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DEVELOPMENT OF THE EXECUTIVE PERSONAL FINANCE SCALE

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There is accumulating evidence that prefrontal systems play an important role in management of personal finances, based on studies using clinical populations, functional neuroimaging, and both subjective and objective neuropsychological measures. This study developed the Executive Personal Finance Scale (EPFS) as a specific self-rating measure of executive aspects of personal money management. The resulting 20-item scale had good reliability and showed four factors: impulse control, organization, planning, and motivational drive. Validity was evidenced by correlations with income, credit card debt, and investments. The EPFS also showed logical correlations with compulsive buying and money attitudes. Second-order factor analysis of the EPFS and other scales revealed two higher-order factors of personal finance: cognitive (e.g., planning, organizing) and emotional (e.g., anxiety, impulse-spending, prestige). The EPFS shows good psychometric properties, is easy

to use, and will make a convenient complement to other research methodologies exploring the neural basis of personal finance management.

There is ample evidence that executive functions, and the prefrontal systems of the brain that mediate them, play a role in management of personal finances. Executive functions are a collection of cognitive abilities that are pertinent for adaptive functioning in general, allowing for behavior that is goal-oriented, flexible, and autonomous. Executive functions apply to various aspects of managing personal finances including financial planning (e.g., savings, retirement planning), spending, organizing finances, and income.

Prefrontal systems consist of prefrontal cortex, the most anterior portions of the frontal lobe, which connect to nuclei of the striatum and thalamus to form processing circuits that mediate executive functions (for reviews see Tekin & Cummings, 2002; Chow, 2000). Evidence from both healthy and clinical human populations, as well as animal studies, support this. There is some regional specificity of function: medial prefrontal regions mediate motivational aspects of behavior (e.g., initiation and persistence) so that individuals with damage to this region exhibit reduced initiation and spontaneous behaviors, abulia or akinetic mutism in the extreme. Dorsolateral prefrontal cortex, on the other hand, mediates conceptual reasoning mental flexibility, planning, and working memory (Masterman & Cummings, 1997). Thus, individuals with dorsolateral lesions exhibit concrete reasoning, mentally inflexibility, and disorganization. Orbitofrontal cortex mediates self-inhibition, social conduct, empathy, and decision making, so individuals with damage to this region exhibit disinhibition, impulsivity, inappropriate social conduct, a lack of empathy, and poor judgment (Malloy et al., 1993). Any of these regions can potentially play a role in management of individual finances.

In support of prefrontal systems in finance management, neurological illnesses that damage those regions tend to produce difficulties in money management. Bechara and colleagues (2000) have shown that individuals with orbitofrontal (ventromedial) damage make poor, more risky choices on the Iowa Gambling Task, which requires making simple financial choices. More specifically, they make shortsighted choices leading long-term losses. Individuals with cognitive impairments also have difficulty with conceptual knowledge about finances, cash transactions, bank statement management, bill payment, and overall financial capacity (Griffith et al., 2003). People with frontal lobe lesions specifically perform worse in financial planning (Goel et al.,

1995). In particular, they have difficulties in organizing and structuring financial problems, problem solving, and generating their own feedback. Consequently, individuals with traumatic brain injury often have difficulty managing their finances, and require increased assistance (Mazaux et al., 1997). People with frontotemporal dementia also develop frontal lobe dysfunction leading to problems with managing personal finances (Mychack et al., 2001; Talerico & Evans, 2001). These difficulties largely result from impairments of executive function.

It is also important to note that an abundance of neuroimaging studies support prefrontal systems in the processing of financial information in healthy individuals. For example, monetary rewards activate orbitofrontal cortex (Thut et al., 1997; O'Doherty et al., 2001; Elliott et al., 2000). Further, the magnitude of activation correlates with the magnitude of financial rewards or punishments (O'Doherty et al., 2001). Monetary rewards and punishments also activate medial prefrontal cortex, and riskier choices made after losing money corresponded to medial prefrontal activation (Knutson & colleagues, 2000; Gehring & Willoughby, 2002). Financial decision making caused predominantly right-sided activation across multiple prefrontal areas including dorsolateral, orbitofrontal, and medial prefrontal cortex (Ernst & colleagues, 2002). Thus, it is likely that real-life management of finances employs widespread prefrontal regions and associated subcortical structures.

