depression Questionnaire (DQ)*, an experimental instrument prepared from an item pooled developed by Zung [15]. The instrument consists of fifteen statements (e.g., "A good part of the time I have crying spells or feel like it" and "I always feel down-hearted or blue") with which the respondent indicates his or her degree of agreement. The response format ranges from 1 (*"completely disagree"*) and 7 (*"completely agree"*). Martinez-Pons [5] found a negative correlation of $r = -.51$, $p < .05$ between this measure of depression and emotional intelligence as measured by the *Trait Meta-Mood Scale* [1]. For the present sample, the internal consistency reliability of the *DQ* was = .80.

Positive Affect

Positive affect was assessed with the *Positive Affect Questionnaire (PAQ),* an experimental ten-item instrument developed for the study. The respondents were asked to show how often they experience the feeling denoted by each item (e.g., "a good part of the time I feel competent" and "a good part of the time I feel proud"), and they responded using a scale ranging between 1 (*"I never feel this way"*) and 7 (*"I always feel this way"*).

The validity of the *PAQ* was tested by correlating it with other, previously validated tests of positive and negative affect. For a group of thirty adults matched to the present sample, the correlation of the *PAQ* with the *anxiety*

subscale of the *Multiple Affect Adjective Check List (MAACL;* [16]) was $r = -.59$, $p < .05$; and that of the *PAQ* with the *positive affect* subscale of the *MAACL* was $r = .55$, $p < .05$. For the present sample ($N = 100$), the *PAQ*'s internal consistency reliability was = .89.

Life Satisfaction

Life Satisfaction was assessed with the *Life Satisfaction Questionnaire (LSQ)* [18]. Consisting of fifteen items, the *LSQ* seeks information about general life satisfaction, posing statements such as "I'm better off than a lot of people I know" and "I don't have a sense of fulfillment about my life." The response format enables the participant to indicate how much he or she agrees with each statement; it ranges between 1 (*"completely disagree"*) and 7 (*"completely agree"*). In a previous study, Martinez-Pons [17] found a correlation between the *LSQ* and a measure of depression [15] of $r = -.64$, $p < .05$. For the present sample, the internal consistency reliability of the LSQ was = .87.

Method of Data Analysis

The data were analyzed to test the *EISRS*'s construct validity as well as its power in explaining the three affective states extraneous to EI described earlier: depression, positive affect and life satisfaction.

Construct Validity

Two aspects of the *EISRS*'s construct validity were tested. The first, involving the instrument's convergent and discriminant power, addressed the cohesiveness of the *EISRS*'s items vis-a-vis measures of affective states extraneous to emotional intelligence. The second aspect of construct validity tested involved the sequential structure stipulated among the components of the SRMEI. Since the *EISRS*'s items were directly derived from the SRMEI, it was judged that construct validation of the former would constitute evidence of the construct validity of the latter.

Convergent and discriminant validity—Convergence and discrimination criteria advanced by Campbell and Fiske [18] were used to address the cohesiveness of the *EISRS*'s components as measures of a unitary construct of emotional intelligence. These criteria are that in order for an instrument to possess construct validity, instrument scores must load together on the same hypothesized factors (convergent validity) but not on different although related factors (discriminant validity). The measures extraneous to EI used to test the cohesiveness of the *EISRS*'s components were depression (D), positive affect (PA), and life satisfaction (LS).

Factor analysis was used to address the cohesiveness of the *EISRS* against the D, PA and LS measures. Two factors were hypothesized. *EISRS* motivation, goal setting and strategy usage subscores, collapsing across the touch, sort and management elements of *emotional engagement* (EE; see Table 1) were expected to load exclusively on one factor; and the D, PA, and LS measures were hypothesized to load exclusively on the other. A correlation was hypothesized between the two factors, and hence, oblique (oblimin) rotations were used in the analysis. Steven's criteria for the statistical significance of factor loadings were used to interpret the factor analysis outcomes: For the present sample size of 100 cases, loadings of .51 and above were interpreted as statistically significant beyond the .01 level (two-tailed test). *SPSS PC+* was used to execute the factor analysis [19].

Validity of the SRMEI's hypothesized internal structure—The validation procedure described above involved measures extraneous to EI against which the cohesiveness of the *EISRS*'s items in representing a unitary construct was tested. But an internal sequential structure was also stipulated among the motivation (M), goal setting (GS), strategy usage (SU), and self-evaluation (SEV) components of the SRMEI, and for the model to possess construct validity the data must also reflect this internal makeup. In the second part of the validation effort, criteria stipulated by Guttman were used to test the SRMEI's sequential composition [20]. Guttman's criteria for such structures are that for the sequential assumption to be tenable, statistically significant correlations must exist between adjacent components, and lower or non-significant correlations must emerge between non-adjacent components. Thus, for the SRMEI to fully possess construct validity, statistically significant correlations must emerge of M with GS, of GS with SU, and of SU with SEV; and lower or non-significant correlations must emerge of M with SU and SEV, and of GS with SEV.

Spurious correlations can emerge between non-adjacent components in sequential structures due to intervening effects, and it is often necessary to statistically control for such distorting influences. Path analysis is a statistical procedure used to control for mediating processes, and it is was used to test the assumption of a sequential structure among the M, GS, SU, and SEV components of the SRMEI—while controlling for the possible confounding intervening roles played by GS and SU [21]. The method used in path analysis to control for such interposing influences is termed "data fitting"; it involves determining whether the model explains the same proportion of the variance in the data with linkages omitted as it does with all linkages included. A path model is said to "fit the data" if the proportion of the variance explained is the same in both cases, and it is said to not fit the data if the proportion is statistically significantly lower for the restricted model. For Guttman sequence testing, the linkages omitted are those connecting non-adjacent components; in the present analysis, the linkages omitted were M → SU, M → SEV, and GS → SEV.

Bentler's comparative fit index (*CFI*) was used to test the model's fit of the data [22]. Although a χ^2 test is sometimes used for model fitting in path analysis, the

test statistic is sensitive to sample size, and it is not unusual for it to yield misleading information regarding model fit in the case of large samples. The *CFI* has the advantage over the χ^2 statistic in that the former is insensitive to sample size, providing more accurate model fit information than the latter when samples are as large as the present one. Bentler's criterion was used for the interpretation of *CFI*: a *CFI* greater than .90 was interpreted as indicative of a good fit [22].

Power of the SRMEI in Explaining Affective State

The major hypothesis posed for this part of the investigation, developed on the basis of the SRMEI's sequential structure, was that the element of EI which most directly influences affective state is strategy evaluation (self-monitoring and strategy adjustment), after the motivation, goal setting, and strategy usage processes have taken effect. This hypothesis was entertained for its intuitive appeal: As suggested in the introductory remarks, strategy usage by itself should not necessarily be expected to directly predict affective state; among other things, it would seem possible for one to perseverate in one's use of an ineffective strategy, and thus enable the affective state to continue unchanged despite one's efforts at modifying it. The self-regulatory component of EI which should be expected to have the most direct and powerful correlation with affective state is the feedback loop of self-monitoring and strategy adjustment that comes at the tail end of the self-regulatory process. As in the previous path analysis, a *CFI* greater than .90 was interpreted as indicative of a good fit of the data. *EQS* [23], a statistical computer package for the testing of structural equations models, was used to execute the path analysis procedures.

RESULTS

Construct Validity of the SRMEI

Convergent and Discriminant Validity

The correlations and means and standard deviations of the four self-regulation subscores and the depression, positive affect and life satisfaction scores appear in Table 3, the unrotated factor matrix appears in Table 4, and the rotated factor matrix appears in Table 5 along with the communalities and eigenvalues.

As hypothesized, two factors emerged. As shown in Table 4, all seven measures examined loaded statistically significantly on the first unrotated factor, disclosing a general factor of *general psychological functioning.* Depression manifested a negative loading on this factor, and only goal setting and depression manifested statistically significant loadings on the second unrotated factor.

Also as hypothesized, the two emergent factors proved to be correlated, a finding that led to the use of the factor pattern matrix appearing in Table 5. The

Table 3. Correlation Matrix, Means and Standard Deviations

Score	1	2	3	4	5	6	7	Mean	Std Dev
1. Motivation	1.000	.643	.523	.476	−.207	.340	.309	43.577	10.298
2. Goal Setting		1.000	.752	.643	−.305	.290	.288	67.536	16.188
3. Strategy usage			1.000	.645	−.400	.452	.446	90.216	23.168
4. Self-Evaluation				1.000	−.534	.459	.413	12.351	6.828
5. Depression					1.000	−.687	−.691	43.103	13.131
6. Positive affect						1.000	.700	50.196	11.469
7. Life satisfaction							1.000	105.072	17.920

Table 4. Unrotated Factor Matrix.
Loadings Enclosed in Parentheses are Statistically Non-Significant;
Loadings Not Enclosed in Parentheses are Statistically Significant
Beyond the .01 Level, 2-Tailed Test [20]

	Factor 1	Factor 2
Motivation	.65607	(.45805)
Goal setting	.75102	.54016)
Strategy usage	.81330	(.30915)
Self-Evaluation	.80379	(.17376)
Depression	−.73000	.52086
Positive affect	.74795	(−.47228)
Life satisfaction	.73101	(−.49781)

Table 5. Factor Pattern Matrix.
Loadings Enclosed in Parentheses are Statistically Non-Significant;
Loadings Not Enclosed in Parentheses are Statistically Significant
Beyond the .01 Level, 2-Tailed Test [20]

	Factor 1	Factor 2	Communality
Motivation	.83267	(.08225)	.64023
Goal setting	.96779	(.10934)	.85607
Strategy usage	.79510	(−.14806)	.75703
Self-Evaluation	.66501	(−.27371)	.67628
Depression	(.01817)	.90456	.80419
Positive affect	(.03766)	−.86747	.78248
Life satisfaction	(.00360)	−.88284	.78219
Eigenvalue	3.93	1.36	
% of variance	56.10	19.60	
Total variance	75.70		

$\varnothing = -.44$

first rotated factor, with an eigenvalue of 3.93, accounted for 56.10 percent of the variance; and the second factor, with an eigenvalue of 1.36, accounted for 19.6 percent. Together, the two factors accounted for 75.7 percent of the variance in the data. More importantly, only the *EISRS* items loaded statistically significantly on the first rotated factor, disclosing an *emotional intelligence* factor; and only the measures of depression (D), positive affect (PA), and life satisfaction (LS) loaded statistically on the second factor (since the loading of D on the second factor was positive and those of PA and LS were negative, the factor can be seen as negatively valenced, a quality that explains the negative correlation that emerged between the two factors). These findings, supporting the hypotheses posed for this part of the investigation, provide evidence of the convergent and discriminant power of the *Emotional Intelligence Self-Regulation Scale*—and by implication, of the construct validity of the SRMEI.

Validity of the SRMEI's Hypothesized Sequential Structure

The second part of the construct validation of the SRMEI involved a test of the model's sequential structure. The correlation matrix and means and standard deviations of the *EISRS* subscores corresponding to the first three rows of the SRMEI, as well as the measure of self-evaluation, appear in Table 3; and the path analysis outcomes for these measures appear in Figure 2.

As shown in Figure 2, the restricted model exhibited a good fit of the data, *CFI* = .96—validating the omission of the M → SU, M → SEV, and GS → SEV linkages in the restricted model. The model explained 42 percent of the variance in SE ($\beta = .65$, $p < .05$), accounted for entirely by SU. It also explained 62 percent of the variance in SU ($\beta = .79$, $p < .05$), accounted for entirely by GS. Finally, the

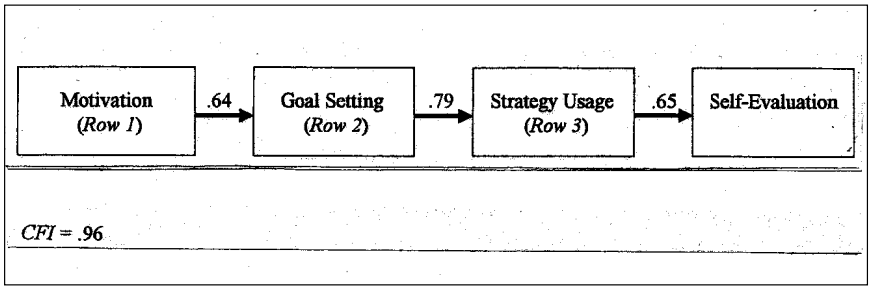

Figure 2. Path analysis outcomes of the SRMEI model. The SRMEI row (see Table 1) corresponding to each variable in this model is shown in parentheses. The path coefficients shown are statistically significant beyond the .05 level.

model explained 41 percent of the variance in GS (= .64, $p < .05$), accounted for by motivation. These outcomes, adhering to Guttman's criteria for sequential structures, show that the relations among M, GS, SU, and SEV follow the sequence stipulated for the SRMEI on the basis of self-regulation theory.

Power of the SRMEI in Explaining Affective State

As noted earlier, depression (D), positive affect (PA), and life satisfaction (LS) loaded on a single factor separately from emotional intelligence—and, as shown in Table 3, the correlations among D, PA, and LS proved high. On the basis of these findings, the three measures were combined through structural equations methodology into a composite variable of *affective state.* This composite measure was used in a path model to test the power of the SRMEI in explaining the affective processes extraneous to EI examined in this study. In Figure 3, the factor loadings in the form of lambda (λ) coefficients, appear along the linkages connecting the D, PA, and LS measures to the factor of *affective state;* and the path coefficients, in the form of standardized regression weights (β), appear along the connections among the four EI measures and the *affective state* factor.

As shown in Figure 3, the restricted model displayed a good fit of the data, *CFI* = .93. As in the previous path analysis, this finding attests to the justification for the excluded linkages in the restricted model. The loadings of depression (D), positive affect (PA), and life satisfaction (LS) with the factor of *affective state*

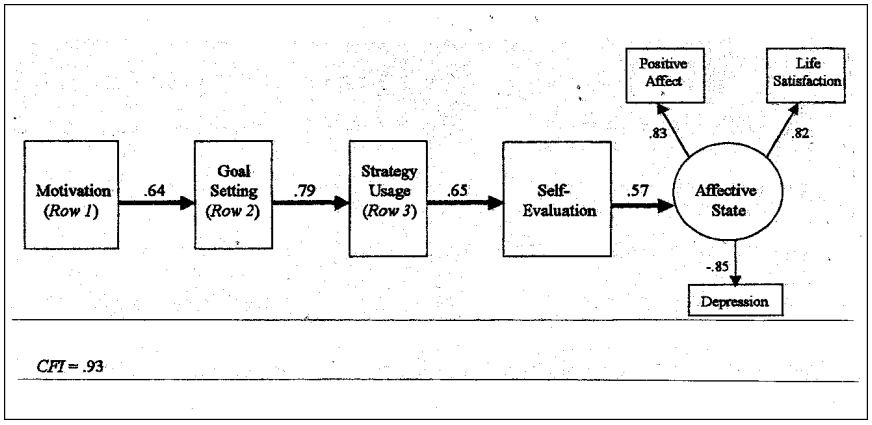

Figure 3. Path analysis outcomes of the SRMEI model's prediction of affective state. The SRMEI rows (see Table 1) corresponding to the variables are shown in parentheses. All coefficients shown are statistically significant beyond the .05 level.

ranged between .82 for LS and –.85 for D. More importantly, the model explained 33 percent of the variance in *affective state* ($\beta = .57$, $p < .05$), accounted for entirely by self-evaluation. This finding supports the hypothesis posed for this part of the investigation and highlights the importance of the sequential self-regulatory nature of EI in explaining emotional states such as depression and positive affect.

Thus, the factor analysis outcomes demonstrated the convergent and discriminant power of the *EISRS,* and the path analysis findings supported the hypothesized sequential structure of the model developed for investigation. Along with the outcomes regarding the model's power in explaining emotional state, these findings show the feasibility of thinking of emotional intelligence as a sequential, self-regulatory process.

DISCUSSION

The purpose of this study was to develop and test a self-regulation model of emotional intelligence, and a social cognitive perspective was taken as the basis of theory building. The following discussion revolves around three issues related to the findings: support of the hypotheses, implications for EI education and remediation, and limitations of the study and recommendations for further research.

Support of the Hypotheses

The three major hypotheses posed for investigation were that 1) the subscores of the *EISRS* corresponding to the rows of the SRMEI would load on a factor separate although related to affective state; 2) statistically significant correlations would emerge between *EISRS* subscores corresponding to adjacent components in the SRMEI sequence, and statistically non-significant correlations would emerge between subscores corresponding to non-adjacent components; and 3) the *EISRS* subscore corresponding to the component of the SRMEI most directly associated with variability in affective state would be self-evaluation, coming at the tail end of the self-regulatory process involved in emotional intelligence. The hypotheses were supported, attesting to the viability of thinking of emotional intelligence (EI) as a self-regulatory sequence involving motivation, goal setting, strategy usage, and self-evaluation. Of particular interest regarding the findings was the sequential structure of the model. While neither motivation, goal setting nor strategy usage proved to directly influence affective state, the findings also show that without strategy usage there can be little or no self-evaluation, that without goal setting there can be little or no concerted strategy use, and that without motivation little goal setting is likely to occur; each component, it is clear, plays a key role in the sequential process of EI leading to a relation with

affective functioning. To my knowledge, this is the first time that emotional intelligence has been studied in detail as a full self-regulatory process involving this important structural sequence.

Implications for EI Education and Remediation

Noting that such forms of negative affect as anger, anxiety, and depression have become widespread problems among grade school and secondary school students, Woitaszewski, Aalsma, and Gridly called for effective educational programs designed to enhance students' emotional intelligence [24]. The present findings show promise in this regard. One general educational implication that emerges from the outcomes is that, in designing EI curricula, effort can be fruitfully concentrated on motivating participants to become involved in the management of their moods and emotions; and then, on training in order to enhance their skills for realistic goal setting, strategy usage, and self-evaluation in emotional self-regulation. In addition, since in the pursuit of any goal it often becomes necessary to self-motivate to persist in one's efforts in the face of emerging obstacles, it seems important to include training in self-motivation skills as part of the motivational interventions.

The major implication that emerges from the findings relative to remediation is diagnostic in nature. In the case in which a person is experiencing emotional difficulties, it may be important to pinpoint the self-regulatory EI component (i.e., that component represented by a given cell of the SRMEI) in which the problem occurs, and to then concentrate intervention efforts in this area. This approach can serve to prevent the form of wasted effort involved when the problem lies in, say, low *motivation* to manage one's emotions (*Cell c*) and the attempt is directed solely at, say, training in *strategy skills* for managing one's emotions (*Cell i*). In fact, development of a twelve-score diagnostic profile, one score for each cell of the SRMEI, would seem to offer promise for determining the best way to proceed in helping someone in overcoming serious emotional difficulties.

Study Limitations and Recommendations for Further Study

One limitation of the investigation involves the scope of the SRMEI: For this study, it addressed only the self-oriented aspect of emotional intelligence (EI), leaving aside the ability to attend to, sort, and help manage the moods and emotions of others—a set of behaviors seen as aspects of EI. In previous work, Martinez-Pons reported a strong correlation between the self- and other-oriented aspects of EI ($r = .50$, $p < .05$), suggesting that knowledge of the former is sufficient for predicting the latter [6]. On the other hand, the author also showed that, while EI's self-oriented aspect is directly related to *internal psychological processes* such as depression, it is the other-oriented aspect that

is directly related to *positive or negative social interactions* such as quality of peer relations. Although examination of the other-oriented aspect of EI was beyond the scope of this study, it seems important to include measures of the other-oriented aspect in an instrument based on the SRMEI to explore the model's ability to show the relation of EI with social as well as psychological functioning.

A possible second limitation of the study involves the self-evaluation items developed for the *EISRS.* As noted earlier, one set of items was used to globally address self-evaluation of strategy usage in general, ignoring the distinctions among the *touch, sort,* and *management* components of emotional engagement—and it may be important to address this feature of emotional intelligence for each component separately. While the general M, GS, and SU measures of self-regulation used in the construct validation effort gave some legitimacy to the use of the global self-evaluation items, a more detailed look at SE for each of the EE elements may add important information to that generated in this study.

Finally, while a substantial relation emerged of *EISRS* scores with affective state, it must be kept in mind that the study was correlational in nature, and that definitive evidence of causality can be obtained only through the use of experimental designs employing pre- and post-tests and control and experimental groups. At the same time, the SRMEI adhered to Guttman's criteria for sequential structures among the variables examined, a finding consistent with the temporal sequence involved in causal relations. These findings show promise for experimentation examining the way in which training in emotional intelligence as a self-regulatory process can influence other aspects of psychological functioning. I recommend work that experimentally examines such effects.

In summary, this study has shown the usefulness of thinking of emotional intelligence in terms of a self-regulatory process involving motivation, goal setting, strategy usage, and self-evaluation comprising self-monitoring and strategy adjustment. The model developed for investigations proved to have theoretical validity and heuristic power for instrument development, and it shows promise for further research involving educational and diagnostic methodology in this important region of psychological functioning.

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IMAGERY IN OBSESSIVE-COMPULSIVE DISORDER: IMPLICATIONS FOR SYMPTOMS AND TREATMENT

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ABSTRACT

The present article examines the existing literature on the role of imagery in the symptoms and treatment of obsessive-compulsive disorder (OCD). Intrusive thoughts and images are conceptualized as falling somewhere along a continuum of normality to pathology. The development of OCD is discussed as resulting from anxious emotional states and dysfunctional cognitive appraisals that occur in response to intrusive cognitions. Four types of imagery evidenced by OCD sufferers are reviewed from de Silva's paper: the obsessional image, the compulsive image, the disaster image, and the disruptive image [1]. The logic and efficacy of an imagery component in the treatment of OCD is discussed, particularly as it pertains to the implementation of imaginal exposure within the framework of the empirically validated cognitive-behavioral treatment of exposure and responsive prevention.

The value of research on imagery for understanding and treating obsessive-compulsive disorder (OCD) seems obvious because not only are certain types of imagery symptomatic of the disorder, but also imagery has contributed positively as a treatment component in a number of studies [2-4]. This article examines three primary facets of the interplay between imagery and OCD. First, thought and imagery are discussed along a continuum of normality to OCD pathology. An attempt will be made to clarify the definition of obsessions from an imagery standpoint and to demonstrate how a dysfunctional appraisal of thoughts and images renders OCD sufferers pathological. Secondly, a review of de Silva's

useful paper will be offered in which he differentiated between four major subtypes of obsessional-compulsive imagery: the obsessional image, the compulsive image, the disaster image, and the disruptive image [1]. My third objective is to discuss the role of imagery in the treatment of OCD. Various perspectives on the relevance of imagery to treatment will be considered, followed by a brief overview of cognitive-behavioral therapies for OCD that have incorporated imagery as a treatment component. Exposure and response prevention (EX/RP) will be introduced as an empirically validated treatment for OCD [5-12], and the effectiveness of incorporating imagery within this treatment framework will be examined.

NORMAL AND PATHOLOGICAL INTRUSIVE COGNITIONS

Researchers studying obsessive-compulsive disorder have been confronted with the problem of identifying the point at which OCD symptoms, which are experienced even by normals, become pathological. Essentially, it is the distress the symptoms cause the sufferer, and not the symptoms in and of themselves, that define the disorder. This point is easily illustrated by two definitions of "obsessions." The DSM-IV (Diagnostic and Statistical Manual of Mental Disorders, 4th edition) characterizes obsessions as "persistent ideas, thoughts, impulses, or images that are experienced as intrusive and inappropriate and cause marked anxiety or distress" [13, p. 418]. Rachman and Shafran defined an obsession to mean "an intrusive, repetitive thought, image, or impulse that is unacceptable or unwanted and gives rise to subjective resistance" [14, p. 51]. Whereas many individuals without pathology may occasionally experience persistent, repetitive, and intrusive thoughts and images such as those described above, OCD sufferers differentiate themselves through the intense anxiety they endure in relation to an obsessional experience.

Beyond anecdotal evidence of occasional intrusive imagery in normals, studies have demonstrated that stress may activate patterns of imagery in nonclinical populations that could be deemed obsessional. For instance, Horowitz reported an elevated number of intrusive cognitions, especially images, in experimental subjects previously exposed to stress-inducing films as compared to control subjects [15, 16]. Further, increased intrusive imagery has been reported following exposure to uncontrived stress situations such as by Vietnam war veterans and by mothers of hospitalized children [17, 18].

Thus, while it is apparent that intrusive thoughts and imagery may be present in normals and more particularly in stressed normals, it is important to note that these "symptoms" become fully pathological only following an enduringly dysfunctional cognitive appraisal by the afflicted individual. Salkovskis elaborated on this point by proposing that intrusive cognitions become pathological when they conflict with the individual's belief system and lead to negative automatic thoughts [19]. That is, whereas normals can dismiss unsavory intrusive

thoughts and images, OCD sufferers feel extremely disturbed and tend to evaluate intrusive cognitions and subsequently themselves negatively (e.g., "This is a bad thing to be thinking; I am a bad person for thinking it"). Salkovskis further proposed that intrusive thoughts are likely to cause distress only when they are personally salient to the individual or otherwise offensive to the individual's belief system.

Gibbs, in her review of the literature on obsessive-compulsive symptoms in nonclinical populations, noted that the way in which obsessive-compulsive symptoms are interpreted and the effectiveness of the coping skills that are adopted differentiate OCD sufferers from non-sufferers [20]. Gibbs further concluded that although occasional obsessions and compulsions are common in the normal population, they are less frequent, less severe, and of shorter duration than the symptoms observed in diagnosable OCD. Rachman and de Silva proposed that although clinical and subclinical symptoms may share similarities, individuals who respond to the intrusive thoughts and imagery with a great deal of distress and anxiety develop OCD, whereas those who respond with less concern do not [21]. This point was further emphasized by Abramowitz in his meta-analysis on the efficacy of cognitive-behavior therapy in OCD [5]. He noted that even "recovered" OCD patients frequently continue to experience intrusive thoughts and images, but because they have learned to attribute minimal importance to these symptoms, they cease to experience clinically significant levels of distress.

DYSFUNCTIONAL BELIEFS IN OCD

Beyond levels of severity and distress, however, obsessive-compulsive individuals share certain beliefs that contribute to the disorder, several of which are detailed in Salkovskis' cognitive analysis of OCD [19]. Specifically, OCD sufferers tend to hold maladaptive beliefs about the ability to control one's own thoughts and images, to feel an overwhelming sense of responsibility for external events, and to believe that thoughts are equivalent to actions. Pulling on Beck's [22] conceptualization of "dysfunctional assumptions," Salkovskis proposed that one component of the disorder is a belief that one should exert absolute control over one's thoughts. Ironically, this belief frequently leads to attempts to suppress obsessional thoughts and imagery, which in turn perpetuates the intrusive cognitions. As an example of this phenomenon, Salkovskis and Kirk proposed that clinicians can challenge their patients' false beliefs regarding thought control by asking them *not* to think of a novel but neutral image such as a giraffe [23]. Even in normals, these instructions are likely to generate uncontrollable images of giraffes. The exercise may be helpful in emphasizing the idea that an attempt to suppress thoughts (even neutral ones) may result in the opposite of the desired effect.

The conviction that thought control is possible and desirable may promote a second dysfunctional belief, that of responsibility for preventing negative external events. Obsessive-compulsive patients tend to believe that because they should have control over their thoughts and images but do not, they therefore must be held responsible for the content of these thoughts. For example, imagining a negative event, such as causing a fire by leaving the clothes iron on, constitutes an increased responsibility for ensuring that the event does not take place. Failing to engage in the compulsion to check and re-check the iron in this instance is perceived to be the moral equivalent of an intent to harm [19]. This is true even when the obsession and compulsion are objectively less controllable and less related than in the above example. For instance, a mother who obsessively pictures her child dead may feel the need to count to ten backwards three times in order to be relieved of the responsibility of causing harm to her offspring.

This sense of responsibility is linked to a belief that thoughts are equivalent to actions, a notion termed "thought-action fusion" [19, 24]. Fusion may operate on two levels, defined respectively by a conviction that imaging an event increases the probability that it will actually occur, and by a belief that thinking about an action and actually performing it are morally equivalent. The first point can be illustrated by a comparison with normals. Anecdotally, it sometimes occurs that a superstitious but clinically normal individual may utter "knock on wood" upon imagining an unfavorable life event. However, the OCD sufferer elevates this brief aside to a firmly-held belief that once an event has been imagined, it is, in actuality, more likely to occur. Along the same lines, a normal individual may feel a fleeting sense of surprise or guilt at imagining, for example, a blasphemous sexual act, but only the OCD sufferer will believe that experiencing the image is just as bad (or almost as bad) as completing the action in reality.

IMAGERY IN OCD

What factors influence the experience of imagery in the normal population? Although the very nature of the disorder may promote imagery, it must be assumed that within the OCD population, imagery capabilities vary, just as they do within the normal population. Several studies have investigated normal individuals' overall ability to obtain vivid images [25-27]. Subsets of this overall ability may include whether an individual tends to be a "verbalizer" or a "visualizer" [28, 29] and how much control an individual is able to exert over mental imagery [30-33].

The prevalence of obsessive-compulsive imagery has been scantily researched. Most studies on the disorder have not included systematic imagery data. Part of the difficulty may lie in the fact that both patients and researchers have difficulty differentiating between images and thoughts [4, 34]. However, research that does indicate the presence of a significant number of intrusive images includes a study by Parkinson and Rachman [34] that reported intrusive imagery in forty out of

sixty nonclinical subjects and a study by de Silva [1] that indicated that thirty-six of seventy-six obsessional-compulsive experiences in forty-eight clinical subjects primarily involved imagery.

De Silva attempted to break down the obsessive-compulsive experience of imagery into four subtypes: the obsessional image, the compulsive image, the disaster image, and the disruptive image [1]. He noted that although visual images are by far the most common, occasionally auditory, tactile, gustatory, or olfactory images may surface. As a further point of clarification regarding the four subtypes, he emphasized that any one type can occur independently of the presence or absence of another type (with the single exception that a corrective compulsive image always occurs in response to an obsessional image). For instance, a patient may obsessively imagine herself being bitten by a wild dog and subsequently contaminated with rabies. Her ensuing compulsion may involve saying a certain phrase aloud without any obvious imagery component.

In de Silva's report of imagery involvement in thirty-six of seventy-six obsessive-compulsive experiences ($N = 48$), fifteen experiences were classified as "obsessional images" [1]. De Silva described the obsessional image as an intrusive cognition exemplified by an experience such as visualizing detailed, recurrent pictures of killing one's parents with an axe. He cited examples from the literature such as a young mother who imagined her baby being flushed down the toilet each time she entered the bathroom and a middle-aged man who had images of maimed or deformed people accompanied by thoughts that he might become like them [35, 36].

The obsessional image evokes the ensuing compulsive behavior, which may or may not involve imagery. De Silva reported that nine of the thirty-six imagery-bound obsessive-compulsive experiences he studied could be classified as "compulsive images." Whereas the obsessional image appears to just "happen" to OCD patients, they must take an active role in forming the compulsive image, the ultimate purpose of which is to alleviate the anxiety caused by an obsession. The compulsive image is, in fact, the only non-spontaneous subtype of the four. Compulsive images exist in two forms, that of the corrective image and that of the independent image. The corrective compulsive image seeks to neutralize the initial obsessional image. De Silva cited the example of a young woman who obsessively imagined four people lying dead in open coffins. In order to relieve her anxiety, she was compelled to form the corrective image of the same four people alive and carrying on normal daily activities [37]. On the other hand, forming an independent compulsive image does not involve imagining the "corrected" version of the original obsessional image, but instead requires the formation of an arbitrary image. An example might be an elderly man tormented by obsessional images of engaging in sexual acts with house pets. To alleviate distress, he was compelled to form a clear image of a specific geometrical pattern.

The compulsive image, whether corrective or independent, is particularly debilitating because OCD sufferers often feel compelled (against their wishes) to expend a great deal of time and energy forming the image with the amount of clarity and detail necessary to alleviate the distress caused by the obsession. Obtaining a satisfactory image is often much more difficult than carrying out a compulsive motor behavior and might take many minutes and even up to an hour in some cases [e.g., 37].

Kosslyn, in his basic research on the imagery phenomenon, suggested the existence of complex techniques for imagery transformation that involve "shifts" or a "blink" [38]. For example, in a corrective compulsive image, OCD sufferers may find it necessary to painstakingly shift components of the original obsessional image, piece by piece, in order to attain an acceptable final result. Or, patients may attempt the blink strategy, wherein they repeatedly try to get the image right in split-second intervals.

According to de Silva, the subtype of the "disaster image" accounts for seven of the thirty-six obsessive-compulsive images he studied. It is likely that compulsive checkers may be particularly vulnerable to this type of imagery [3]. The disaster image is created when OCD patients imagine that their obsessions or the failure to complete the appropriate compulsions will lead to disastrous events. Whereas many obsessive-compulsive images are on some level "disastrous," the disaster image is characterized by its particularly disproportionate scale. De Silva offered examples of disaster images such as contamination of the entire globe and mass death and destruction.

The disruptive image, accounting for five of the thirty-six obsessional-compulsive experiences studied by de Silva, is an event that occurs within the course of a compulsive behavior and causes the compulsion to be repeated. An example would be a woman suffering from obsessional thoughts about swearing at a priest. Consequently, she might feel compelled to say a certain number of Hail Marys. If, during the course of this compulsion, she experienced the disruptive image of obscenities scrawled on the altar, she would be forced to begin anew the entire sequence of Hail Marys. This type of image complicates the picture of OCD by making it necessary to add an extra step in the ritualized process.

WHY IMAGERY MAY BE AN EFFECTIVE TREATMENT COMPONENT IN OCD

Having formed a picture of the role imagery plays in OCD symptoms, it makes sense to turn now to a discussion of how and why imagery is effective in the treatment of the disorder. Sheikh and Jordan provided an argument for the value of imagery by emphasizing that the verbalization of thoughts can never capture the cognitive experience in its entirety [39]. These authors proceeded to offer fifteen bases for the efficacy of imagery in therapy. As one basis, they cited Klinger [40],

who believed that the client's areas of greatest current concern are over-represented in mental imagery. Thus, while a client may struggle with trying to confront an issue outright during conversation with the therapist, deep-seated problems may be revealed through exercises in imagery. Sheikh and Jordan also cited Klinger [40] in the argument that experiencing an event via imagery is in many ways the psychological equivalent of experiencing the same event in actuality. This statement is certainly supported by the enormous amount of distress OCD patients suffer in response to their mental images. Such internally-generated anxiety is bound to impact upon therapy, and may push the course of treatment toward an imagery-related goal. Further, these authors suggested that imagery is relevant in therapy particularly because research has indicated that individuals may act more in accordance with imagined consequences than with realistic probabilities [41, 42]. When placed in a feared situation, OCD patients tend to be unable to evaluate possible consequences realistically and instead submit to their own distressing images; thus, these images stand out as potential points of intervention. Additionally, Sheikh and Jordan noted the wide range of studies that support the ability of imagery to induce physiological changes, such as change in heart rate and alteration in pupil size [43, 44]. This body of research introduces the idea that if OCD sufferers experience physiological changes as a result of mental imagery, then imagery may also be used to reverse some of the physical symptoms of anxiety. Such an idea, of course, is not far detached from the basis of imagery use in techniques like systematic desensitization [45, 46].

Meichenbaum proposed three psychological processes that explain why the use of imagery in therapy contributes to change [47]. First, he believed that by monitoring and rehearsing mental images, patients may develop a sense of control. They may be taught that their imagery is irrational and can be distinguished from reality. They may come to make more realistic appraisals of possible consequences of their thoughts and actions. This is a valuable insight in light of the above discussion that notes that even while OCD patients believe they should control their thoughts, they remain passive victims of their obsessions. They are overcome by their fears and are unable to make logical assessments of potential results of their own thoughts and actions.

Secondly, Meichenbaum asserted that by making clients aware of how irrational mental imagery has contributed to their maladaptive behavior, clients may be able to deemphasize the meaning and subjective importance of their related thoughts. If OCD patients, for example, could be convinced that negative imagery is greatly contributing to their excessive worries and ensuing compulsions, they may learn to rationalize that their thoughts are driven by negative imagery that does not reflect a realistic evaluation of the world. This step is the beginning of the third psychological process of coping. By developing a sense of control and awareness, patients will be able to investigate alternative behaviors that may help them to lessen their distress.

EXPOSURE AND RESPONSE PREVENTION AS AN EMPIRICALLY VALIDATED TREATMENT FOR OCD

In response to arguments for the efficacy of imagery in therapy such as those above, it is not surprising that imagery has been incorporated into treatments for OCD for decades. In some forms, these treatments have focused on techniques such as teaching patients relaxation upon purposely exposing them to increasingly distressing intrusive images in *systematic desensitization,* repeatedly exposing them to intense, unpleasant imagery in the hopes that they will habituate in *implosion* or in *flooding,* and training them to terminate an unwanted image by *thought-stopping* [45, 48, 49]. Systematic desensitization may offer a coping skill in the form of relaxation to help OCD patients manage their anxiety, or, as suggested by Singer's [50] review, the technique may work by simply familiarizing the patient with the feared situation. The habituation treatments are designed to flood patients with images of their worst fears, and to prove to them that these fears are not followed by the actual dreaded events. Presumably, patients become less affected by the feared images after being intensely exposed to them. Thought-stopping provides an interruption of the unwanted cognitions and hence affords a method of control over mental imagery. However, despite the intuitive appeal of these techniques, they have generally yielded unimpressive results [for a review, see 51].

Many clinicians and researchers have turned to a cognitive-behavioral treatment known as exposure and response prevention (EX/RP) that has yielded more satisfactory outcomes [e.g., 9, 10, 12]. In a recent review of twelve outcome studies (N = 330), it was found that an average of 83 percent of treatment completers improved during EX/RP therapy [52]. The same review reported that in sixteen studies of long-term outcome (N = 376), an average of 76 percent of OCD sufferers remained improved at a mean follow-up interval of twenty-nine months. In fact, EX/RP has come to be generally regarded as the treatment of choice for obsessive-compulsive disorder [53]. In his meta-analysis, Abramowitz [5] summarized that EX/RP has been shown to be significantly more effective than control treatments and is associated with a statistically significant reduction in symptoms from pre- to post-treatment [see 12 and 54 for reviews of the literature]. Other researchers have also indicated the superiority of EX/RP over alternative treatments [6, 7].

Exposure and response prevention has been refined since it was introduced by Meyer [55], but it still operates using the same tenets of deliberate exposure to obsessional thoughts and images followed by prevention of compulsions. The exposure component can become gradually more intense with time and can be completed either in vivo (as in the case of the compulsive washer being made to touch the door handle of a public restroom) or imaginally. Imaginal exposure can be done by recording obsessional thoughts on an audiotape or writing them on paper and subsequently listening or reading while vividly imaging the scene.

Imaginal exposure is particularly useful in cases wherein the obsession is not conducive to an in vivo procedure (for instance, in the case of someone with catastrophic obsessions). Imaginal exposure also has the benefit of circumventing the strategies patients may employ to avoid thinking about feared consequences during in vivo exposure.

Response prevention (also known as ritual prevention) is intended to force habituation to the obsessions by disallowing the relief afforded by compulsions. Prolonged exposure to the feared stimulus without engaging in the neutralizing compulsive behavior is thought to educate OCD patients about the irrational cycle of their thoughts. Patients will ideally learn that despite intense exposure to obsessive thoughts without the relief of compulsions, the feared consequences do not, in fact, come to fruition. Eventually, it is hoped that OCD sufferers will be able to navigate daily life without the performance of rituals.

The actual task of response prevention can be carried out by exterminating behaviors gradually, or it can be done strictly. Some successful programs have even recommended such extreme response prevention as allowing compulsive cleaners only one or two ten-minute showers a week [e.g., 12]; however, that level of severity is not the norm. Particularly in the initial phase of treatment, family members or friends may need to be enlisted to help the patient adhere to response prevention, as the patient may attempt to verbally "check" with others in order to relieve anxiety, another form of ritualizing. For example, the patient who knows she cannot keep checking her apartment door herself to ensure that it is locked may ask her roommates repeatedly to confirm this fact for her.