Subjective rating scales of executive functioning have been created that have shown good reliability and validity. These include instruments such as the Executive Function Index (EFI), Barratt Impulsiveness Scale (BIS), Dysexecutive Questionnaire (DEX), and Frontal Systems Behavior Scale (FrSBe) (Grace & Malloy, 2001; Wilson et al., 1996; Spinella, 2005; Patton et al., 1995). It has been shown that these self-rating instruments of executive function reflect brain structure and function as evidenced by studies using neurological populations, objective neuropsychological measures, and structural and functional neuroimaging (Grace et al., 1999; Spinella, 2004; Carrillo-de-la-Pena et al., 1993; Hoptman et al., 2002; Horn et al., 2003; Chiaravalloti & DeLuca, 2003; Varney & Bushnell, 1998). Self-rating executive scales also correlate well with other everyday behaviors such as eating patterns and drug use (e.g., Spinella & Lyke, 2004; Spinella, 2003). Thus, measuring executive function by self-rating questionaires is demonstrated to reflect prefrontal system function.

Preliminary research has shown that self-rated measures of executive function relate to aspects of personal finance management (Spinella et al., 2004). Credit card debt correlated positively with symptoms of prefrontal dysfunction in a community sample after controlling for demographic variables

(age, sex, education, and income). Particular association was seen with the E (executive) scale of the FrSBe scale, which measures conceptualizing and organization ability. A second study showed that personal income correlated inversely with various measures of prefrontal dysfunction including the FrSBe, obsessive-compulsive symptoms, and errors in cognitive estimation after controlling for demographic influences (Spinella et al., in review). Further, prefrontal dysfunction related to delay discounting, preferring smaller more immediate rewards over larger delayed rewards (Spinella et al., 2004).

Given this evidence, this study aimed to create a self-rating scale that specifically measured executive function aspects of personal finances.

METHODS

Participants

Participants were 225 adults (82 male, 142 female, one did not specify sex), aged 18 to 64 years ($M = 26.2, SD = 10.3$) who had completed between 9 and 21 years of formal education ($M = 14.7, SD = 1.6$). Participants were recruited by research assistants via word-of-mouth from the college campus and local community. Research assistants were instructed to find non-institutionalized, community-dwelling adults. The study was approved by an institutional review board and all participants agreed to a consent form in accordance with the ethical principles of the American Psychological Association and the Declaration of Helsinki. To maintain anonymity and encourage more honest responding, participants were asked to seal their completed questionnaires in an envelope that was provided to them before returning them to the research assistant. No financial compensation was given for participation.

Measures

Personal Finances. Aspects of personal finances were obtained using a questionnaire. Participants reported personal gross annual earnings between $0 and $200,000 per year ($M = \$19,909, SD = \$26,450$). Current total credit card debt ranged from $0 to $27,000 ($M = \$1,534, SD = \$3,415$), and lifetime maximum credit card debt ranged from $0 to $40,000 ($M = \$2,588, SD = \$5,180$). A current debt-to-income ratio was calculated for each person using current credit card debt and personal gross annual income, which ranged from 0.0 to 0.9 ($M = 0.1, SD = 0.2$). Participants were also inquired about their financial investment methods: 188 (84%) utilized a savings account, 62 (28%) utilized certificates of deposit, 47 (21%) utilized mutual funds, 58 (26%)

invested in the stock market, 47 (21%) had a retirement account, and 29 (13%) invested in real estate.

Executive Personal Finance Scale. The Executive Personal Finance Scale (EPFS) is a novel scale that was created for this study. An initial pool of 26 items were created regarding executive functions as they pertain to finances. Items were created to reflect different domains of prefrontal system function, including, conceptalization of finances, organization, financial planning, and impulse control over spending (Tekin & Cummings, 2002; Chow, 2000). These items were subjected to statistical analyses in order to construct a scale, as detailed later.

Money Attitudes Scale (MAS). The MAS is a 29-item scale that was developed as a self-rating measure to assess attitudes toward money along four scales: Power-Prestige, Retention-Time, Distrust, and Anxiety (Yamauchi & Templer, 1982). Power-Prestige (MASpp) items relate to the tendency to use money as a means to impress others and measure success. Retention-Time items (MASrt) relate to the tendency to save money and plan financially. Distrust items (MASdt) relate to a hesitant attitude toward spending and suspicion that better prices for purchases could have been found elsewhere. The Anxiety subscale (MASanx) relates to various aspects of worry and concern over one's spending and financial security. The MAS shows good psychometric properties and relates to compulsive spending and credit card use among college students (Roberts & Jones, 2001).