EFFICACY OF IMAGINAL EXPOSURE IN EX/RP

An important debate in the literature addresses the efficacy of imaginal exposure within the framework of exposure and response prevention for OCD. Although it makes intuitive sense that a disorder whose symptoms are so often characterized by imagery would benefit from treatment that takes advantage of the medium of imagery, the results are not clear-cut. As a brief literature review, the results of three studies that have examined treatment outcome with in vivo exposure combined with imaginal exposure as compared to in vivo exposure alone will be described.

Foa and Goldstein [2] reported a successful treatment regimen involving EX/RP treatment with both in vivo and imaginal exposure. Subjects ($N = 21$) showed significant symptom reduction immediately post-treatment and at follow-up, especially for compulsive behavior. In fact, at a mean follow-up of 15 months, approximately two-thirds of the patients reported no symptoms, 20 percent remained somewhat improved, and only three patients failed to benefit from treatment.

The results of a study by Foa, Steketee, Turner, and Fischer [3] suggest that imaginal exposure in combination with in vivo exposure may enhance the maintenance of long-term treatment gains as compared to in vivo exposure alone. All

fifteen patients in the trial were compulsive checkers and received ten two-hour sessions over two weeks. Sessions consisted of two hours of in vivo exposure in the EX group or ninety minutes of imaginal exposure plus thirty minutes of in vivo exposure in the I/EX group. Overall symptom reduction was significant for both groups, but did not differ significantly between groups immediately post-treatment. Although percentages are not reported in the original paper, Franklin and Foa's [7] review reanalyzed the data to reveal that post-treatment symptom reduction in the EX group was 66 percent for obsessions and 75 percent for compulsions, whereas in the I/EX group it was 63 percent for obsessions and 70 percent for compulsions. No group differences were found on six more specific outcome measures. However, at follow-up (mean interval of 11 months; range = 3 months to 2.5 years), the I/EX group proved to be less symptomatic overall and on four of six more specific measures (obsessions, compulsions, urges to ritualize, and obsessive-compulsive symptoms). Mean follow-up reductions in obsessions and compulsions were reported to be 43 percent and 53 percent, respectively, for the EX group and 72 percent and 74 percent for the I/EX group.

Several years later, another team of investigators led by de Araujo failed to find support for the theory that the addition of imaginal exposure to in vivo exposure enhances treatment gains in OCD [56]. The study was designed so as to compare an EX group (N = 23) and an I/EX group (N = 23) on treatment outcome. Both groups were comprised of equal numbers of washers and checkers (approximately 50% of each type). All patients received nine weekly sessions of ninety minutes duration; the EX patients experienced in vivo exposure for that time period, while I/EX patients received sixty minutes of live exposure and thirty minutes of imaginal exposure. Mean overall improvement, measured by self- and independent assessor-ratings, was given as a percentage of symptom reduction and did not differ significantly between groups. Immediately post-treatment, the I/EX group showed slightly superior improvement over the EX group (55% versus 48%). However, at a thirty-two week follow-up, the trend reversed to reveal 49 percent mean symptom reduction in I/EX group members as compared to 53 percent in EX group members. The I/EX treatment produced more drop-outs than the EX treatment (8 versus 2). Post-treatment, I/EX patients relapsed marginally more than did EX patients (20% versus 12%). Further, of six patients requiring booster sessions between treatment completion and follow-up, five were from the I/EX group.

Ito, Marks, de Araujo, and Hemsley [57] reported on a different component of the data from the de Araujo et al. [56] study. Based on the theory that discordance between behavioral and subjective symptom reduction is predictive of poor treatment outcome in anxiety disorders [58], Ito and colleagues hypothesized that the addition of imaginal exposure to in vivo treatment might reduce behavioral-subjective desynchrony by strengthening the subjective component, thus promoting better outcome. Results indicated an insignificant difference in behavioral-subjective discordance between the EX and I/EX groups. Immediately

after treatment, improvement was greater on behavioral measures for both groups. At a twenty-week follow-up, both groups had improved slightly more on subjective measures and slightly less on behavioral measures. The only significant between-group differences existed for two subjective measures, one for resistance to obsessions and one for strength and fixity of beliefs. The I/EX group fared significantly worse on these measures immediately post-treatment, but the difference disappeared at follow-up. The results of the study suggest that adding imaginal to live exposure did not reduce discordance between behavioral and subjective measures. Ultimately, however, discordance did not appear to influence clinical outcome.

The discrepancy in findings may be due to incompatible methodology among the studies, or more significant factors may be at large. A comparison between the Foa et al. [3] study and the de Araujo et al. [56] study would have been more interpretable had the treatment procedure been the same for both experiments. The differing results may be due, in part, to the fact that treatment was more intensive in the Foa et al. study as compared to the de Araujo et al. study (10 daily sessions spread over 2 weeks versus weekly sessions spread over 9 weeks). Additionally, it is possible that in the Foa et al. study, longer treatment sessions (2 hours versus 90 minutes) and longer imaginal exposure in the I/EX condition (90 minutes versus 30 minutes) contributed to the superiority of the I/EX group over the EX group [56]. Follow-up interval was also inconsistent between the studies. Because the effects of imaginal exposure were not detected until approximately eleven months after treatment in the Foa et al. study, it is possible that the eight-month follow-up interval in the de Araujo et al. study was insufficient to allow the benefits of I/EX to emerge [7].

It can also be argued that the intensely subjective nature of imagery is a large part of what makes the discrepancy in findings difficult to interpret. For instance, in vivo exposure is in no way the polar opposite of imaginal exposure; indeed, it makes intuitive sense to postulate that live exposure contains an imagery component. Even while the feared situation is being experienced live, it is highly probable that imagery is occurring simultaneously within the mind. It is thus difficult to discount the role of imaginal exposure in symptom reduction. Foa et al. [3] proposed a second interesting hypothesis by suggesting that in vivo exposure contributes to short-term habituation, whereas imaginal exposure promotes long-term habituation. It is possible that imaginal exposure may operate long-term by constantly providing a highly accessible process of mental rehearsal, as opposed to the more hands-on and less immediate process of live exposure.

The purpose of the preceding article has been to explore the role of imagery in the symptoms and treatment of obsessive-compulsive disorder. First, it has been proposed that intrusive thoughts and imagery and the subjective interpretation of these cognitive processes define a continuum of normality to obsessive-compulsive pathology. Secondly, de Silva's conceptualization of four

types of obsessional-compulsive images has been presented, suggesting the need for further research on the treatment implications for each type of image [1]. More data is needed to establish the relative incidence of each type of image in OCD and to explore individual differences in the types of images generated. Finally, the logic behind and the effectiveness of the use of imagery in treatment for OCD has been explored, particularly as it pertains to the implementation of imaginal exposure within the framework of the cognitive-behavioral treatment known as exposure and response prevention. The conflicting results of this literature indicate a need for further study of the additive effect of imaginal exposure to in vivo exposure in EX/RP.

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THE TEMPORAL SETTING, EMOTIONS, AND IMAGERY OF DAYDREAMS: AGE CHANGES AND AGE DIFFERENCES FROM LATE ADOLESCENT TO THE OLD-OLD*

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ABSTRACT

Daydream temporal setting, emotionality, and imagery were examined through responses to the *Imaginal Processes Inventory.* Giambra [1-8] and McCraven and Singer [9] have demonstrated adult age differences and seven-year changes. These earlier studies were expanded by increasing the size and diversity of the cross-sectional (n = 2791, 17 to 95 yrs old) and 5.45-9.54 year longitudinal samples (n = 886) and by adding 11.45-16.67 year (n = 628) and 17.40-23.44 year (n = 290) longitudinal samples. Age differences and age changes were observed, but found to be moderated by general daydreaming levels. Acceptance of daydreaming and willingness to self-revelation were related to emotional reactions to and in daydreams.

It has happened to each of us, a spontaneous shift of attention from external stimuli to the contents of consciousness, i.e., we have daydreamed. Are your daydreams as much about the past, present, and future as they were six, thirteen, or twenty years ago? Do your daydreams cause the same positive and negative emotional responses as they did six, thirteen, or twenty years ago? To what extent do your daydreams today contain visual imagery as they did six, thirteen, or twenty years

*The data for this study was collected while the author was a Research Psychologist with the Intramural Research Program, National Institute on Aging.

ago? Do you have sounds and voices in your daydreams today and how is that different from six, thirteen, or twenty years ago? These questions will be addressed by this article based on data collected by psychometric techniques which rely upon retrospective memory.

What is considered to be daydreaming and what constitutes a daydream is constrained by its long usage in the English language. Indeed, psychologists do not have a universally accepted definition. Thus, psychometric measurement of daydreaming has the potential of being muddled. Individuals might use different definitions even when provided with a definition. Furthermore, different instruments may define daydreaming differently. Hence, our understanding of daydreaming has been hampered. In this article, a daydream is defined as a thought or image unrelated to the task at hand and which occurs spontaneously, i.e., not deliberately recalled from memory or directly elicited by a perceptual stimulus. That is, a daydream is an internally initiated and generated spontaneous switch in the contents of consciousness to content unrelated to the task at hand. A daydream may be a fantasy, i.e., have fantastic content, but need not be. A daydream and a fantasy are *not* considered as interchangeable terms for the same phenomena as is often done by psychologists, psychiatrists and lay persons. In a previous article, Giambra provided data demonstrating a relationship between daydreaming frequency and intensity and aging across adulthood [10]. Daydreaming frequency and intensity showed a decrease with increased age and changes within individuals over period of seven, thirteen, and twenty years. In this article, the relationship of age and intraindividual change with age is examined for three aspects of daydreaming: their temporal setting, emotional tone, and imagery.

In this article, I seek to provide basic descriptive data on the temporal setting, emotional reactions of and to, and the imagery of daydreams across the adult lifespan. These basic data provide outcomes which constrain both present and future potential explanations. We know, from earlier studies by Giambra [1-8] and McCraven and Singer [9], that adult age differences and seven-year age changes do occur. This article expands on these earlier works by increasing the size and diversity of the age group samples and by increasing the size and diversity of the seven-year longitudinal sample and adding thirteen-year and twenty-year longitudinal samples.

Following a description of the Method this article has three additional parts. In the first part, scales measuring the extent that daydreams are oriented to the present, past, or future are examined. Emotional reactions in and to daydreams are examined in the second part. Imagery in daydreams is examined in the third part. In all parts, we look at age differences across adulthood and age changes that occur in approximately, seven, thirteen, and twenty years across adulthood. We examine women and men separately and look for similarities and differences. Finally, we make comparisons across scales to determine relative importance and strength.

METHOD

Participants

Overview

The recruitment of participants began in 1971 and continued through 1996. This included individuals who were tested only once and individuals who were tested as many as six times over a twenty-four-year period. Most longitudinal participants were men and women who were volunteers in the Baltimore Longitudinal Study on Aging (BLSA) [11]; the remainder were their relatives and friends. The BLSA participants were from all over the United States with about 80 percent living within 150 miles of Baltimore. Cross-sectional participants who were college students were recruited from Miami University (Ohio) and schools in Maryland. Older non-BLSA participants were recruited through senior citizen organizations in the Baltimore Metropolitan area and from civic and service organizations in the Baltimore and St. Louis Metropolitan areas and Southwestern Pennsylvania. All participants were told when they were recruited that they would be completing a questionnaire on imaginal processes.

Cross-Sectional Sample

The sample consisted of 1782 women (W) and 1545 men (M) from seventeen to ninety-five years of age. Of these, 597 W and 1009 M were BLSA participants. The distribution by age was: (a) 17 to 24 years, 677 W, 478 M; (b) 25 to 34 years, 278 W, 182 M; (c) 35 to 44 years, 216 W, 143 M; (d) 45 to 54 years, 187 W, 160 M; (e) 55 to 64 years, 186 W, 222 M; (f) 65 to 74 years, 142 W, 174 M; (g) 75 to 84 years, 82 W, 165 M; (h) 85 to 95 years, 14 W, 21 M. BLSA participants made of from 37 percent to 79 percent of the age groups for women and 84 percent to 100 percent of the age groups for men, except for the seventeen to twenty-four year age interval which contained less than 5 percent. In general, the sample was made up of individuals from urban or suburban areas, of a Protestant religion, of the middle or upper-middle class, White, and married. For a complete demographic description of the sample see Giambra [10].

Longitudinal Samples

Three two-point longitudinal periods were used: 5.45 to 9.54 years (M = 6.9 years, SD = 0.9 years; 367 W, 519 M), 11.45 to 16.67 years (M = 13.6 years, SD = 1.1 years; 230 W, 398 M), and 17.40 to 23.44 years (M = 20.0 years, SD = 1.4 years; 72 W, 218 M). These represent the maximum sample sizes since not all participants responded to all items of the IPI; for example, see Table 1 for the age distribution of these three longitudinal samples for participants who responded to all items of Scale 10 of the IPI. The Age-at-First-Testing

(by decades) × Sex analyses of longitudinal change variances, for each longitudinal interval, reported in the results were restricted to those decades where at least ten men and ten women provided data—hence the decades tested were different for each longitudinal interval and means were not directly comparable among the three longitudinal intervals unless restricted to specific age groups. For men, all longitudinal participants were members of the BLSA. For women, in the 5.45 to 9.54 year period, 80 percent were from the BLSA; in the 11.45 to 16.67 year period, 77 percent were from the BLSA; in the 17.40 to 23.44 year period, 52 percent were from the BLSA; the remainder were wives, women friends, and relatives of the male BLSA participants. After the first testing, eighteen men and nine women from the BLSA refused to participate in a longitudinal repeat. In general, the sample was of individuals who were from urban or suburban areas, of a Protestant religion, of the middle or upper-middle class, White and married. For a detailed demographic description of the sample see Giambra [10].

Procedure

Temporal, emotional, and imagery characteristics of daydreaming were determined from participant responses to the items of seven scales of the 344 item

Table 1. Present-Oriented Daydreaming Scale, Age-at-First-Testings, Group Sizes for the Longitudinal Intervals

		Longitudinal Interval (Yrs)		
	Age-at-First-Testing Age Group (Yrs)	5.5 to 9.5	11.5 to 16.7	17.4 to 23.4
Women	17-24	6	4	3
	25-34	54	33	15
	35-44	44	33	14
	45-54	54	36	11
	55-64	63	35	8
	65-74	36	17	1
	75-84	21	2	0
Men	17-24	4	3	3
	25-34	68	58	30
	35-44	62	55	28
	45-54	84	78	37
	55-64	92	79	38
	65-74	47	28	10
	75-84	24	2	0

Imaginal Processes Inventory (IPI) [6, 12]. The IPI was usually taken alone or in small groups. For those 17 to 24 years old the IPI was usually completed in larger groups during a single session with a proctor present or nearby. Non-BLSA women twenty-four years and older usually completed the IPI at home after receiving it in the mail. BLSA participants usually completed the IPI while on a regularly scheduled visit to the Gerontology Research Center in Baltimore, Maryland. Instructions and approximately fifty items were completed in small groups; the IPI was finished when participants were alone and in the privacy of their rooms. Some inactive BLSA participants received the IPI by postal service and completed it at home.

Each participant was given a brief explanation of daydreaming and the purposes of the study. Each participant was provided with examples of daydreaming behavior and urged to "Make a distinction between thinking about an immediate task you're performing, e.g., working doing school work, thinking directly about it while doing it and daydreaming which involves thought unrelated to a task you are doing or else thoughts that go on while you are getting ready for sleep or during a long bus, plane, or train ride." Relevant demographic information was also obtained from each participant prior to attempting the IPI.

Scoring the *Imaginal Process Inventory*

Each item has five options on a continuum implying frequency or quantity. The options were assigned values of 0, 1, 2, 3, or 4 according to their ordinal position on the implied continuum—negatively phrased items were appropriately treated. The five options were: (a) "definitely not true for me or strongly uncharacteristic of me," (b) "usually not true for me," (c) "usually true for me," (d) "true for me," (e) "very true for me or strongly characteristic of me." Scores had a possible minimum of zero and a possible maximum of 48. The seven scales reported in this study along with their internal consistency and test-retest reliability are presented in Table 2. Prior to the presentation of the results of analyses performed on each scale, a more complete description of each scale is given.

The temporal setting of thoughts, i.e., the relative number concerned with the past, the present, or the future, in general and, of daydreams in particular, would seem to be a function of the age of the adult individual [13-16]—a young adult has a long future and a short past and an old-old adult has a short future and a long past. Cameron [17, 18] using a consciousness sampling technique on large community-based, adult lifespan samples, found no evidence that the younger adults thought less about the past than the older adults. At any age thoughts about the present were the most likely while the second most likely thoughts were about the past. From age twenty to age sixty-five years and older there was evidence of a moderate *decrease* in thoughts about the future and a moderate *increase* in thoughts about the present. Surprisingly, teenagers showed the greatest proportion of thoughts of the past and the smallest proportion of thoughts about the present.

Table 2. Scales: Internal Consistency and Test-Retest Reliability

Scale	Internal Consistency	Test-Retest Correlation Interval (Yrs) < 2.01	5.5-9.5	11.5-16.7	17.4-23.4
Temporal setting					
Present-Oriented Daydreams (#10)	.65	.41	.46	.42	.38
Future in Daydreams (#11)	.80	.63	.59	.54	.57
Past in Daydreams (#12)	.84	.72	.66	.61	.53
Emotional reactions					
Positive Reactions in Daydreaming (#5)	.83	.68	.61	.51	.40
Frightened Reactions to Daydreams (#6)	.84	.40	.58	.55	.47
Imagery					
Visual Imagery in Daydreaming (#7)	.84	.58	.61	.54	.45
Auditory Imagery in Daydreaming (#8)	.89	.67	.61	.50	.48

Note: Cronbach's alpha was used to determine internal consistency; it is the mean of the value calculated for men and women separately, based upon the first testing sample. The test-retest interval was as indicated; the correlation is for men and women combined; all correlations, $p < .001$.

However, these trends may be modified by ethnicity. Ghanians and Iranians found future-oriented thoughts most likely and present-oriented thoughts as least likely; past-oriented thoughts *increased* with age while future-oriented and present-oriented thoughts *decreased* with age. The shortening of one's future perspective in the elderly has, in general, been found [14, 18]. However, that shortening is not overwhelming in terms of the proportion of individuals who evidence shortening nor in terms of the years that they look ahead if they have foreshortened their future perspective. Further, Cameron has found a greater percentage (27%) of older adults thoughts extend more than five years into the future than any younger age group [17]. As might be expected, Cameron found that older adults had a greater percentage (20%) of thoughts that extended more than five years into the past. However, other variables such as health, age of death of parents, desire for change, positive or negative view of the future, and control of one's activities play important moderating roles. "A dominant past orientation may be representative for isolated, lonely elderly. For the majority of active

community aged, futurity is still an important aspect of their lives" [16, p. 115]. Because current concerns and unfinished business are an important source of daydream content then it would be reasonable that the temporal orientation, most likely the present, of those concerns would be expressed in daydreams [10]. Other evidence [1, 2, 4, 5] points to a modest reduction in future orientation and a modest increase in past orientation in the elderly.

RESULTS AND DISCUSSION

Present-Oriented Daydreams

This scale measured the extent to which the daydreams of the individual were set in the present. For example, items ask how much the events in a person's daydreams relate to their current life, relate to their current problems, and show a preference for the presence over the past or future.

Age Differences

The Sex × Age ANOVA found a significant age effect (1% of variance accounted for) and a significant sex effect (2% of variance accounted for), see Table 3. The middle-aged groups showed somewhat greater means than young and elderly groups and women had greater mean values than men in all age groups—all means were at "usually true for me" values. When the regressions of present-oriented daydream scale values on linear and nonlinear age components were carried out for men and women separately, no significant, $p > .001$, age components were obtained, see Table 4. Clearly, age differences account for little variance in the likelihood of daydreaming about the present. Furthermore, the correlations of the present-oriented daydreams scale and scales indicating daydream frequency and absorption in daydreaming were not significant, $|r| < .06$, $p > .001$, indicating no apparent relationship between likelihood of daydreaming about the present and likelihood of daydreaming.

Age Changes

Analyses of variance of changes for the longitudinal intervals indicated a significant decrease in present-oriented daydreams scores for the 5.5 to 9.5 year interval ($M = –0.4$, $F(1,637) = 4.47$, $p < .05$, partial $\eta^2 = .007$), but not the 11.5 to 16.7 year interval ($F < 1$) and the 17.4 to 23.4 year interval ($F(1,129) = 3.83$, $p < .06$). Magnitude of longitudinal change was determined by age-at-first-testing only for the 11.5 to 16.7 year interval ($F(4,442) = 2.71$, $p < .05$, partial $\eta^2 = .024$); the twenty-five to thirty-four and sixty-five to seventy-four-year-old groups showed mean increases and the intermediate age groups showed mean decreases—note that this age effect was not significant within the context of a MANOVA of the three temporal setting scales, see "MANOVA

Table 3. Daydreaming Characteristic Scales:
ANOVA Results and Means by Age Group for All Participants Tested for the First Time

Scale	Sex[a]	Age Groups 17-24	25-34	35-44	45-54	55-64	65-74	75-84	Standard Deviations	ANOVA Effects[b] Age	Sex	A × S
Temporal setting												
Present-Oriented Daydreams	W	24.8	25.4	25.9	26.4	25.6	25.9	25.2	4.9-6.0	***	***	NS[c]
(#10)	M	23.3	23.7	24.4	24.8	24.4	23.1	23.3	4.1-5.4	1[d]	2	
Future in Daydreams (#11)	W	29.8	27.4	26.5	26.2	26.0	24.2	23.9	6.0-6.9	***	**	NS
	M	28.4	27.7	25.5	25.4	24.1	23.8	22.7	6.0-6.7	8	<1	
Past in Daydreams (#12)	W	24.6	24.0	22.6	24.1	23.8	24.9	26.4	6.4-8.1	***	***	NS
	M	24.4	22.6	22.6	21.3	22.4	24.3	24.6	6.2-7.4	2	<1	
Emotional reactions												
Positive Reactions in	W	26.5	25.9	23.9	23.9	21.9	20.7	20.4	6.2-7.2	***	***	NS
Daydreaming (#5)	M	25.7	24.3	24.0	21.9	20.2	20.4	18.3	6.0-6.8	10	<1	
Frightened Reactions to	W	17.4	15.0	12.8	13.3	12.9	12.2	13.1	5.1-7.1	***	***	NS
Daydreams (#6)	M	16.1	12.3	11.8	11.6	10.5	11.4	10.9	5.5-7.3	10	1	
Imagery												
Visual Imagery in	W	24.3	23.4	21.1	20.7	18.9	18.6	19.2	6.1-7.7	***	NS	NS
Daydreaming (#7)	M	24.0	22.0	21.8	20.4	19.3	20.0	17.7	5.8-7.4	8		
Auditory Imagery in	W	20.8	18.6	15.7	16.4	14.7	14.0	15.3	6.8-9.2	***	NS	NS
Daydreaming (#8)	M	21.3	17.4	16.7	14.7	13.8	14.3	12.8	6.3-8.1	11		

[a]W = Women, M = Men

[b]The 85-95-year-old age group was omitted since sample size were less than 20. The Age × Sex ANOVA included the age groups indicated. The degrees of freedom were Age (6), Sex (1), Age × Sex (6), Error (2707 to 3077).

[c]Indicates significance level, NS $p > .05$, *$p < .05$, **$p < .01$, ***$p <$,001.

[d]Indicates effect size, partial η^2 converted to a percentage for all significant effects.

Table 4. Daydreaming Characteristic Scales: Correlation with Age and Results of Forward (Hierarchical) Regression of Scale on Age, Age^2, and Age^3 for the Cross-Sectional Sample

					Regression Parameter Estimates			
Scale	Sex[a]	*N*	*r*[b]	R^2 (%)	A	B	C	D
Temporal setting								
Present-Oriented Daydreams (#10)	W	1539	.07$[c]					
	M	1294	.03NS					
Future in Daydreams (#11)	W	1598	−.27	7.5	31.2	−.10		
	M	1330	−.31	9.7	30.3	−.09		
Past in Daydreams (#12)	W	1594	.03NS					
	M	1340	−.01NS					
Emotional reactions								
Positive Reactions in	W	1599	−.27	7.5	28.5	−.10		
Daydreaming (#5)	M	1348	−.38	14.4	28.2	−.12		
Frightened Reactions to	W	1606	−.26	8.8	23.2	−.36	+.0030	
Daydreams (#6)	M	1358	−.28	10.2	22.0	−.37	+.0030	
Imagery								
Visual Imagery in	W	1516	−.28	8.4	28.3	−.19		+.000012
Daydreaming (#7)	M	1298	−.30	8.9	25.7	−.09		
Auditory Imagery in	W	1491	−.27	9.3	26.3	−.28		+.000024
Daydreaming (#8)	M	1263	−.38	15.5	27.8	−.38	+.0026	

[a]W = Women, M = Men

[b]All correlations were significant at .001 level unless indicated otherwise.

[c]$.05 > $ *p* $ > .001$, NS = not significant ($p > .05$)

Note: The regression parameter estimates were for the following equation: A + B*Age + C*Age^2 + D*Age^3. An omitted entry indicates that it did not significantly, $p < .001$, add to accounted for variance and the regression equation was appropriately restricted to included predictors. *p*(inclusion) < .001 for all parameter estimates unless indicated otherwise.

analyses across scales" section below. In addition, changes in present-oriented daydream scale scores were essentially unrelated to changes in daydream frequency or absorption in daydreaming, see Table 5. When, for each longitudinal interval, the age change in present-oriented daydream scores was subjected to a forced stepwise (hierarchical) multiple regression: (a) the women showed a linear age component for the 5.5 to 9.5 year interval and no age components for the 11.5 to 16.7 and 17.4 to 23.4 year intervals, (b) the men had an age by initial level interaction significant which accounted for most of the age-related variance in the 5.5 to 9.5 year and 11.5 to 16.7 year intervals, and (c) for men in the 17.4 to 23.4 year interval the nonlinear age components accounted for most of the age-related variance; see Table 6. Attrition analyses (subsequent dropouts versus subsequent continuance in program) revealed no main effect or interaction with age for the 5.5 to 9.5 and 11.5 to 16.7 year intervals, all F's < 1—the 17.4 to 23.4 year interval was not analyzed because so few participants dropped out.

Using a procedure described in Giambra et al. [19], see also Appendix A, to maximize sample sizes the longitudinal samples were reconstituted into six-year interval, age-at-*later*-testing, male-female combined groups—sex did not affect age changes as tested for each age-at-*later*-testing group. The use of maximized

Table 5. Correlation of Longitudinal Change in Daydreaming Frequency and Absorption in Daydreaming with Longitudinal Change in Present-Oriented Daydreams (#10), Future in Daydreams (#11), Past in Daydreams (#12), Positive Reactions in Daydreaming (#5), Negative Reactions in Daydreams (#6), Visual Imagery in Daydreaming (#7), and Auditory Imagery in Daydreaming (#8) for the 5.5-9.5 Year, 11.5-16.7 Year, and 17.4-23.4 Year Longitudinal Intervals

	Daydreaming Frequency						Absorption in Daydreaming					
Scale	5.5-9.5 yrs		11.5-16.7 yrs		17.4-23.4 yrs		5.5-9.5 yrs		11.5-16.7 yrs		17.4-23.4 yrs	
#	W[a]	M	W	M	W	M	W	M	W	M	W	M
10	01	07	04	12*	–14	08	–03	06	–03	04	–10	21*
11	24***	12*	16	19**	22	19*	26***	22***	16	19**	08	31**
12	05	05	12	02	02	08	31***	24***	29***	23***	16	15
5	40***	37***	35***	44***	58***	55***	53***	49***	39***	55***	57***	71***
6	20**	08	20*	06	–17	13	44***	39***	40***	43***	34*	42***
7	18**	13*	10	20**	29*	21*	26***	35***	26**	39***	07	47***
8	18**	12*	07	11	24	20*	23***	29***	11	42***	26	22*

[a]W = Women, M = Men
[b]Decimal points omitted
*p < .05
**p < .01
***p < .001

Table 6. Present-Oriented Daydreams Scale. Prediction of Age Changes: Results of Forced Stepwise Regression Analysis for the 5.5 to 9.5 Year, 11.5 to 16.7 Year, and 17.4 to 23.4 Year Longitudinal Intervals, Women and Men Separately

	Women						Men					
Longitudinal Interval	*N*	Step	Variable	Percent Variance Increase	Partial Regression Coefficient	Change Correlation	*N*	Step	Variable	Percent Variance Increase	Partial Regression Coefficient	Change Correlation
5.5 to 9.5 Yrs	279	1	1st Score	35.7***	–0.612***	–.60	381	1	1st Score	26.3***	0.060	–.51
		2	Age	1.0*	–0.032*	–.10		2	Age	0.6[a]	0.243***	–.05
			Intercept		16.840***			3	Age × 1st	2.9***	–0.011784***	–.35
									Intercept		0.039	
11.5 to 16.7 Yrs	160	1	1st Score	27.2***	–0.555***	–.52	303	1	1st Score	34.6***	–0.229	–.59
			Intercept		14.081***			2	Age	0.2[a]	0.184*	–.06
								3	Age × 1st	1.1*	–0.008324*	–.39
									Intercept		5.908	
17.4 to 23.4 Yrs	52	1	1st Score	51.4***	–0.743***	–.72	146	1	1st Score	28.7***	–0.278	–.54
			Intercept		18.596***			2	Age	1.1[a]	3.174**	–.10
								3	Age × 1st	2.2*	–0.006744	–.43
								4	Age Sq	0.2[a]	–0.067787**	–.08
								5	Age Cubed	3.4**	–0.00478**	–.06
									Intercept		–35.017*	

[a]These variables were retained because the subsequent variable or variables would not have been significant if they were omitted from the regression equation.

Note: The longitudinal change was the difference between the first testing scale value and the "later" testing scale value [later score-first score]. The forced stepwise regression variables were: (1) Longitudinal interval. (2) First scale score. (3) Age-at-first-testing. (4) The Age × First Scale Score interaction (multiplicative term). (5) Age squared. (6) Age cubed. Variables significantly ($p < .05$) contributing to accounted for variance were retained for the final regression equation except when they were required to allow other subsequent variables to attain significance.

*$p < .05$

**$p < .01$

***$p < .001$

sample age-at-*later*-testing groups allowed for two additional analyses and for comparisons of changes for a specific age from three earlier ages. The first analysis was a determination, for each age-at-*later*-testing group at each longitudinal interval, of the significance of the scale score change. The second analysis was a determination of the significance of the difference among the scale score changes for the three longitudinal intervals. Statistically, these procedures were very conservative. Thus, significant changes for any age group and between longitudinal periods suggest, respectively, true changes and true differences. When comparisons of present-oriented daydreaming scale changes were made among longitudinal intervals, see Table 7, the thirty-four to thirty-nine year and fifty-eight to sixty-three year age-at-later-testing groups showed a significant difference between the changes in the 5.5 to 9.5 year and 11.5 to 16.7 year periods. Of the twenty-nine longitudinal changes reported in Table 7, only seven were significantly different from zero—men and women were significantly different in the seventy-six to eighty-one year age-at-later-testing group. In general, the pattern of longitudinal changes were consistent with the age differences in that going to middle-age from the twenties and thirties increased the present temporal setting in daydreams and going from middle-age to old-age decreased the likelihood of finding a present temporal setting in daydreams.

Future in Daydreams

This scale measured the extent to which the daydreams of the individual were set in the future. For example, items ask how much daydream events involve thinking ahead, about what might happen in the future, and a person's future life.

Age Differences

The Sex × Age ANOVA found a significant age effect (8% of variance accounted for) and a significant sex effect, see Table 3. Group means decreased with increased age for both men and women. Women had greater mean values than men in all age groups. The correlation with age was –.27 for women and –.31 for men. The regression of future in daydreams scale values on age yielded only a significant, $p < .001$, linear component for both men and women, see Table 4. Age differences showed a clear decrease in daydreaming about the future with increased age. The correlations of this scale with scales indicating daydream frequency and absorption in daydreaming were all significant, $p < .001$, and were, respectively, for women, .28 and .31 and, for men, .35 and .42. When the frequency and absorption scales were held constant the correlation with age was reduced to –.16 for women and –.15 for men, both $p < .001$. After entering the daydream frequency and absorption scale scores in the regression of future in daydreams on age the linear component continued to be significant, but the

Table 7. Present-Oriented Daydreaming Scale, Maximum Age-at-Later-Testing Samples: Mean Change Scores (Later-Earlier) and Results of Analysis of Variance between Longitudinal Intervals for Change Scores within Each Age-at-Later-Testing

Age-at-Later-Testing Age Group (Yrs)	Change in Score from When ___ Years Younger			Between Longitudinal Interval ANOVA Results				Significant $p < .05$
					Partial	— Error —		
	6.8[a]	13.3[b]	19.4[c]	*F*	η^2	*df*	MS	Contrasts
28-33	+1.9[d]	—	—	—	—	—	—	
34-39	0.0	+4.5[d]	—	8.32**	.0855	89	22.9	
40-45	–0.1	+0.4	—	< 1	—	186	25.4	
46-51	–0.5	–0.2	+0.7	< 1	—	230	21.2	
52-57	–0.6	–1.1	–0.6	< 1	—	218	18.7	
58-63	–0.1	–1.3[d]	+0.3	2.40	—	278	21.4	(6.8, 13.3)
64-69	–0.5	–0.8	–2.0[d]	1.22	—	304	22.5	
70-75	–0.8[d]	–0.9	–2.1	< 1	—	264	22.8	
76-81 [Women]	+1.0	+1.5	—	< 1	—	63	20.4	
76-81 [Men]	–1.0	–1.5[d]	–1.7	< 1	—	171	32.0	
82-87	0.0	–0.2	–0.1	< 1	—	90	18.6	
88-95	–1.9[d]	—	—	—	—	—	—	

[a, b, c]These are means, the longitudinal interval were, respectively, 5.5 to 9.5 years, 11.5 to 16.7 years, and 17.4 to 23.4 years.

[d]Indicates change score within an age group-longitudinal interval combination was significantly, $p < .05$, different from zero

Note: Analysis of variance was a one-way repeated measure between the longitudinal intervals on change scores. *df* = degrees of freedom, MS = Mean Square. The sample sizes for the 6.8, 13.3, and 19.4 year longitudinal intervals, respectively, for the age-at-later-testing group were: 28-33 (21, 0, 0), 34-39 (80, 11, 0), 40-45 (133, 55, 7), 46-51 (122, 85, 26), 52-57 (132, 64, 25), 58-63 (178, 80, 23), 64-69 (183, 97, 27), 70-75 (160, 82, 25) 76-81 (126, 86, 31), 82-87 (55, 26, 12), 88-95 (18, 9, 0).

*$p < .05$

**$p < .01$

***$p < .001$

amount of variance accounted for decreased from 7.5 percent to 2.2 percent for women and from 9.7 percent to 1.8 percent for men.

Age Changes

Analyses of variance of changes for the longitudinal intervals indicated a significant decrease in future in daydreams scores for the 5.5 to 9.5 year interval ($M = -0.7$, $F(1,669) = 8.33$, $p < .01$, partial $\eta^2 = .012$), the 11.5 to 16.7 year interval ($M = -1.0$, $F(1,467 = 11.78$, $p < .01$, partial $\eta^2 = .025$), but not the 17.4 to 23.4 year interval ($F < 1$). However, age-at-first-testing did determine the level of decrease for the 17.4 to 23.4 year longitudinal interval ($F(2,139) = 4.83$, $p < .01$, partial $\eta^2 = .065$); the twenty-five to thirty-four year old group showed an increase ($M = 2.2$) while the thirty-five to forty-four and forty-five to fifty-four year old groups showed a decrease ($M = -1.8$ and -1.0, respectively). When, for each longitudinal interval, the age change in future in daydream scores was subjected to a forced stepwise (hierarchical) multiple regression: (a) the women had an age by initial level interaction term for the 11.5 to 16.7 year interval and no age components for the 5.5 to 9.5 and 17.4 to 22.4 year intervals, (b) the men showed only linear components for all longitudinal intervals; see Table 8. Attrition analyses (subsequent dropouts versus subsequent continuance in program) revealed one significant effect, a main effect for the 11.5 to 16.7 year interval ($F(1,452) = 5.69$, $p < .05$, partial $\eta^2 = .012$); subsequent dropouts showed a larger decrease ($M = -1.6$) than subsequent nondropouts ($M = -.02$)—suggesting that those individuals who remained for the 17.4 to 23.4 year interval may have been those who were least likely to show an intraindividual decrease in daydreams about the future. In general, changes in daydreaming frequency and absorption were found to be significantly correlated with changes in daydreaming about the future, see Table 5. When changes in these scales were used as covariates in the above ANOVAs all significant effects became nonsignificant, $p > .13$—suggesting that changes in likelihood of daydreaming about the future may be primarily determined by changes in likelihood of daydreaming.

The longitudinal samples were reconstituted into six-year interval, maximize sample size, age-at-later-testing groups. When comparisons of future in daydreams scale changes were made among longitudinal intervals, see Table 9, the sixty-four to sixty-nine and seventy to seventy-five year age-at-later-testing group showed a significant difference among the changes. Of the thirty longitudinal changes reported in Table 9, only six were significantly different from zero—men and women were significantly different in the forty to forty-five year age-at-later-testing group. Both age differences and age changes point to less daydreaming about the future with increased age and there was evidence that the greatest decreases occurred for individuals as they became sixty-four or sixty-five years and older.

Table 8. Future in Daydreams Scale. Prediction of Age Changes: Results of Forced Stepwise Regression Analysis for the 5.5 to 9.5 Year, 11.5 to 16.7 Year, and 17.4 to 23.4 Year Longitudinal Intervals, Women and Men Separately

	Women						Men					
Longitudinal Interval	*N*	Step	Variable	Percent Variance Increase	Partial Regression Coefficient	Change Correlation	*N*	Step	Variable	Percent Variance Increase	Partial Regression Coefficient	Change Correlation
5.5 to 9.5 Yrs	293	1	1st Score	22.7***	–0.450***	–.48	400	1	Long Int	0.1[a]	0.279	–.03
			Intercept		10.621***			2	1st Score	22.7***	–0.434***	–.48
								3	Age	0.8*	–0.034*	–.01
									Intercept		13.849***	
11.5 to 16.7 Yrs	166	1	1st Score	27.7***	–1.136***	–.53	321	1	1st Score	22.4***	–0.473***	–.47
		2	Age	1.1[a]	–0.398***	–0.5		2	Age	1.9**	–0.063**	–.09
		3	Age × 1st	4.4**	0.013726**	–.34			Intercept		13.895***	
			Intercept		30.989***							
17.4 to 23.4 Yrs	56	1	1st Score	26.5***	–0.509***	–.52	156	1	1st Score	13.8***	–0.370***	–.37
			Intercept		13.046***			2	Age	4.1**	–0.104**	–.18
									Intercept		13.086***	

[a]These variables were retained because the subsequent variable or variables would not have been significant if they were omitted from the regression equation.

Note: The longitudinal change was the difference between the first testing scale value and the "later" testing scale value [later score-first score]. The forced stepwise regression variables were: (1) Longitudinal interval. (2) First scale score. (3) Age-at-first-testing. (4) The Age × First Scale Score interaction (multiplicative term). (5) Age squared. (6) Age cubed. Variables significantly ($p < .05$) contributing to accounted for variance were retained for the final regression equation except when they were required to allow other subsequent variables to attain significance.

*$p < .05$

**$p < .01$

***$p < .001$

Table 9. Future in Daydreaming Scale, Maximum Age-at-Later-Testing Samples: Mean Change Scores (Later-Earlier) and Results of Analysis of Variance between Longitudinal Intervals for Change Scores within Each Age-at-Later-Testing

Age-at-Later-Testing Age Group (Yrs)	Change in Score from When ___ Years Younger			Between Longitudinal Interval ANOVA Results				Significant $p < .05$
					Partial	— Error —		
	6.8[a]	13.3[b]	19.4[c]	*F*	η^2	*df*	MS	Contrasts
28-33	–1.4	—	—	—	—	—	—	
34-39	+0.2	–1.4	—	1.00	—	100	29.1	
40-45 [Women]	–0.4	+2.1	—	2.95	—	84	39.2	
40-45 [Men]	–1.2	–1.6	—	< 1	—	110	33.8	
46-51	–0.6	–0.2	+0.8	< 1	—	238	26.9	
52-57	–0.6	–0.5	–0.8	< 1	—	238	33.2	
58-63	–0.8	–0.1	+0.7	< 1	—	295	35.2	
64-69	–0.6	–2.4[d]	+0.4	3.86*	.0248	304	34.8	(6.8, 13.3) (13.3, 19.4)
70-75	+0.1	–1.4[d]	–2.7[d]	3.83*	.0268	278	33.4	(6.8, 19.4)
76-81	–1.4[d]	–0.9	–1.5	< 1	—	243	31.1	
82-87	–1.7[d]	–4.0	–2.5	1.82	—	97	29.5	
88-95	+1.7	–1.7	—	2.43	—	28	21.5	

[a, b, c]These are means, the longitudinal intervals were, respectively, 5.5 to 9.5 years, 11.5 to 16.7 years, and 17.4 to 23.4 years.