Compulsive Buying Scale (CBS). The CBS is a 7-item scale that was developed to identify compulsive buying (Faber & O'Guinn, 1992). Its items address behaviors specific to compulsive buying rather than normal consumer behavior (e.g., "Others would be horrified if they knew my spending habits" and "I bought things even though I couldn't afford them"). The scale shows good validity and reliability. It also correctly classified 87.5% of the subjects as compulsive buyers or normal consumers.

RESULTS

Scale Construction and Factor Analyses of the EPFS

Construction of the scale began with generating 26 items that created from a literature review and examination of items of other self-rating executive

function scales. The items were re-written, however, to pertain specifically to some aspect of personal finance. Items were rated on a Likert-type scale ranging from 1 ("Never") to 5 ("Always"). Values for negatively valenced items were inverted so that higher scores represent better executive functioning. After the instrument was administered, corrected item-total correlations were obtained, which ranged from .33 to .67, $p < .001$. Exploratory factor analysis was done using principal components analysis with varimax rotation. The number of factors to be extracted was determined by interpretability and parallel analysis. Parallel analysis indicated a 4 factor structure, which also yielded logically interpretable factors (Zwick & Velicer, 1986). The five factors had 9, 7, 5, and 5 items, respectively, with eigenvalues of 7.4, 3.3, 2.1, and 1.9. Respectively, these accounted for 16.0%, 15.1%, 13.4%, and 11.9% of the variance, and cumulatively 56.4%.

To shorten the scale, a maximum of 6 items with the highest loadings were chosen from each factor and the factor analysis was repeated using only those items. The final scale included a total of 20 items. Factor analysis again yielded a 4 factor structure, with eigenvalues of 3.4, 3.0, 2.8, and 2.7, and accounting for 17.1%, 14.8%, 14.1%, and 13.6% of the variance, respectively. Cumulatively it accounted for 59.5% of the total variance of the final 20-item scale.

The four factors were named Impulse Control (IC), Motivational Drive (MD), Organization (ORG), and Planning (SP) based on the content of the items (Table 1). Ratings from items were summed to create additive scales. Cronbach's alpha was good for the subscales: .80, .83, .86, .76, respectively, and .86 for the total score. Total scores for the EPFS were normally distributed in this sample (Kolmogorov-Smirnov $Z = .74$, $p = .64$).

A second-order factor analysis was done using the subscales of the EPFS, CBS, and MAS using principal components analysis with varimax rotation. Parallel analysis suggested a two-factor solution Eigenvalues for these factors were 3.2 and 1.9, which accounted for 29.9% and 26.9% of the variance, and collectively accounted for 56.8% of the total variance (Table 2). These two factors represented cognitive and emotional factors of finance management.

Demographic Influences on the EPFS

Linear regression was performed to determine the contributions of demographic variables to EPFS total score, which was significant, $F(4, 214) = 9.84$, $p < .001$ (Table 3). The model accounted for 15.5% of the variance (Adjusted $R^2 = .140$). EPFS scores increased as a function of age and income, whereas sex and education had no apparent influence on the total score.

Table 1. Factor analysis of the Executive Personal Finance Scale ($n = 225$)

1	2	3	4	Item
.79	.05	−.03	−.02	When I see something I want, I have a hard time not buying it.
.78	−.06	−.14	−.24	I buy things I don't really need . . .
.70	−.21	−.17	.14	I tend to spend more when I know that I am already over my limit.
.70	.00	−.16	−.12	I spend more money than I can afford to spend.
.66	.06	−.07	−.14	When I go to a store, I end up buying things I didn't set out to buy.
.62	−.02	−.12	−.36	I tend to spend money as soon as I get it.
−.07	**.89**	−.01	.08	I work hard at making money.
−.01	**.87**	.07	.12	I put a lot of effort into making money.
.05	**.77**	.02	.26	I work long hours to increase my wealth.
−.04	**.76**	.22	−.04	I'm enthusiastic when it comes to making money.
.03	.03	**.74**	.20	I am organized at balancing my checkbook.
.26	.08	**−.74**	−.13	I have trouble keeping my finances organized.
−.07	.22	**.70**	.15	I keep my bills organized.
.26	−.06	**−.69**	.08	I make a lot of mistakes when keeping track of my money.
−.11	.21	**.59**	.43	I have a system set up for managing my money.
−.10	.06	.07	**.81**	I make investments for the long term.
.06	.07	−.01	**.71**	I buy stocks and mutual funds for investment.
−.30	.14	.20	**.59**	I put money into savings on a regular basis & leave it there.
−.25	.21	.29	**.57**	I save money for the future.
−.24	.02	.34	**.54**	I set aside money for emergencies.