[d]Indicates change score within an age group-longitudinal interval combination was significantly, $p < .05$, different from zero

Note: Analysis of variance was a one-way repeated measure between the longitudinal intervals on change scores. *df* = degrees of freedom, MS = Mean Square. The sample sizes for the 6.8, 13.3, and 19.4 year longitudinal intervals, respectively, for the age-at-later-testing group were: 28-33 (21, 0, 0), 34-39 (80, 11, 0), 40-45 (133, 55, 7), 46-51 (122, 85, 26), 52-57 (132, 64, 25), 58-63 (178, 80, 23), 64-69 (183, 97, 27), 70-75 (160, 82, 25) 76-81 (126, 86, 31), 82-87 (55, 26, 12), 88-95 (18, 9, 0).

*$p < .05$

**$p < .01$

***$p < .001$

Past in Daydreams

This scale measured the likelihood that the daydreams of the individuals were set in the past. For example, items queried how often daydream events relate to their immediate and distant past, relate to their past experiences, relate to their youth, and show a preference for the past over the present or future.

Age Differences

The Sex × Age ANOVA found a significant age effect (2% of variance accounted for) and a significant sex effect, see Table 3. The middle-aged groups showed somewhat smaller means than young and elderly groups. Women had somewhat greater mean values than men in all but one age group. When regressions were carried out for past in daydreams scale values on age no significant age components were obtained, $p > .001$, see Table 4. The correlations of this scale with scales indicating daydream frequency and absorption in daydreaming were all significant, $p < .001$, and were, respectively, for women .18 and .39 and for men .25 and .32. When the frequency and absorption scales were held constant the correlation with age was *increased* from .03 to .17 for women and from –.01 to .16 for men, both $p < .001$. After entering the daydream frequency and absorption scale scores in the regression of future in daydreams on age the cubic component became significant, $p < .001$, and the amount of variance accounted for increased from less than 1 percent to 3.2 percent for women and to 3.6 percent for men. These outcomes suggest that the reduced likelihood of daydreaming with age acted to obscure the increase in the likelihood of daydreaming about the past.

Age Changes

Analyses of variance on changes for the longitudinal intervals resulted in only one significant and two near-significant effects. Magnitude of longitudinal changes was determined by age-at-first-testing for the 5.5 to 9.5 year interval ($F(5,686) = 2.71$, $p < .05$, partial $\eta^2 = .016$). The changes were as expected from the cross-sectional means, younger groups decreased while middle-aged and young-old groups increased in daydreaming about the past. When, for each longitudinal interval, the age change in past in daydream scores was subjected to a forced stepwise (hierarchical) multiple regression: (a) the 5.5 to 9.5 year interval showed only a linear age component for both men and women; (b) the 11.5 to 16.7 and 17.4 to 23.4 year intervals showed both linear and nonlinear age components for both men and women; see Table 10. Attrition analyses (subsequent dropouts versus subsequent continuance in program) revealed no main effect or interaction with age (all F's < 1.54). The correlations of change in daydream frequency and absorption in daydreaming scores with change in likelihood of daydreaming about the past were significant for the absorption in daydreaming in two

Table 10. Past in Daydreams Scale. Prediction of Age Changes: Results of Forced Stepwise Regression Analysis for the 5.5 to 9.5 Year, 11.5 to 16.7 Year, and 17.4 to 23.4 Year Longitudinal Intervals, Women and Men Separately

	Women						Men					
Longitudinal Interval	*N*	Step	Variable	Percent Variance Increase	Partial Regression Coefficient	Change Correlation	*N*	Step	Variable	Percent Variance Increase	Partial Regression Coefficient	Change Correlation
5.5 to 9.5 Yrs	299	1	Long Int	2.2*	0.874*	.15	410	1	1st Score	17.9***	–0.382***	–.42
		2	1st Score	16.5***	–0.313***	–.41		2	Age	2.1**	0.055**	.09
		3	Age	1.9**	0.046**	.12			Intercept		6.157***	
			Intercept		–1.013							
11.5 to 16.7 Yrs	173	1	1st Score	15.0***	–0.354***	–.39	318	1	Long Int	2.4**	0.802**	.15
		2	Age	3.3*	–0.477*	.17		2	1st Score	13.3***	0.049	–.37
		3	Age Sq	3.4**	0.005781**	.20		3	Age	1.6*	0.248**	.12
			Intercept		16.861***			4	Age × 1st	1.3*	–0.008224*	–.20
									Intercept		–14.367*	
17.4 to 23.4 Yrs	58	1	1st Score	29.2***	–0.440***	–.54	145	1	1st Score	19.1***	–0.430***	–.47
		2	Age	8.9**	–3.112	.35		2	Age	1.3[a]	–4.632**	.06
		3	Age Sq	1.3[a]	0.086817	.32		3	Age Sq	1.1[a]	0.097319**	.08
		4	Age Cubed	4.6*	–0.00718*	.28		4	Age Cubed	4.1**	–0.000643**	.08
			Intercept		40.808				Intercept		79.139***	

[a]These variables were retained because the subsequent variable or variables would not have been significant if they were omitted from the regression equation.

Note: The longitudinal change was the difference between the first testing scale value and the "later" testing scale value [later score-first score]. The forced stepwise regression variables were: (1) Longitudinal interval. (2) First scale score. (3) Age-at-first-testing. (4) The Age × First Scale Score interaction (multiplicative term). (5) Age squared. (6) Age cubed. Variables significantly ($p < .05$) contributing to accounted for variance were retained for the final regression equation except when they were required to allow other subsequent variables to attain significance.

*$p < .05$

**$p < .01$

***$p < .001$

longitudinal intervals, see Table 5. When changes in daydreaming frequency and absorption were used as covariates in the ANOVA's of changes in daydreaming about the past, as described above, the change associated with the 11.5 to 16.7 year interval became significant ($F(1,367) = 3.89$, $p < .05$).

The longitudinal samples were reconstituted into six-year interval, maximize sample size, age-at-later-testing groups. When comparisons of past in daydreaming scale changes were made among longitudinal intervals, the seventy to seventy-five and seventy-six and eighty-one year age-at-later-testing groups showed a significant difference among the changes, see Table 11. Of the thirty-one longitudinal changes reported in Table 11, only six were significantly different from zero—men and women were significantly different in the fifty-two to fifty-seven year age-at-later-testing group. While age differences and age changes were consistent in the sense that young and old daydreamed more about the past than middle-aged adults, the change from middle-age to old age was particularly salient. Table 11 shows significant increases and generally larger increases in likelihood of daydreaming about the past for longer longitudinal intervals.

MANOVA Analyses Across Temporal Setting Scales

Age Differences

An Age Group × Sex MANOVA was carried out on the three scales reflecting temporal setting of daydreams. Significant effects occurred for age group (Wilks $F(18.7555) = 17.30$, $p < .001$, effect size = .037) and for sex (Wilks $F(3,2671) = 31.38$, $p < .001$, effect size = .034), but not their interaction (Wilks $F(18,7555) = 1.11$, $p > .05$).

Age Changes

An Age-at-First-Testing × Sex MANOVA was carried out on the longitudinal changes of the three scales for each longitudinal interval. Significant longitudinal changes occurred for the 5.5 to 9.5 year (Wilks $F(3,574) = 4.25$, $p < .01$, effect size = .022) and 11.5 to 16.7 year (Wilks $F(3,396) = 3.06$, $p < .05$, effect size = .023) intervals, but not for the 17.4 to 23.4 year interval (Wilks $F < 1$). Age-at-First-Testing Significantly affected the level of these changes only for the 17.4 to 23.4 year (Wilks $F(9,348) = 2.04$, $p < .05$, effect size = .041) interval. Neither sex nor sex in combination with age significantly affected the level of longitudinal change.

Table 11. Past in Daydreaming Scale, Maximum Age-at-Later-Testing Samples: Mean Change Scores (Later-Earlier) and Results of Analysis of Variance between Longitudinal Intervals for Change Scores within Each Age-at-Later-Testing

Age-at-Later-Testing Age Group (Yrs)	Change in Score from When ___ Years Younger			Between Longitudinal Interval ANOVA Results				Significant $p < .05$
					Partial	— Error —		
	6.8[a]	13.3[b]	19.4[c]	*F*	η^2	*df*	MS	Contrasts
28-33	–.08	—	—	—	—	—	—	
34-39	–1.0	–0.7	—	< 1	—	97	23.8	
40-45	0.0	0.0	—	< 1	—	197	32.6	
46-51	+0.1	–0.7	–0.4	< 1	—	242	31.3	
52-57 [Women]	–1.3	–2.2[d]	–4.2	1.29	—	91	30.2	
52-57 [Men]	+0.6	+0.7	+1.0.	< 1	—	143	31.8	
58-63	+0.3-	+0.7	+0.3	< 1	—	296	29.8	
64-69	+0.9[d]	+0.9	+1.5	< 1	—	319	32.3	
70-75	+1.0[d]	+2.8[d]	+1.3	3.08*	.0209	289	32.4	(6.8, 13.3)
76-81	+0.2	+1.8[d]	+3.6[d]	5.28**	.0412	246	32.2	(6.8, 13.3) (6.8, 19.4)
82-87	+0.9	+1.9	–0.4	< 1	—	101	36.1	
88-95	+1.4	+3.4	—	< 1	—	33	37.0	

[a, b, c]These are means, the longitudinal interval were, respectively, 5.5 to 9.5 years, 11.5 to 16.7 years, and 17.4 to 23.4 years.

[d]Indicates change score within an age group-longitudinal interval combination was significantly, $p < .05$, different from zero

Note: Analysis of variance was a one-way repeated measure between the longitudinal intervals on change scores. *df* = degrees of freedom, MS = Mean Square. The sample sizes for the 6.8, 13.3, and 19.4 year longitudinal intervals, respectively, for the age-at-later-testing group were: 28-33 (21, 0, 0), 34-39 (80, 11, 0), 40-45 (133, 55, 7), 46-51 (122, 85, 26), 52-57 (132, 64, 25), 58-63 (178, 80, 23), 64-69 (183, 97, 27), 70-75 (160, 82, 25) 76-81 (126, 86, 31), 82-87 (55, 26, 12), 88-95 (18, 9, 0).

*$p < .05$

**$p < .01$

***$p < .001$

Comparisons Among Temporal Setting Scales

Cross-Sectional Sample

A measure of the relative tendency to daydream about the past, present, and future was obtained by observing the relative magnitudes of the means of the scales measuring past, present, and future settings in daydreams. To determine if the differences in the means, see Table 3, were statistically different, an Age Group by Sex by Temporal Scales (repeated) ANOVA was carried out. A significant effect occurred for the difference between temporal scales ($F(2,5346) = 48.71$, $p < .001$, partial $\eta^2 = .018$), for the effect of sex on this difference ($F(2,5346) = 3.02$, $p < .05$, partial $\eta^2 = .001$), and the effect of age on this difference ($F(12,5346) = 12.51$, $p < .001$, partial $\eta^2 = .046$). The temporal order was future ($M = 25.9$), present ($M = 24.8$), and past ($M = 23.8$). Both men and women showed this order. However, women showed a greater difference (1.3) than men (0.7) between the future and present, but women showed a smaller difference (0.7) than men (1.5) between the present and the past. When the differences among the temporal setting scales was examined at each age group that differences were significant for all age groups except the sixty-five to seventy-four-year-olds. The future was more prominent than the past until age sixty-five to seventy-four years where it became equally prominent; at seventy-five to eighty-four years the past became more prominent than the future. The future was more prominent than the present until age forty-five to fifty-four where it became equally prominent until age seventy-five to eighty-four where it became less prominent. The present was more prominent than the past from twenty-five to sixty-four years old and was less prominent in the seventy-five to eighty-four-year-olds.

Longitudinal Sample

A measure of the relative change over time in the tendency to daydream about the past, present, and future was obtained by comparing the magnitude of the mean changes for the scales measuring past, present, and future settings in daydreams. To determine if the mean changes were statistically different an Age-at-First-Testing by Sex by Temporal scales (repeated) ANOVA was carried out on changes for each longitudinal period. Significant effects involving the repeated measures factor occurred in the 11.5 to 16.7 year interval for the difference between the temporal scales ($F(2,796) = 5.27$, $p < .01$, partial $\eta^2 = .013$) and in the 17.4 to 23.4 year interval for the interaction of age on that difference ($F(6,290) = 2.86$, $p < .05$, partial $\eta^2 = .056$). For the 11.5 to 16.7 year interval the present and future daydream settings showed negative mean changes (M's = –0.7 and –0.8, respectively) and past daydream settings showed a positive mean change ($M = +0.7$). In the 17.4 to 23.4 year interval the age interaction

resulted from the previously described tendency of the past setting to increase and the future setting to decrease in the oldest individuals.

Summary

The pattern for both cohort differences and age changes was, as follows: the likelihood of daydreams with a future temporal setting decreased with increased age in adulthood; the likelihood of a past temporal setting decreased then increased with age; the likelihood of a present temporal setting increased then decreased with age; the differences in magnitude among the scales were small at all ages except for the seventeen to twenty-four-year-olds where the future was clearly greatest. Thus, one's age does influence the time setting of one's daydreams and growing older resulted in changes in the likelihood of a time setting. As an expression of the individual's current concerns the future setting appears to be the most strongly influenced by age; sometimes because of an increased orientation to the present—brought about by increased unfinished business or mounting daily concerns—and sometimes because of an increased orientation to the past. Changes in the temporal orientation of a person's daydreams may thus provide cues to the changes in the degree to which they must deal with unfinished business and the press and immediacy of their current concerns.

EMOTIONAL REACTIONS

Three important components of emotion are expression, experience, and control [20, 21]. Emotional responses to, and in, daydreams are in expression of emotion in terms of physiological response or arousal and an experience of emotion, i.e., an affective or feeling state associated with or brought about by daydreaming. Control of emotions associated with daydreams is minimal, in the sense that daydreams and the emotions associated with them occur spontaneously. Control could be gained by cutting off the daydream by shifting attention to something in the environment or by deliberately thinking of something else. These controlling actions could reduce, but not eliminate, the emotions engendered by and in the daydreams. Emotions may be further classified as positive (desirable or pleasant) and negative (undesirable or unpleasant) [22]. Theories of emotion and speculations regarding life experiences in general, and emotional experiences in particular, as well as putative changes associated with physiological responses associated with aging lead to conflicting expectations regarding emotional experiences and the relative likelihood of positive and negative emotional experiences [21-23]. Experimental studies have been somewhat clearer.

Gross et al. studied that relationship of emotional experience, emotional expression and emotional control in divergent adult lifespan samples [20]. They found increases in positive emotional experience and selective decreases in negative emotional experience. Also, found was evidence of greater emotional control,

especially with regard to effective regulation of the inner experience of emotion—as opposed to external expression—with greater regulation resulting in decreasing the experience of negative emotions. Because daydreams have an essentially uncontrolled or spontaneous nature this position could lead to the expectation of a greater level of negative emotional experience in daydreams than in consciously controlled aspects of mental life. Other studies, see [20, 22], for a review, found decreases with increased age in both positive and negative emotional experiences and intensity of those experienced emotions. Costa and McCrae report facets of personality measuring "positive emotions," "hostility," and "depression" which were negatively correlated with age in a cross-sectional sample—six year longitudinal and cross-sequential samples failed to show any decrease on these facets [24]. In studies where individuals were asked to recall and re-experience intense emotional life episodes no age differences were observed in rated intensity of the experienced emotion and in the ability to re-experience the episode.

RESULTS AND DISCUSSION

Positive Reactions in Daydreaming

This scale indicated positive emotional and affective responses to, and tone of, the daydreams recalled. Items were concerned with daydreams which aroused and excited, which generated a smile, which had pleasant emotions, and which thrilled the daydreamer.

Age Differences

The Age × Sex ANOVA yielded significant age (10% of variance accounted for) and sex effects, but not their interaction, see Table 3. Decreased means occurred with increased age—means decrease from levels somewhat above, to levels somewhat below, "usually true for me" and women reported about 5 percent higher levels than men. The scale correlation with age was –.27 for women and –.38 for men. Table 4 provides the results of the regression of the scale on age for men and women separately; note that only linear components were significant, $p < .001$. The correlations of this scale with scales indicating daydream frequency and absorption in daydreaming were all high and were, respectively, for women .41 and .54 and for men .50 and .64, all $p < .001$. When the frequency and absorption scales were held constant the correlation with age was reduced to –.08 for women and –.14 for men, both $p < .01$. After entering the daydream frequency and absorption scale scores in the regression of positive reactions in daydreams on age the linear component continued to be significant, but the amount of variance accounted for decreased from 7.5 percent to 0.4 percent for women and from 14.4 percent to 1.2 percent for men.

It is reasonable to believe that positive emotional reactions to and in daydreams would be related to acceptance of daydreaming and to willingness to self-revelations. When measures of these scales, see Giambra [10], were correlated with positive emotions scale scores significant values were obtained; for the acceptance and self-revelation scales, respectively, the correlations were .34 and .26 for women and .39 and .29 for men, all $p < .001$. Giambra found that both acceptance and self-revelation were negatively correlated with age [10]. The reduced positive reactions with increased age may be the source of reduced acceptance of daydreaming with increased age—it may also play a role in reduced self-revelation with increased age but there is no obvious direct relationship between self-revelation and positive emotional reactions.

Age Changes

Analyses of variance of changes for the longitudinal intervals showed a significant, $p < .001$, decrease for the 5.5 to 9.5 year ($M = -1.2$, $F(1,664) = 23.06$, partial $\eta^2 = .034$), the 11.5 to 16.7 year ($M = -1.8$, $F(1,456) = 34.57$, partial $\eta^2 = .070$), and for the 17.4 to 23.4 year ($M = -2.6$, $F(1,189) = 19.70$, partial $\eta^2 = .094$) intervals. The only other significant effect was sex for the 5.5 to 9.5 year interval ($F(1,664) = 5.87$, $p < .05$, partial $\eta^2 = .009$); women showed a greater mean decrease (–1.7) than men (–0.6)—the magnitude of the sex difference remained for both longer intervals. When, for each longitudinal interval, the age change in positive reactions in daydreaming scores was subjected to a forced stepwise (hierarchical) multiple regression: (a) men showed only a linear age component for each longitudinal interval, older participants showed greater decreases than younger participants, and (b) women showed an age component (nonlinear) only for the 11.5 to 16.7 year interval; see Table 12. Attrition analyses (subsequent dropouts versus subsequent continuance in program) revealed an attrition effect for the 11.5 to 16.7 year interval ($F(1,440) = 7.87$, $p < .01$, partial $\eta^2 = .018$), but not an interaction with age ($F(4,440) = 1.01$, $p > .05$). Subsequent dropouts showed a mean decrease of –2.2 while those continuing showed a mean decrease of –.05. Although there was no significant attrition effect for the 5.5 to 9.5 year interval nor an interaction with age ($F(1,548)$ and $F(4,548) < 1.07$) the dropouts also showed a larger decrease than those continuing in the study—suggesting that attrition acted to reduce age changes. The correlations of change in daydream frequency and absorption in daydreaming scores with change in positive reactions in and to daydreams were significant in all three longitudinal intervals, $p < .001$ see Table 5. When changes in daydreaming frequency and absorption were used as covariates in the ANOVAs of changes in positive reactions, as described above, the changes associated with all three intervals remained significant; the effect of sex on change in the 5.5 to 9.5 year interval became nonsignificant ($F(1,550) = 1.79$, $p > .18$). Changes in positive reactions varied

Table 12. Positive Reactions in Daydreaming Scale. Prediction Age Changes: Results of Forced Stepwise Regression Analysis for the 5.5 to 9.5 Year, 11.5 to 16.7 Year, and 17.4 to 23.4 Year Longitudinal Intervals, Women and Men Separately

	Women						Men					
Longitudinal Interval	*N*	Step	Variable	Percent Variance Increase	Partial Regression Coefficient	Change Correlation	*N*	Step	Variable	Percent Variance Increase	Partial Regression Coefficient	Change Correlation
5.5 to 9.5 Yrs	283	1	1st Score	15.8***	–0.423***	–.40	403	1	1st Score	18.9***	–0.418***	–.43
			Intercept		11.670***			2	Age	3.4***	–0.067***	–.06
									Intercept		12.178***	
11.5 to 16.7 Yrs	166	1	Long Int	0.9[a]	–0.697	–.10	314	1	1st Score	20.3***	–0.454***	–.45
		2	1st Score	22.6***	–1.576***	–.47		2	Age	2.5**	0.073**	–.07
		3	Age	0.2[a]	–0.977***	.06			Intercept		12.503***	
		4	Age × 1st	4.4**	0.020825***	–.25						
		5	Age Sq	2.1*	0.004783*	.08						
			Intercept		55.479***							
17.4 to 23.4 Yrs	56	1	1st Score	19.4***	–0.608***	–.44	157	1	Long Int	2.5*	–0.606	–.16
			Intercept		11.780**			2	1st Score	22.3***	–0.574***	–.48
								3	Age	5.4***	–0.133***	–.16
									Intercept		28.911***	

[a]These variables were retained because the subsequent variable or variables would not have been significant if they were omitted from the regression equation.