Significant factor loadings are in boldface.

Correlations

Correlations were obtained between the EPFS and financial parameters (Table 4). Positive correlations were found between income and all scales of the EPFS. These correlations remained significant for MD, ORG, PL, and the total score after partial correlations were done to control for age, sex, and education ($df = 214$). Invese correlations between current and maximum credit card debt, and debt-to-income ratio emerged, particularly when partial correlations were done to control for age, sex, education, and income ($df = 188$).

Point biserial correlations were performed between EPFS scales and means of investment (Table 4). Positive correlations were found primarily with the ORG and PL scales. Most correlations remained significant for the PL scale after controlling for age, sex, education, and income ($df = 188$).

Correlations were obtained for scals of the EPFS, MAS, and CBS (see Table 5 for results). Positive correlations were obtained between the CBS

Table 2. Second order factor analysis of the Executive Function Index subscales, Money Attitude Scales, and Compulsive Buying Scale ($n = 225$)

	1	2
PL	**.83**	−.03
MASrt	**.82**	.06
ORG	**.71**	−.21
MD	**.43**	.15
MASanx	−.13	**.82**
MASdt	.23	**.71**
CBS	**.50**	**−.66**
MASpp	.09	**.64**
IC	**.57**	**−.58**

Abbreviations: PL—planning, MD—motivational drive, IC—impulse control, ORG—Organization, MASrt—retention-time, MASdt—distrust, MASpp—power-prestige, MASanx—anxiety, CBS—Compulsive Buying Scale. Significant factor loadings are in boldface.

and IC, ORG, and PL subscales of the EPFS, which remained significant aftercontrolling for age, sex, education, and income ($df = 213$). Negative correlations were found between the prestige-power subscale of the MAS and the IC and ORG subscales of the EPFS, which also remained significant after controlling for age, sex, education, and income. In contrast, positive correlations were found between the retention-time subscale of the MAS and EPFS scales. The distrust subscale only showed a weak inverse corrleation with impulse control after controlling for demographics.

Table 3. Linear regression of demographic variables predicting total scores of the Executive Function Index

	B	SE	Beta	Partial	Part
Age	.17	.08	.15*	.14	.13
Sex	1.01	.71	.09	.10	.09
Education	.06	.10	.04	.04	.04
Income	.00	.00	.28**	.24	.23

$^{*}p < .05, ^{**}p < .001.$

Table 4. Correlations between subscales of the Executive Personal Finance Scale (EPFS) and personal finances

	Bivariate					Partial				
	IC	MD	ORG	PL	Total	IC	MD	ORG	PL	Total
Income	.15*	.24†	.23†	.41†	.36†	.04	.23†	.16*	.27†	.24†
CCcurrent	−.10	.11	−.01	.08	.02	−.22**	.02	−.16*	−.18*	−.21**
CCmaximum	−.07	.11	.04	.09	.05	−.20**	−.02	−.17*	−.25†	−.24†
DIR	−.23**	−.04	−.11	−.17*	−.21**	−.27†	−.01	−.13	−.23**	−.25†
Savings	.09	−.02	.25†	.26†	.22†	.07	−.05	.27†	.29†	.23**
CDs	.04	.01	.15*	.24†	.16*	.02	.02	.13	.22**	.15*
Mutual funds	.12	.10	.16*	.36†	.27†	.03	.06	.06	.25†	.15*
Stocks	.10	.30†	.20**	.43†	.36†	.09	.27†	.11	.31†	.27†
Retirement	.09	.22†	.20**	.45†	.34†	.01	.13	.05	.26†	.16*
Real estate	.14*	.05	.19**	.25†	.23†	.03	.02	.09	.08	.08

*$p = .05$, **$p \leq .01$, †$p \leq .001$. Partial correlations with income control for age, sex, and education ($df = 214$). All other partial correlations control for age, sex, education, and income ($df = 188$). Abbreviations: CCD—credit card debt, DIR—debt-to-income ratio.