Note: The longitudinal change was the difference between the first testing scale value and the "later" testing scale value [later score-first score]. The forced stepwise regression variables were: (1) Longitudinal interval. (2) First scale score. (3) Age-at-first-testing. (4) The Age × First Scale Score interaction (multiplicative term). (5) Age squared. (6) Age cubed. Variables significantly ($p < .05$) contributing to accounted for variance were retained for the final regression equation except when they were required to allow other subsequent variables to attain significance.

*$p < .05$
**$p < .01$
***$p < .001$

Table 13. Correlation of Longitudinal Change in Self-Revelation and Acceptance of Daydreaming with Longitudinal Change in Present-Oriented Daydreams (#10), Future in Daydreams (#11), Past in Daydreams (#12), Positive Reactions in Daydreaming (#5), Negative Reactions in Daydreams (#6), Visual Imagery in Daydreaming (#7), and Auditory Imagery in Daydreaming (#8) for the 5.5-9.5 Year, 11.5-16.7 Year, and 17.4-23.4 Year Longitudinal Intervals

	Self-Revelation						Acceptance of Daydreaming					
	5.5-9.5 yrs		11.5-16.7 yrs		17.4-23.4 yrs		5.5-9.5 yrs		11.5-16.7 yrs		17.4-23.4 yrs	
Scale #	W[a]	M	W	M	W	M	W	M	W	M	W	M
10	–10[b]	00	01	04	–08	01	18**	14*	03	05	27	15
11	–08	16	08	09	–06	29**	24***	17**	20*	29***	34*	28**
12	17**	18**	19*	07	18	09	18**	14**	07	–02	–18	–15
5	02	14*	01	14*	10	18	29***	32***	23**	40***	36*	42***
6	09	17**	14	11	34*	32**	03	00	08	–06	–14	–05
7	13	17**	02	06	–01	16	16*	21***	17	25***	–03	23*
8	15*	26***	–04	10	14	04	17*	16**	08	10	09	–04

[a]W = Women, M = Men
[b]Decimal points omitted
*$p < .05$
**$p < .01$
***$p < .001$

with changes in daydreaming likelihood, but changes in positive reactions with age remained evident even when changes in daydream likelihood were taken into account.

Changes in acceptance of daydreaming were significantly correlated with changes in positive reactions in daydreaming for all three longitudinal intervals, see Table 13. This correlation and the significant correlations between change in positive reactions and daydream likelihood suggest that daydreaming likelihood, positive reactions in daydreams and acceptance of daydreams may form a core, at least with regard to retrospective self-report.

The longitudinal samples were reconstituted into six-year interval, age-at-*later*-testing groups to maximized sample sizes. Sex significantly affected longitudinal change in the thirty-four to thirty-nine-year-old group within the 5.5 to 9.5 year longitudinal interval and the fifty-eight to sixty-three year groups within the 5.5-9.5 and 11.5 to 16.7 year longitudinal intervals; women showed a large decrease while men showed a small increase or decrease, see Table 14. When comparisons of positive reactions in daydreaming scale changes were made between longitudinal intervals only two age-at-later-testing groups had significant contrasts between the changes, men fifty-eight to sixty-three years and sixty-four

Table 14. Positive Reactions in Daydreaming Scale, Maximum Age-at-Later-Testing Samples: Mean Change Scores (Later-Earlier) and Results of Analysis of Variance between Longitudinal Intervals for Change Scores within Each Age-at-Later-Testing

Age-at-Later-Testing Age Group (Yrs)	Change in Score from When ___ Years Younger			Between Longitudinal Interval ANOVA Results				Significant $p < .05$
					Partial	— Error —		
	6.8[a]	13.3[b]	19.4[c]	*F*	η^2	*df*	MS	Contrasts
28-33	+.08	—	—	—	—	—	—	
34-39	–0.5	+1.4	—	1.29	—	101	31.3	
40-45	–1.3[d]	–1.5[d]	—	< 1	—	184	24.5	
46-51	–0.9[d]	–2.1[d]	+0.1	2.34	—	235	26.1	
52-57	–0.7	–1.1	–2.6[d]	1.52	—	246	29.6	
58-63 [Women]	–2.7[d]	–3.7[d]	–0.8[e]	< 1	—	92	50.3	
58-63 [Men]	–0.4	–0.5	–3.8[d]	3.02	—	207	36.3	(6.8, 19.4) (13.3, 19.4)
64-69	–0.8	–2.1[d]	–3.3[d]	3.62*	.0233	303	30.3	(6.8, 19.4)
70-75	–0.8	–1.0	–3.0[d]	1.46	—	257	37.5	
76-81	–1.2[d]	–1.5[d]	–3.6[d]	1.64	—	232	37.6	
82-87	–1.1	–3.5[d]	–2.8	1.48	—	116	47.9	
88-95	–1.3	–2.2	—	< 1	—	30	33.1	

[a, b, c]These are means, the longitudinal interval were, respectively, 5.5 to 9.5 years, 11.5 to 16.7 years, and 17.4 to 23.4 years.

[d]Indicates change score within an age group-longitudinal interval combination was significantly, $p < .05$, different from zero.

[e]$N < 10$

Note: Analysis of variance was a one-way repeated measure between the longitudinal intervals on change scores. *df* = degrees of freedom, MS = Mean Square. The sample sizes for the 6.8, 13.3, and 19.4 year longitudinal intervals, respectively, for the age-at-later-testing group were: 28-33 (21, 0, 0), 34-39 (80, 11, 0), 40-45 (133, 55, 7), 46-51 (122, 85, 26), 52-57 (132, 64, 25), 58-63 (178, 80, 23), 64-69 (183, 97, 27), 70-75 (160, 82, 25) 76-81 (126, 86, 31), 82-87 (55, 26, 12), 88-95 (18, 9, 0).

*$p < .05$

**$p < .01$

***$p < .001$

to sixty-nine years. Of the thirty-three longitudinal changes reported in Table 14, sixteen were significantly different from zero. Clearly, age changes followed age differences and as groups got older, men especially, the magnitude of the decrease in positive reactions in daydreaming tended to become greater.

Frightened Reactions in Daydreaming

This scale indicated negative emotional and affective responses to, and tone of, daydreams. Items were concerned with daydreams which depressed or frightened, which upset, which terrified, which were unpleasant, and which resulted in muscular tension.

Age Differences

The Age × Sex ANOVA yielded significant age (10% of variance accounted for) and sex effects, but not their interaction, see Table 3. Means decreased rapidly from seventeen to twenty-four to thirty-five to forty-four years and remained stable thereafter. Frightened reactions were at the "usually not true for me" level, except for the seventeen to twenty-four year-olds and twenty-five to thirty-four-year-old women which were closer to the "usually true" level. Women showed greater means than men. The scale correlation with age was –.26 for women and –.28 for men. The regression of scale on age was nonlinear for both men and women, see Table 4. The correlations of this scale with scales indicating daydream frequency and absorption in daydreaming were all high and were, respectively, for women .34 and .66 and for men .31 and .62, all $p < .001$. These high correlations may be the result of frightened reactions in and to daydreams making them more memorable and thus biasing the individuals when retrospectively reporting daydreaming. When the frequency and absorption scales were held constant the correlation with age was reduced to –.07 for women and –.08 for men, both $p < .01$. After entering the daydream frequency and absorption scale scores in the regression of future in daydreams on age the linear component continued to be significant, but the amount of variance accounted for decreased from 8.8 percent to 1.0 percent for women and from 10.2 percent to 1.5 percent for men.

It is reasonable to believe that frightened emotional reactions to and in daydreams would be related to acceptance of daydreaming and to willingness to self-revelations. When measures of these scales, see Giambra [10], were correlated with frightened emotions scale scores significant values were obtained; for the acceptance and self-revelation scales, respectively, the correlations were –.02 and .21 for women and .01 and .28 for men. Giambra found that both acceptance and self-revelation were negatively correlated with age [10]. The reduced frightened reactions with increased age is inconsistent with reduced acceptance of daydreaming with increased age—the explanation of greater self-revelation with a greater likelihood of frightened reactions remains open.

Age Changes

Analyses of variance of changes for the longitudinal intervals produced the following significant effects, $p < .05$, on changes; all others were not significant: (a) age-at-first-testing for the 5.5 to 9.5 year interval ($F(5,697) = 2.26$, partial $\eta^2 = 0.16$), (b) sex for the 11.5 to 16.7 year interval ($F(1,474) = 5.16$, partial $\eta^2 = .011$), and (c) Age × Sex interaction for the 17.4 to 23.4 year interval ($F(3,179) = 2.77$, partial $\eta^2 = .044$). Note that effects (b) and (c) were not significant within the context of a MANOVA of both emotional reaction scales, see "MANOVA analyses across scales" section below. The differential effect of age for the 5.5 to 9.5 year interval was the most likely the result of a decrease for the twenty-five to thirty-four-year-olds ($M = –0.8$) and an increase for the seventy-five to eighty-four-year-olds ($M = 2.1$); from thirty-five to seventy-four years little change occurred. For the 11.5 to 16.7 year interval women showed a decrease ($M = –0.9$) and men showed a small increase ($M = 0.4$). The Age × Sex interaction for the 17.4 to 23.4 year interval was difficult to interpret. Women showed greater absolute mean changes than men, respectively, 2.2 to 0.7 with the greatest difference between men and women in the twenty-five to thirty-four-year-old (–4.9) and fifty-five to sixty-four-year-old (2.3) groups. When, for each longitudinal interval, the age change in frightened reactions in daydreaming scores was subjected to a forced stepwise (hierarchical) multiple regression: (a) no age components occurred for the men in the 5.5 to 9.5 year and 17.4 to 23.4 year intervals and for the women in the 11.5 to 16.7 year interval, and (b) nonlinear age components occurred for women in the 5.5 to 9.5 year and 17.4 to 23.4 year intervals and for men in the 11.5 to 16.7 year interval; see Table 15. Attrition analyses (subsequent dropouts versus subsequent continuance in program) revealed an attrition effect for the 11.5 to 16.7 year interval ($F(1,460) = 4.47$, $p < .05$, partial $\eta^2 = .010$), but not an interaction with age ($F(4,460) = 1.25$, $p < .05$). Subsequent dropouts showed a mean of –0.4 while those continuing showed a mean increase of 0.8—the fifty-five to sixty-four-year-old group appeared to be primarily responsible for the increase, its mean was 3.5 The correlations of change in daydream frequency and absorption in daydreaming scores with change in frightened reactions in and to daydreams were mostly significant in all three longitudinal intervals, see Table 5. When changes in daydreaming frequency and absorption were used as covariates in the ANOVAs of changes in positive reactions, as described above, the subsample of individuals who had all three change measures did not maintain the significant effects obtained in the full sample. Interpretation of any covariance results on this subsample thus became extremely ambiguous.

Changes in acceptance of daydreaming were not significantly correlated with changes in frightened reactions in daydreaming for all three longitudinal intervals; there was some evidence of a correlation with changes in self-revelation, see Table 14. These outcomes suggest that changes in frightened reactions have little to

Table 15. Frightened Reactions in Daydreaming Scale. Prediction of Age Changes: Results of Forced Stepwise Regression Analysis for the 5.5 to 9.5 Year, 11.5 to 16.7 Year, and 17.4 to 23.4 Year Longitudinal Intervals, Women and Men Separately

	Women						Men					
Longitudinal Interval	*N*	Step	Variable	Percent Variance Increase	Partial Regression Coefficient	Change Correlation	*N*	Step	Variable	Percent Variance Increase	Partial Regression Coefficient	Change Correlation
5.5 to 9.5 Yrs	303	1	1st Score	19.1***	–0.417***	–.44	419	1	1st Score	30.4***	–0.491***	–.55
		2	Age	0.3[a]	–0.305**	.13			Intercept		5.514***	
		3	Age Sq	2.2**	0.003126**	.15						
			Intercept		11.905***							
11.5 to 16.7 Yrs	178	1	1st Score	29.6***	–0.510***	–.54	317	1	1st Score	29.4***	–0.779***	–.54
			Intercept		6.261***			2	Age	0.2[a]	–0.052	.12
								3	Age × 1st	0.9*	0.006551*	–.42
									Intercept		8.082***	
17.4 to 23.4 Yrs	57	1	1st Score	43.8***	–1.074*	–.66	148	1	1st Score	33.4***	–0.551***	–.58
		2	Age	0.8[a]	3.314	.29			Intercept		6.365***	
		3	Age × 1st	0.0[a]	0.011971	–.46						
		4	Age Sq	0.5	–0.090039	.29						
		5	Age Cubed	4.1*	0.000740*	.29						
			Intercept		–28.125							

[a]These variables were retained because the subsequent variable or variables would not have been significant if they were omitted from the regression equation.

Note: The longitudinal change was the difference between the first testing scale value and the "later" testing scale value [later score-first score]. The forced stepwise regression variables were: (1) Longitudinal interval. (2) First scale score. (3) Age-at-first-testing. (4) The Age × First Scale Score interaction (multiplicative term). (5) Age squared. (6) Age cubed. Variables significantly ($p < .05$) contributing to accounted for variance were retained for the final regression equation except when they were required to allow other subsequent variables to attain significance.

*$p < .05$

**$p < .01$

***$p < .001$

Table 16. Frightened Reactions to Daydreaming Scale, Maximum Age-at-Later-Testing Samples: Mean Change Scores (Later-Earlier) and Results of Analysis of Variance between Longitudinal Intervals for Change Scores within Each Age-at-Later-Testing

Age-at-Later-Testing Age Group (Yrs)	Change in Score from When ___ Years Younger			Between Longitudinal Interval ANOVA Results				Significant $p < .05$
					Partial	— Error —		
	6.8[a]	13.3[b]	19.4[c]	F	η^2	df	MS	Contrasts
28-33	−1.3	—	—	—	—	—	—	[None]
34-39	−0.7	+0.2	—	< 1	—	102	32.3	
40-45	−0.3	−0.4	—	< 1	—	200	35.9	
46-51	−0.4	−0.8	+0.3	< 1	—	248	29.2	
52-57	−0.8	−0.8	+0.3	< 1	—	240	36.0	
58-63 [Women]	−1.4[d]	−0.5	−0.9[e]	< 1	—	108	24.2	
58-63 [Men]	+0.4	−0.2	−1.8	1.42	—	190	27.0	
64-69 [Women]	+1.4	+0.1	+0.3[e]	< 1	—	104	32.1	
64-69 [Men]	−0.4	−0.3	−0.2	< 1	—	209	23.3	
70-75	+0.2	+0.1	−1.1	< 1	—	287	26.1	
76-81	+0.6	+1.2[d]	+1.2	< 1	—	237	28.3	
82-87	+0.6	−0.7	+1.2	< 1	—	105	37.3	
88-95	+1.0	—	—	—	—	—	—	

[a, b, c]These are means, the longitudinal intervals were, respectively, 5.5 to 9.5 years, 11.5 to 16.7 years, and 17.4 to 23.4 years.

[d]Indicates change score within an age group-longitudinal interval combination was significantly, $p < .05$, different from zero

[e]$N < 10$

Note: Analysis of variance was a one-way repeated measure between the longitudinal intervals on change scores. df = degrees of freedom, MS = Mean Square. The sample sizes for the 6.8, 13.3, and 19.4 year longitudinal intervals, respectively, for the age-at-later-testing group were: 28-33 (21, 0, 0), 34-39 (80, 11, 0), 40-45 (133, 55, 7), 46-51 (122, 85, 26), 52-57 (132, 64, 25), 58-63 (178, 80, 23), 64-69 (183, 97, 27), 70-75 (160, 82, 25) 76-81 (126, 86, 31), 82-87 (55, 26, 12), 88-95 (18, 9, 0).

*$p < .05$

**$p < .01$

***$p < .001$

do with changes in acceptance of daydreaming, a surprising outcome. Also, there is a suggestion that changes in frightened reactions varied with changes in self-revelation, i.e., more self-revelation and more frightened reactions went together, another surprising outcome. These surprising outcomes may be the result of relatively small changes in absolutely low levels of frightened reactions in daydreams and could be artifactual.

The longitudinal samples were reconstituted into six-year interval, age-at-*later*-testing groups to maximized sample sizes. Sex significantly affected longitudinal change in the thirty-four to thirty-nine year, fifty-eight to sixty-three year, and sixty-four to sixty-nine-year-old groups within the 5.5 to 9.5 interval; women showed a large absolute change while men showed a small absolute change, see Table 16. When comparisons of frightened reactions to daydreams scale changes were made between longitudinal intervals no significant differences between longitudinal periods were found. Of the thirty-five longitudinal changes reported in Table 16, only two were significantly different from zero. There was little evidence for age differences and age changes in frightened reactions in and to daydreams except for the younger ages. There was some suggestion that reaching old age may somewhat increase frightened reactions intraindividually. However, levels tended to be low at all ages and indicated little in the way of frightening daydreams.

MANOVA Analyses Across Emotional Reaction Scales

Age Differences

An Age Group × Sex MANOVA was carried out on the two scales measuring emotional reactions to daydreams. Significant effects occurred for age group (Wilks $F(12,5498) = 39.72$, $p < .001$, effect size = .080) and for sex (Wilks $F(2,2749) = 21.85$, $p < .001$, effect size = .016) but not for their interaction (Wilks $F(12,5498) = 1.04$, $p > .05$).

Age Changes

An Age-at-First-Testing × Sex MANOVA was carried out on the longitudinal changes of the two scales for each longitudinal interval. Significant longitudinal changes occurred for the 5.5 to 9.5 year (Wilks $F(2,600) = 12.40$, $p < .001$, effect size = .040), 11.5 to 16.7 year (Wilks $F(2,406) = 6.99$, $p < .01$ effect size = .033), and 17.4 to 23.4 year (Wilks $F(2,157) = 4.05$, $p < .05$, effect size = .049) intervals. Age-at-First-Testing (Wilks $F(10,1200) = 1.87$, $p < .05$, effect size = .015) and sex (Wilks $F(2,600) = 4.03$, $p < .05$, effect size = .013) significantly affected the level of these changes only for the 5.5 to 9.5 year interval. Age in combination with sex did not significantly affect level of longitudinal change.

Comparisons Between Emotional Reaction Scales

Cross-Sectional Sample

A measure of the relative tendency of daydreams to have positive and negative emotional responses was obtained by observing the magnitude of the means of the positive and negative reaction scales. To determine if the differences in the means, see Table 3, were statistically different an Age Group by Sex by Emotional Reaction Scales (repeated) ANOVA was carried out. A significant effect occurred for the difference between emotional reaction scales ($F(1,2750) = 2774.02$, $p < .001$, partial $\eta^2 = .502$) and the effect of age on this difference ($F(6,2750) = 8.58$, $p < .001$, partial $\eta^2 = .018$). Positive reactions ($M = 22.7$) were much more likely than negative reactions ($M = 13.0$); both men and women responded this way. The difference between emotional reaction scales was significant for all age groups. Positive reactions exceeded negative reactions in decreasing amounts as the age groups increased from twenty-five to forty-four years ($M_{\text{Difference}} = 11.5$) to seventy-five to eighty-four years ($M_{\text{Difference}} = 7.4$); the seventeen to twenty-four-year-old group's mean difference was 9.3.

Longitudinal Sample

A measure of the relative change, over time, in the tendency to have daydreams with positive or negative emotional responses was obtained by comparing the magnitude of the mean changes for these two scales. To determine if the mean changes were statistically different a Age-at-first-testing by Sex by Emotional Reaction Scales (repeated) ANOVA was carried out for each longitudinal period. A significant repeated measures factor effect occurred for all longitudinal intervals: 5.5 to 9.5 years ($F(1,601) = 18.11$, $p < .001$, partial $\eta^2 = .029$); 11.5 to 16.7 years ($F(1,407) = 6.90$, $p < .01$, partial $\eta^2 = .017$); and 17.4 to 23.4 years ($F(1,158) = 4.26$, $p < .05$, partial $\eta^2 = .026$). For the 5.5 to 9.5 year interval, age-at-first-testing determined the difference between the mean changes of the two emotional reaction scales ($F(5,601) = 2.87$, $p < .05$, partial $\eta^2 = .023$). For the three intervals there was a decrease (–1.2, –1.2, and –1.5, respectively) for the positive reactions and little change for the frightened reactions (0.2, –0.1, and –0.1, respectively). For the 5.5 to 9.5 year interval, age group influenced the difference (positive minus frightened reactions) between the two emotional reaction scale changes; with similar mean values for the twenty-five to thirty-four, forty-five to fifty-four, and fifty-five to sixty-four year-old groups (0.5, –0.8, –0.5, respectively) and disparate values for the thirty-five to forty-four, sixty-five to seventy-four, and seventy-five to eighty-four-year groups (–1.6, –2.4, –3.6, respectively—negative values result because the changes in positive reactions were large decreases and the changes in frightened reactions were small decreases or increases).

Summary

It is clear, both cross-sectionally and longitudinally, that age influences emotions in, and to, daydreams. Positive reactions dominate at all ages but with less dominance with increased age. Relative to seventeen to twenty-four-year-olds, both positive and frightened emotional reactions decrease. For frightened reactions, age has little effect following early middle-age. For positive reactions, age acts to reduce such reactions until old age. In the oldest individuals, change in positive reactions were markedly greater than change in frightened reactions. Increased age seems to result in less emotional experience associated with daydreams which are spontaneous and less subject to control. Furthermore, these results seem to be at odds with emotional experience in situations where control can be exercised. In those studies positive emotions seem to remain high and relatively unchanged with increased age while negative emotions were reduced [20]. A subsidiary result of this study is that changes in acceptance of daydreaming were unrelated to changes in frightened reactions to daydreams but were highly related to changes in positive reactions to daydreams. Furthermore, likelihood of daydreaming and likelihood of any type of emotional response appear to be highly related and changes in likelihood of daydreaming and changes in likelihood of any kind of emotional response both seem to be evident. Why this may be so is open to speculation. A good candidate would be that the emotional component makes for greater memorability of the daydreaming biasing their report using the retrospective report method of this study.

IMAGERY

Visual mental imagery may be partitioned into four aspects: image generation, image maintenance, image inspection, and image transformation [25]. Auditory mental imagery can easily be conceived as having generation, maintenance, and transformation; inspection may be possible but seems less likely, more difficult, and more problematical. During a daydream, image generation, maintenance, and transformation may occur; image inspection is logically possible but seems unlikely. Dror and Kosslyn show clearly that the older adult has moderate impairment of image generation and transformation and mild impairment of image maintenance—impairment was defined as disproportionate slowing and error-making with increased difficulty [25]. Johnson and Rybash, in their review, found considerable evidence for age effects on image transformation, usually mental rotation, but suggest that the outcomes were the result of an "attention shift" artifact in the image transformation tasks—because an age effect did not occur in a mental rotation experiment where no attention shift was required [26]. Johnson and Rybash report additional studies by Johnson where image generation was not particularly age sensitive but

image maintenance was strongly age sensitive [26]. Finally, in a survey study, Giray, Roodin, Altkin, et al. found that sixty to ninety-four-year-olds reported more frequent eidetic imagery than twenty to fifty-nine year-olds [27]. This outcome was clearly anomalous in terms of the age relationship because eidetic images represent the most vivid and "true" of generated visual images; it is in need of replication and may be the result of sampling bias. Despite Giray et al. [27], the age effects reported in the literature on image generation, maintenance and transformation in the elderly would predict reduced imagery in the daydreams of the aged.

RESULTS

Visual Imagery in Daydreams

This scale reported the extent and clarity of visual imagery in daydreams. Items were concerned with daydreams which were like "pictures in my mind," which included seeing things and people moving around, were in color, and which contained "scenes."

Age Differences

The Age × Sex ANOVA yielded only a significant age effect (8% of variance accounted for), see Table 3. Decreased means occurred with increased age, from levels somewhat above, to levels somewhat below, "usually true for me." The correlation with age was –.28 for women and –.30 for men. The regression of the scale on age was linear for men and nonlinear for women, see Table 4. The correlations of this scale with scales indicating daydream frequency and absorption in daydreaming were all high and were, respectively, for women .37 and .49 and for men, .42 and .54, all $p < .001$. When the frequency and absorption scales were held constant the correlation with age was reduced to –.10 for women and –.08 for men, both $p < .01$. After entering the daydream frequency and absorption scale scores in the regression of visual imagery in daydreams on age the linear component continued to be significant, but the amount of variance accounted for decreased from 8.4 percent to 0.9 percent for women and from 8.9 percent to 0.5 percent for men.

Age Changes

Analyses of variance of changes for the longitudinal intervals showed a significant, $p < .05$, decrease for the 5.5 to 9.5 year interval ($M = –0.6$, $F(1,615) = 5.85$, partial $\eta^2 = .009$) and the 17.4 to 23.4 year interval ($M = –1.1$, $F(1,175) = 4.22$, partial $\eta^2 = .024$)—both effects were not significant within the context of a MANOVA of both imagery scales, see "MANOVA analyses

across scales" section below. The effects of age, sex, and their interaction on longitudinal changes were not significant, $p > .05$. When, for each longitudinal interval, the age change in visual imagery in daydreams scores was subjected to a forced stepwise (hierarchical) multiple regression, only the 5.5 to 9.5 year interval for women produced any significant age components, both were nonlinear. For the other longitudinal intervals and for men, change was predictable from first the testing level, greater visual imagery predicted a greater decrease than lesser visual imagery, see Table 17. Attrition analyses (subsequent dropouts versus subsequent continuance in program) revealed one significant effect, the interaction of age-at-first-testing with dropout status for the 5.5 to 9.5 year longitudinal interval ($F(4,514 = 2.91, p < .05$, partial $\eta^2 = .022$; all other Fs < 1). The interaction was primarily due to the radical difference between subsequent dropouts ($M = –6.1$) and nondropouts ($M = –0.6$) for the twenty-five to thirty-four-year-olds; all other groups showed a much smaller difference between dropouts and nondropouts, from 0.4 to 1.7. The correlations of change in daydream frequency and absorption in daydreaming scores with change in visual imagery in daydreams were mostly significant in all three longitudinal intervals, see Table 5. When changes in daydreaming frequency and absorption were used as covariates in the ANOVA of 5.5 to 9.5 year changes in visual imagery, as described above, the effect of the longitudinal interval was not significant ($F < 1$). For the 17.4 to 23.4 year interval the subsample of individuals who had all three change measures did not maintain the significant effect of the longitudinal interval obtained in the full sample; however, the probability level associated with the effect was considerably increased, $p = .46$.

The longitudinal samples were reconstituted into six-year interval, age-at-later-testing groups to maximize sample sizes. Sex significantly affected longitudinal change in the forty-six to fifty-one year group within the 11.5 to 16.7 year longitudinal interval; women showed a large decrease while men showed a small decrease, see Table 18. When comparisons of visual imagery in daydreams scale changes were made between longitudinal intervals no significant effects were obtained. Of the thirty longitudinal changes reported in Table 18, five were significantly different from zero.

Summary

Although the 11.5 to 16.7 year longitudinal interval failed to show a significant decrease in visual imagery in daydreams the longer and shorter intervals did show significant, but small decreases. However, there was evidence that these changes , and cross-sectional effects, may have been primarily the result of an overall reduction in daydreaming likelihood. When individual age groups were examined negative changes indicated in the cohort differences were evident and in five cases

Table 17. Visual Imagery in Daydreams Scale. Prediction of Age Changes: Results of Forced Stepwise Regression Analysis for the 5.5 to 9.5 Year, 11.5 to 16.7 Year, and 17.4 to 23.4 Year Longitudinal Intervals, Women and Men Separately

	Women						Men					
Longitudinal Interval	*N*	Step	Variable	Percent Variance Increase	Partial Regression Coefficient	Change Correlation	*N*	Step	Variable	Percent Variance Increase	Partial Regression Coefficient	Change Correlation
5.5 to 9.5 Yrs	258	1	1st Score	23.0***	–0.024	–.48	380	1	1st Score	20.6***	–0.396***	–.45
		2	Age × 1st	1.8*	–0.09977***	–.38			Intercept		7.633***	
		3	Age Sq	2.7**	0.001645**	.08						
			Intercept		3.605							
11.5 to 16.7 Yrs	155	1	1st Score	27.5***	–0.540***	–.52	301	1	1st Score	19.0***	–0.414***	–.44
			Intercept		10.215***				Intercept		8.470***	
17.4 to 23.4 Yrs	57	1	1st Score	17.2**	–0.407**	–.41	143	1	1st Score	33.3***	–0.564***	–.58
			Intercept		6.486*				Intercept		11.033***	

Note: The longitudinal change was the difference between the first testing scale value and the "later" testing scale value [later score-first score]. The forced stepwise regression variables were: (1) Longitudinal interval. (2) First scale score. (3) Age-at-first-testing. (4) The Age × First Scale Score interaction (multiplicative term). (5) Age squared. (6) Age cubed. Variables significantly ($p < .05$) contributing to accounted for variance were retained for the final regression equation except when they were required to allow other subsequent variables to attain significance.

*$p < .05$

**$p < .01$

***$p < .001$

Table 18. Visual Imagery in Daydreams Scale, Maximum Age-at-Later-Testing Samples: Mean Change Scores (Later-Earlier) and Results of Analysis of Variance between Longitudinal Intervals for Change Scores within Each Age-at-Later-Testing

Age-at-Later-Testing Age Group (Yrs)	Change in Score from When ___ Years Younger			Between Longitudinal Interval ANOVA Results				Significant $p < .05$
					Partial	— Error —		
	6.8[a]	13.3[b]	19.4[c]	*F*	η^2	*df*	MS	Contrasts
28-33	+0.5	—	—	—	—	—	—	[None]
34-39	–1.8[d]	–0.5	—	< 1	—	94	40.0	
40-45	–1.0	–1.1	—	< 1	—	175	48.9	
46-51 [Women]	–1.3	–3.2[d]	–1.4	< 1	—	85	34.4	
46-51 [Men]	+0.4	+0.5	+1.7	< 1	—	143	27.6	
52-57	–0.4	–0.7	–0.3	< 1	—	228	35.6	
58-63	–0.7[d]	–0.5	–2.6[d]	1.43	—	282	33.4	
64-69	0.0	0.0	–1.4	< 1	—	287	31.8	
70-75	–0.1	+0.1	–0.6	< 1	—	238	31.1	
76-81	–0.1	+0.3	–0.9	< 1	—	223	33.9	
82-87	+1.5[d]	+0.2	—	< 1	—	84	32.0	
88-95	+0.9	+0.7	—	< 1	—	25	28.0	

[a, b, c]These are means, the longitudinal intervals were, respectively, 5.5 to 9.5 years, 11.5 to 16.7 years, and 17.4 to 23.4 years.

[d]Indicates change score within an age group-longitudinal interval combination was significantly, $p < .05$, different from zero

Note: Analysis of variance was a one-way repeated measure between the longitudinal intervals on change scores. *df* = degrees of freedom, MS = Mean Square. The sample sizes for the 6.8, 13.3, and 19.4 year longitudinal intervals, respectively, for the age-at-later-testing group were: 28-33 (21, 0, 0), 34-39 (80, 11, 0), 40-45 (133, 55, 7), 46-51 (122, 85, 26), 52-57 (132, 64, 25), 58-63 (178, 80, 23), 64-69 (183, 97, 27), 70-75 (160, 82, 25) 76-81 (126, 86, 31), 82-87 (55, 26, 12), 88-95 (18, 9, 0).

*$p < .05$

**$p < .01$

***$p < .001$

significant. Thus, age effects on visual imagery, when allowances are made for biasing resulting from different daydream likelihoods at different ages, seem to be small, weak, and real.

Auditory Imagery in Daydreams

This scale reported the extent and apparent clarity of auditory imagery in daydreams. Items were concerned with daydreams which were like listening to the radio and which included voices, music, and conversations between the individual and others.

Age Differences

The Age × Sex ANOVA yielded only a significant age effect (11% of variance accounted for), see Table 3. Means decreased with increased age, from levels somewhat below "usually true for me" to levels somewhat above "usually not true for me." The correlation with age was –.27 for women and –.38 for men. Unlike the visual imagery scale, the prediction of the auditory imagery scale scores by age was nonlinear for both men and women, see Table 4. The correlations of this scale with scales indicating daydream frequency and absorption in daydreaming were all high and were, respectively, for women .32 and .48 and for men .39 and .53 all $p < .001$. When the frequency and absorption scales were held constant the correlation with age was reduced to –.11 for women and –.20 for men, both $p < .01$. After entering the daydream frequency and absorption scale scores in the regression of auditory imagery in daydreams on age the linear component continued to be significant, but the amount of variance accounted for decreased from 9.3 percent to 1.9 percent for women and from 15.5 percent to 2.6 percent for men.

Age Changes

Analyses of variance of changes for the longitudinal intervals showed a significant: (a) age-at-first-testing effect ($F(5,598) = 4.99$, $p < .001$, partial $\eta^2 = .040$; the means for the twenty-five to thirty-four through seventy-five to eighty-four year old were, respectively, –1.4, –2.1, –0.8, 0.1, 0.2, 3.2) and Age × Sex interaction ($F(5,598) = 4.07$, $p < .01$, partial $\eta^2 = .033$; due primarily to seventy-five to eighty-four-year-old women having an increase of 6.5 and seventy-five to eighty-four-year-old men having a decrease of –0.1) for the 5.5 to 9.5 year interval and (b) effect of the longitudinal period ($M = –0.8$, $F(1,417) = 5.67$, $p < .05$, partial $\eta^2 = .013$) for the 11.5 to 16.7 year interval—this effect was not significant in the MANOVA of both imagery scales, see "MANOVA analyses across scales" section below. No effects were significant for the 17.4 to 23.4 year interval, $p > .05$. When, for each longitudinal interval, the age change in auditory imagery in daydream scores was subjected to a forced stepwise

(hierarchical) multiple regression, only the 5.5 to 9.5 year interval for women and the 11.5 to 16.7 year interval for men produced significant age components, both nonlinear—in all instances higher initial auditory imagery predicted greater decreases than lesser initial auditory imagery—see Table 19. Attrition analyses (subsequent dropouts versus subsequent continuance in program) revealed one significant effect, the interaction of age-at-first-testing with dropout status for the 5.5 to 9.5 year interval ($F(4,498) = 3.02$, $p < .05$, partial $\eta^2 = .024$; all other Fs < 1.33). The interaction was primarily the result of a large difference between subsequent dropouts ($M = -5.7$) and nondropouts ($M = -0.8$) for twenty-five to thirty-four year olds; all other ages showed a much smaller difference between dropout groups, from 0.6 to 3.6. The correlations of change in daydream frequency and absorption in daydreaming scores with change in visual imagery in daydreams were mostly significant for absorption in all three longitudinal intervals, see Table 5. When changes in daydreaming frequency and absorption were used as covariates in the ANOVA of 5.5 to 9.5 year changes in auditory imagery, as described above, the effect of age and of age and sex in combination on the longitudinal remained significant. For the 11.5 to 16.7 year interval the subsample of individuals who had all three change measures did not maintain the significant effect of the longitudinal interval obtained in the full sample; however, the probability associated with the effect was considerably increased, $p = .55$.

The longitudinal samples were reconstituted into six-year interval, age-at-later-testing groups to maximize sample sizes. Sex significantly affected longitudinal change in the eighty-two to eighty-seven year group within the 5.5 to 9.5 year longitudinal interval; women showed a large increase while men showed essentially no change, see Table 20. When comparisons of auditory imagery in daydreams scale changes were made between longitudinal intervals one significant effect—for the fifty-eight to sixty-three-year-olds—was obtained, see Table 20. Of the twenty-nine longitudinal changes reported in Table 20, five were significantly different from zero.

Summary

There was greater discordance between the age changes observed here and the age differences displayed in Table 3. This was especially true because the change for the 17.4 to 23.4 year interval was not significant and because all the older age groups showed increases in auditory imagery for 5.5 to 9.5 year and 11.5 to 16.7 year longitudinal intervals. Furthermore, changes in daydreaming likelihood seem to be biasing changes in likelihood of having auditory imagery in daydreams. Hence, the effect of age on auditory imagery remains less clear.

Table 19. Auditory Imagery in Daydreams Scale. Prediction of Age Changes: Results of Forced Stepwise Regression Analysis for the 5.5 to 9.5 Year, 11.5 to 16.7 Year, and 17.4 to 23.4 Year Longitudinal Intervals, Women and Men Separately

	Women						Men					
Longitudinal Interval	*N*	Step	Variable	Percent Variance Increase	Partial Regression Coefficient	Change Correlation	*N*	Step	Variable	Percent Variance Increase	Partial Regression Coefficient	Change Correlation
5.5 to 9.5 Yrs	255	1	Long Int	2.1*	0.958*	.14	366	1	1st Score	22.3***	–0.379***	–.47
		2	1st Score	20.1***	–0.441***	–.47			Intercept		5.256***	
		3	Age	0.5[a]	–0.731***	.20						
		4	Age Sq	7.3***	0.007397**	.24						
			Intercept		15.744**							
11.5 to 16.7 Yrs	148	1	1st Score	23.9***	–0.469***	–.49	291	1	1st Score	22.6***	0.051	–.48
			Intercept		5.892***			2	Age	0.0[b]	0.171*	.11
								3	Age × 1st	1.7*	–0.010658*	–.42
									Intercept		–2.127	
17.4 to 23.4 Yrs	50	1	1st Score	15.0**	–0.409**	–.39	133	1	1st Score	30.1***	–0.549***	–.55
			Intercept		5.759*				Intercept		7.265***	

[a]This variable was included because it was needed to maximize variance accounted for by age squared, 7.3% vs. 1.3% and because its partial regression coefficient was significant.

[b]Age was retained because the subsequent variable would not have been significant if age were omitted from the regression equation.

Note: The longitudinal change was the difference between the first testing scale value and the "later" testing scale value [later score-first score]. The forced stepwise regression variables were: (1) longitudinal interval. (2) First scale score. (3) Age-at-first-testing. (4) The Age × First Scale Score interaction (multiplicative term). (5) Age squared. (6) Age cubed. Variables significantly ($p < .05$) contributing to accounted for variance were retained for the final regression equation except when they were required to allow other subsequent variables to attain significance.