DISCUSSION

This study demonstrated that executive aspects of managing personal finances factor together in a logical manner as would be expected from other studies of more general executive functions. These factors are impulse control (IC), organization (ORG), planning (PL), and motivational drive (MD). Intrascale

Table 5. Correlations between subscales of the Executive Personal Finance Scale, Money Attitudes Scale (MAS), and Compulsive Buying Scale (CBS)

	Bivariate					Partial				
	IC	MD	ORG	PL	Total	IC	MD	ORG	PL	Total
CBS	.70†	.09	.41†	.35†	.58†	.70†	.08	.41†	.34†	.60†
MASpp	−.22†	−.01	−.15*	.09	−.11	−.24†	−.05	−.18**	.07	−.16*
MASrt	.36†	.19**	.50†	.61†	.61†	.31†	.13	.46†	.55†	.54†
MASdt	−.12	.02	−.07	.08	−.04	−.14*	.01	−.09	.05	−.07
MASanx	−.52†	.12	−.17*	−.21**	−.31†	−.50†	.13*	−.16*	−.19**	−.29†

(*$p = .05$, **$p \leq .01$, †$p \leq .001$). Partial correlations are controlling for age, sex, education, and income ($df = 213$). Abbreviations: PL—planning, MD—motivational drive, IC—impulse control, ORG—Organization, MASrt—retention-time, MASdt—distrust, MASpp—power-prestige, MASanx—anxiety.

reliability was high for these subscales and the total score and these scores were normally distributed in this community sample that showed a wide range of age, education, and income level. Linear regression indicated that executive financial management skill (total EPFS scores) increases with age and income level, but does not vary according to sex or education.

Validity for this scale is provided by correlations with individual income, credit card debt, and tendency to use various forms of financial investment. As anticipated, correlations with credit card debt only became apparent when controlling for income because such debt is more maladaptive for those less capable of repaying it. Although income related to almost all EPFS subscales, credit card debt specifically related to IC, ORG, and PL, but not MD. Also, as would be anticipated, investing related strongest to ORG and PL scales. However, there was little or no relationship between investing and impulse control, and only stocks and retirement accounts related to MD. Once controlling for demographics and income level, only PL bore a consistent relationship with various types of investing.

Further validity for the scale is provided by significant correlations with other established scales measuring financial attitudes and behavior, the CBS and MAS. As anticipated the EPFS scales correlated with compulsive buying. Logically, IC showed the strongest correlation since both of these involve one's financial self-control and spending. However, correlations were also seen with ORG and PL, suggesting that compulsive buying problems are not limited to impulsive behaviors, but may be part of a more pervasive pattern of finance mismanagement. Positive correlations with retention-time (of the MAS) was also expected because this scale measures the tendency to save and financially plan. Inverse relationships occurred between the power-prestige and anxiety subscales of the MAS and the EPFS. This also is logical because the anxiety scale includes a number of different types of finance-related anxiety due to shopping and planning. Power-prestige involves a tendency to emphasize money as a symbol of success. This consistently showed inverse relationships with IC and ORG.

The second-order factor analysis of all financial subcales used suggested two underlying factors: cognitive and emotional aspects of finances. The cognitive factor covers one's tendency to plan, organize, and save money whereas the emotional factor covers anxiety and emotionally driven spending, whether compulsive or impulsive. Indeed, compulsive buyers report doing so because of an overwhelming emotional urge to do so. Power-prestige logically factors in this group because it involves using money as a means to achieve a feeling of accomplishment. It is also noteworthy that financial impulse

control and compulsive buying load significantly on both factors, supporting the notion that these types of driven behaviors have both emotional and cognitive components.

The EPFS thus shows good psychometric properties and is short and easy to use. It relates logically to real-life management of personal finances and correlates well with other established measures of financial behavior. As such, the EPFS is a convenient measure to incorporate into future research using other methodologies such as objective neuropsychological tests, neuroimaging, and clinical populations.

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