*$p < .05$
**$p < .01$
***$p < .001$

Table 20. Auditory Imagery in Daydreams Scale, Maximum Age-at-Later-Testing Samples: Mean Change Scores (Later-Earlier) and Results of Analysis of Variance between Longitudinal Intervals for Change Scores within Each Age-at-Later-Testing

Age-at-Later-Testing Age Group (Yrs)	Change in Score from When ___ Years Younger			Between Longitudinal Interval ANOVA Results				Significant $p < .05$
					Partial	— Error —		
	6.8[a]	13.3[b]	19.4[c]	*F*	η^2	*df*	MS	Contrasts
28-33	–2.9	—	—	—	—	—	—	
34-39	–1.2	0.0	—	< 1	—	89	40.0	
40-45	–1.8[d]	–2.0	—	< 1	—	177	45.8	
46-51	–0.5	–1.9[d]	+0.1	1.59	—	223	39.8	
52-57	–0.1	–0.7	–2.4	1.40	—	208	42.1	
58-63	–0.6	–1.2	–4.7[d]	4.33*	.0338	248	40.6	(6.8, 19.4) (13.3, 19.4)
64-69	–0.5	–0.9	–1.0	< 1	—	263	37.6	
70-75	+0.3	+0.5	–1.0	< 1	—	232	39.3	
76-81	+0.5	+0.4	–0.7	< 1	—	209	41.7	
82-87[e]	+1.8	+2.2	0.0	< 1	—	90	51.9	
88-95	+3.8[d]	—	—	—	—	—	—	

[a, b, c]These are means, the longitudinal intervals were, respectively, 5.5 to 9.5 years, 11.5 to 16.7 years, and 17.4 to 23.4 years.

[d]Indicates change score within an age group-longitudinal interval combination was significantly, $p < .05$, different from zero

[e]Significant sex effect on longitudinal change for the 6.3 year interval; women's mean of 6.1 ($t(15) = 3.07$, $p < .01$) and men's mean of –0.1 ($t(35) = -0.09$, $p > .05$). However, for the 13.3 year interval $N < 10$ for both men and women so separate ANOVAs for men and women were not run.

Note: Analysis of variance was a one-way repeated measure between the longitudinal intervals on change scores. *df* = degrees of freedom, MS = Mean Square. The sample sizes for the 6.8, 13.3, and 19.4 year longitudinal intervals, respectively, for the age-at-later-testing group were: 28-33 (21, 0, 0), 34-39 (80, 11, 0), 40-45 (133, 55, 7), 46-51 (122, 85, 26), 52-57 (132, 64, 25), 58-63 (178, 80, 23), 64-69 (183, 97, 27), 70-75 (160, 82, 25) 76-81 (126, 86, 31), 82-87 (55, 26, 12), 88-95 (18, 9, 0).

*$p < .05$
**$p < .01$
***$p < .001$

MANOVA Analyses Across Imagery Scales

Age Differences

An Age Group × Sex MANOVA was carried out on the two scales measuring imagery in daydreams. A significant effect occurred for age group (Wilks $F(12,5140) = 27.81$, $p < .001$, effect size = .061) and for Age × Sex (Wilks $F(12,5140) = 1.93$, $p < .05$, effect size = .004), but not for sex (Wilks $F(2,2570) = 2.95$, $p > .05$). It should be noted that neither imagery scale demonstrated a significant interaction in their univariate ANOVA.

Age Changes

An Age-at-First-Testing × Sex MANOVA was carried out on the longitudinal changes of the two scales for each longitudinal interval. Significant effects occurred only in the 5.5 to 9.5 year interval: Age-at-First-Testing (Wilks $F(10,1074) = 2.33$, $p < .05$, effect size = .021) and age in combination with sex (Wilks $F(10,1074) = 2.86$, $p < .01$, effect size = .026) affected the level of longitudinal change.

Comparisons Between Imagery Scales

Cross-Sectional Sample

A measure of the relative tendency of daydreams to have visual and auditory imagery in daydreams was obtained by comparing the magnitude of the means of the visual and auditory imagery scales. To determine if the differences in the means, see Table 3, were significant an Age Group by Sex by Imagery Scales (repeated) ANOVA was carried out. A significant effect occurred for the difference between imagery scales ($F(1,2571) = 1247.95$, $p < .001$, partial $\eta^2 = .327$), for the effect of sex on the difference ($F(1,2571) = 4.62$, $p < .05$, partial $\eta^2 = .002$), the effect of age on the difference ($F(6,2571) = 11.32$, $p < .001$, partial $\eta^2 = .026$), and the combined effect of the age and sex ($F(6,2571) = 2.47$, $p < .05$, partial $\eta^2 = .006$). Overall, visual imagery ($M = 20.8$) was more likely than auditory imagery ($M = 16.2$); furthermore, this difference was significant for all age groups. Women had a smaller mean difference (4.4) between the scales than men (5.1); the sex difference was significant in the forty-five to fifty-four, fifty-five to sixty-four, and sixty-five to seventy-four-year-old groups. The mean difference was smallest in the seventeen to twenty-four-year-olds (3.1) and seventy-five to eighty-four-year-olds (4.4) and greatest in the thirty-five to forty-four-year-olds (5.3) Women showed this pattern while men diverged from it—the twenty-five to thirty-four-year-olds had the second smallest mean difference between the scales.

Longitudinal Sample

A measure of the relative change over time in the tendency to have daydreams with visual or auditory imagery was obtained by comparing the magnitude of the mean changes for these two scales. To determine if the mean changes were statistically different an Age-at-First-Testing by Sex by Daydream Imagery Scales (repeated) ANOVA was carried out for each longitudinal period. A single significant effect occurred, the interaction of imagery type, sex, and age in the 5.5 to 9.5 year interval ($F(5,538) = 2.94$, $p < .05$, partial $\eta^2 = .027$). The difference between the changes for the two imagery scales was less than one for both men and women between twenty-five and fifty-four years old at age-at-first-testing and for men in the fifty-five to sixty-four-year-old group and for women in the sixty-five to seventy-four-year-old group. The greatest differences between the changes in the two scales occurred in the fifty-five to sixty-four-year-old women (–1.7), sixty-five to seventy-four-year-old men (–1.7), and the seventy-five to eighty-four-year-old women (–5.0) and men (+1.1). Note also that seventy-five to eighty-four-year-old women showed large longitudinal increases in visual imagery (2.6) and auditory imagery (7.6) while all other age group-sex combinations showed longitudinal decreases or essential no changes in either visual or auditory imagery.

SUMMARY

Both age differences and age changes were clear and mutually confirmatory for visual imagery in daydreams but not for auditory imagery in daydreams. Image generation, maintenance and transformation in daydreams was reduced with increased age for visual imagery. Auditory imagery seemed to be relatively low at all age groups and thus left little room for further age-related decreases. Longitudinally, there appeared to be in the oldest age groups a tendency to have a large increase in auditory imagery accompanied by some increase in visual imagery, especially in women. These disparate results need replication and, if replicated, then these increases in daydream imagery may be the result of increased opportunity or occurrence of psychiatric disorders (auditory imagery often accompanies psychiatric disorders of a schizoid nature).

APPENDIX A

Maximizing Age Group Representation

Some longitudinal participants were tested as many as four times, not including short-term test-retest repeats. Table A1 shows three hypothetical longitudinal participants who were last tested at age 56. Participant 1 (P1) was tested twice; Participant 2 (P2) was tested three times; and Participant 3 (P3) was tested four

Table A1. An Illustration of How to Maximize Sample Size for Longitudinal Periods for Particular Age-at-Later-Testings of Three Hypothetical Longitudinal Participants Who Were 56 Years Old at Last Testing

	Longitudinal Period (Years)		Age-at-Later-Testing	Testing			
Participant	Maximum	Used		Last-3	Last-2	Last-1	Last
P1	6	6	56			50	56
P2	12	6	56		44	50	56
P3	18	6	56	38	44	50	56
P2	12	6	50		44	50	56
P3	18	6	50	38	44	50	56
P3	18	6	44	38	44	50	56
P2	12	12	56		44		56
P3	18	12	56	38	44		56
P3	18	12	50	38		50	56

times. Each of these participants had 6 years between testings and a different initial testing age. P1 had one 6-year longitudinal period (50-56 years), P2 had two 6-year longitudinal periods (44-50 and 50-56 years), and P3 had three 6-year longitudinal periods (38-44, 44-50, 50-56 years). Therefore, P1 contributed information on longitudinal change for one 6-year interval, P2 contributed information on two 6-year intervals, and P3 contributed information on three 6-year intervals. Thus, if the maximum information on 6-year longitudinal change between 50 and 56 years of age were to be obtained, all three participants would contribute; for 44-50 years, two participants (P2, P3) would contribute; and for 38-44 years, one participant (P3) would contribute. The cost of this gain in information at specific ages is that longitudinal change estimates for different ages come from interdependent samples instead of independent samples, as was the case in the earlier regression analyses. A similar maximization of sample size at a particular age interval can occur for the 12 year longitudinal periods depicted in Table A1. With the 12 year longitudinal period, for example, P2 and P3, could contribute to the 44-56 year interval; and P3 could contribute to the 38-50 year interval.

This method of aggregating longitudinal participants permits a longitudinal period one-way ANOVA for each age-at-later-testing. An ANOVA was carried out for each age-at-later-testing interval with two or more longitudinal periods consisting of samples of at least 10 men or women.

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BOOK REVIEWS

Editor: DELMONT MORRISON, PH.D.

AN INVITATION TO READERS

Imagination, Cognition and Personality solicits reviews of new books from its readers. Good reviews provide a valuable professional service by informing readers of new books and by critically orienting them to the major issues the books address. Any relevant volume may be considered. If you wish to submit a review, before proceeding please send a letter of intent, identifying the book in question (title, author, publisher), to Dr. Delmont Morrison, ICP Book Review Editor, Department of Psychiatry, CAS-0984, University of California, San Francisco, CA 94143-0984. Instructions will then be sent to you. The Editor reserves the right of final decision on publication.

Dreams and Nightmares: The New Theory on the Origin and Meaning of Dreams, by Ernest Hartmann, M.D., New York: Basic Books, $27.95.

Dreams and Nightmares offers a meaningful balance between research and useful clinical understanding of dreams. In order to understand the origin and meaning of dreams, Dr. Hartmann begins with a subset of dreams—dreams triggered by traumatic experiences—and then moves on to dreams triggered by less traumatic but stressful situations. This research demonstrates that the content of the dream provides an explanatory metaphor for the dreamer's emotional state of mind. Dreams that occur after a severe trauma are typically nightmares that reflect the same sense of fear or terror, the same sense of helplessness or vulnerability and the same sense of quilt as the triggering trauma.

Siri Carpenter, reporting recent research in the latest issue of the APA Monitor (July/August 1999) reported a study by Allan R. Braun, M.D., which physiologically supports Dr. Hartmann's concept that dreams are explanatory metaphors for the dreamers emotional state. "Using Positron Emission Tomography (PET) Dr. Braun found that the limbic and paralimbic regions of the brain—areas that

control emotion and motivation—were highly active during REM sleep and areas of the prefrontal cortex were inactive."

Dr. Hartmann concludes that dreaming allows us to make connections more broadly, guided by emotions, to other life experiences and, by making these connections, "the storm is calmed" or the disturbance is smoothed out. These dreams emotionally repeat the story of the trauma in many different metaphoric ways, connecting the trauma to other parts of one's life and allowing the trauma to be integrated into one's life. With such connections, the emotions become less powerful and overwhelming, thus calming the storm. Dreams are thus similar to therapy in that they provide a means of catharsis diminishing the power of a trauma.

Dr. Hartmann repeatedly uses the word "connection." What are these connections? He explains that in considering the neural network of the brain, most thinking done during a waking state is goal directed and thus linear. In dreaming, connections are made more broadly and loosely, thus more hyperconnective. Rather than being linear, in dreams neural impulses make connections in any direction, associating the dream content with many other events in one's life that in return may influence the dream. These more broad and loose connections allow for retelling the story in many different ways thus calming the storm.

Though Dr. Hartmann is offering a new explanation of the origin and meaning of dreams, I believe that this explanation can be used with hypnotic recall or other imagery and hypnotic experiences.

This book greatly clarified to me what I have already been doing in therapy but had not put clearly into words: dreams are an explanatory metaphor for the dreamer's emotional state of mind. I believe this concept provides a solution to the controversial issue of false memory. Consider the following dream of a young professional woman. "I was riding in a golf cart with my father. We stopped and I reached into the golf bag to pull out a club but found instead that I was pulling on a penis." How many therapists would have jumped to the conclusion that she had been sexually molested by her father? Yet she described her father as very loving and a good man who would have never sexually abused her. I asked her about her feelings in this dream. After some thought she decided that the best words to describe her feelings were of disgust and vulnerability. When I asked her in what part of her life did she feel disgusted and vulnerable she was quick to tell me how she recently decided to invest some money in the stock market, had gone to a reputable investment company and found a stock broker she trusted and liked. She followed his advice but so far she has taken a big loss. She felt disgusted and vulnerable in this situation. The penis was not really connected to her father just as the price of stock was not connected to her stock broker. She did feel vulnerable, disgusted and raped by the stock market. The dream was a metaphor of her emotional state of mind. If therapists would limit their interpretation of dreams and hypnotic recall to examining the client's emotional state of mind, the issue of false memories would be avoided.

Near the end of the book, Dr. Hartmann draws a distinction between Dream People and Thought People. Thought People have "thicker boundaries." They tend to be more rational and keep perceptions, thoughts and feelings distinct and separate. The Dream People have thin boundaries. They tend to make broader associations and are more creative. They tend to dream more vividly and do not always distinguish reality from fantasy. Though the research and clarity which Dr. Hartmann brings to his New Theory on the Origin and Meaning of Dreams demonstrates his propensity to being a thought person, the fact that he can make these connections in this new and refreshing manner demonstrates that he is also a dream person. Finding such balance between dreams and thought makes his approach more human.

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Mind Myths: Exploring Popular Assumptions About the Mind and the Brain, edited by Sergio Della Sala, John Wiley & Sons, 1993, 291 pp., $35.00 (paper).

Two articles in the *New York Times* of September 7, 1999, illustrate one of the main themes of this very timely book: "*neuromythology*" is big news. One article reported the evidence from mouse research that there is a gene for memory (and perhaps for intelligence); the other reported that there may be a gene for types of dyslexia. The editor of *Mind Myths* argues that articles such as these demonstrate that we live in a "credulous world," where "we are inundated by bold neurological explanations of consciousness, . . . best-sellers unlocking the mysteries of the brain, and a surplus of enchanting anecdotes mistaken for science." "Brain sciences" are not immune from the contemporary "popularization and flowering of false science and myths." The growth of knowledge about the central nervous system in the past few decades has increased public interest in its functioning, and possible benefits to people's daily lives. This has led to an explosion of beliefs, techniques, and products associated with brain functioning. Many of these seem novel, but as the editor points out, this is *far from a new trend* in popular science writings, though it is exacerbated by the media's ubiquity today.

The articles in *Mind Myths* are aimed at educated lay people, as well as students and neuroscientists. The tone is largely skeptical and debunking, replacing misconceptions about brain mechanisms with a "scientific view," although attempts are made by most authors to give a balanced presentation.

The aim of the editor is largely successful. Chapters, the majority of which were written by research psychologists from the UK, Canada, and New Zealand, are presented in a lively style, with a balance between clear writing, reports on research, and conclusions. Technical background material about brain function and other relevant variables, clearly marked off from the remainder of the article,

or inserted in endnotes, may be skipped by readers without adequate background or interest in the specific subject being discussed. Cartoons, illustrations, snappy titles, humor, a conclusions section at the end of each chapter, and a full bibliography and usually adequate index at the end of the book contribute to enhanced readability and attractiveness of the volume.

The book is divided into six sections (I: Brain Mythology—use of 10% of the brain, left vs. right hemispheres, energy and the brain, tuners and tonics; II: Twilight Zone between Life and Death—near death experiences, recovery from death and/or deep coma; III: Memory and Creative Thinking—false memories, learning through repetition, creativity; IV: Cloning, Aging and Hypnosis; V: Multifarious Aspects of Deception—Placebos, Magicians, Psychic Fraud; and VI: The Media and the Brain.

The editor, Sergio Della Sala, Department of Psychology, Aberdeen, provides a short introduction to each major section, then turns over the presentation to individual authors. The meatier chapters occur near the beginning of the book, with extensive discussion of issues around plasticity, mass action vs. localization, left vs. right brain claims, physical correlates of brain function, including energy and nerve cells, and near death experiences.

The chapter entitled "Are We in Our Right Minds?" by Michael Corballis, Dept. of Psychology, Auckland, is particularly readable and informative. Dr. Corballis begins by reviewing split brain research. He then addresses the media hype on right brain functioning, which he calls the "1977 fad of the year." A recent article in the Boston Globe, a legitimate non-tabloid newspaper, headlined an article on an Arts course for MIT science students with the phrase: "Left brain, meet the right," illustrating that this is still a contemporary trend.

Dr. Corballis points out that this type of discussion is not new. In fact he illustrates an obsession with left and right brains in the latter part of the 19th century "that eerily foreshadows the present one." He quotes a poem by Kipling, which reads in part:

> "I would go without shirt or shoes,
> Friends, tobacco or bread
> Sooner than for an instant lose
> Either side of my head."

This 19th century trend was typified by the work of Broca and Wernicke on localization of language to the left hemisphere. The British neurologist Jackson and the French and Austrian neurologists De Fleury and Exner, writing in the mid-19th century, attributed "Perception" to the right hemisphere. Corballis discusses outlandish 19th century claims for therapies, such as "metallotherapy," which was said to produce a doubling of mental facilities by transfer of each hemisphere's specialty to the other. It is but a step to the contemporary popularity of workshops on right-brain education (*Neurolinguistic-Programming* et al.), which are shown to have no scientific

validity, but have great potential for making money for fraudulent practitioners. Discussions follow on the symbolic significance of left and right, theories about bilateral symmetry, and left-handers.

The chapter on "Pseudo Science and the Brain: Tuners and Tonics for Aspiring Superhumans" by Barry L. Beyerstein, Simon Fraser University, British Columbia, is particularly compelling in its critique of the claims of "untutored tinkerers" who provide "dubious tools for brain enhancement." Beyerstein points out that these claims are largely unfalsifiable by definition, and can often be recognized by their isolation from the mainstream, their grandiose and irreproducible claims,, and their near paranoid insistence on persecution by the Establishment. He gives an excellent summary presentation of the history of EEGs and alpha waves, on which many claims about biofeedback, meditation, brain drivers, and tonics are based. While most claims are inspired by the profit motif, some have been proposed by serious scientists (Benson, Mack) with excellent credentials, demonstrating the possibility for self-delusion by even the most sophisticated workers in this field.

I found the chapters on the "Twilight Zone between Life and Death" the most informative in the amount of data and scientific information provided. There is extensive discussion on the brain functions related to the subjective phenomena of near death experiences, at both the macrostructural and microstructural levels. The relationship of bio-chemical data and near ecstasy experiences is particularly fascinating. The author discusses attempts at experimental induction of these states in specific electro-physiological terms. He also includes references to complex partial seizures, putative studies involving imbalance of the hemisphere, and personality change.

The editor is co-author of a chapter on learning via unconventional means (such as sleep conditioning and subliminal messages). Presentation of materials on learning via "blindsight" suggest that even the most rigorous studies may leave large areas of mental functioning unexplained, and that the whole area of possible alternate routes of thinking, memory, and emotion is still unexplored.

Authors who are not psychologists provide shorter, entertaining chapters, such as the discussion by James Randi, magician, on magicians' best kept secrets, and those by two scientists from the Department of Complementary Medicine, University of Exeter, UK, on placebos. A chapter by a member of an Italian organization which studies claims for the paranormal reveals many of the mechanisms used for deception in cases of psychic fraud. A final chapter on the role of the media in spreading and popularizing *Mind Myths* closes the book.

Overall, this book presents much thought-provoking material in a readable format, which should be useful to relatively educated lay people and undergraduates. It also can offer fresh objective perspectives to advanced readers in fields apart from their own specialities. A particularly valuable emphasis on the methods and limits of science is present in many of the chapters and in the Introductory Section by the editor. Several authors illustrate the step-wise progress

of scientific knowledge in the field of the mind sciences. The editor emphasizes the need to inform readers on how to evaluate whether the evidence on which claims are based is reliable or not. He also points out that scientific discoveries need not have immediate or pragmatic applications to have value.

My main criticisms are two: first, I would have liked to have seen specific research data reported and discussed more extensively in a greater number of the chapters. Second, while the coverage of topics is comprehensive, I might have added chapters on "emotional intelligence" and "the Mozart effect," but probably most readers will have their own favorite topics in this field.

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