



Dispositional Greed Scales

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Abstract: In recent years, different scales have been developed to assess individual differences in dispositional greed. We report two studies ($N_1 = 300$, $N_2 = 1,000$) on the comparative psychometric properties of these scales. We find that all scales are reliable and that they correlate highly, suggesting that all can be used to assess dispositional greed. Exploratory factor analyses, using the Empirical Kaiser Criterion, the Hull method, and Parallel Analysis as extraction methods, were done on the separate scales and all items together. These analyses reveal that there is quite some consistency in the scales, as in both studies a one-factor solution seems to describe the data best. These results imply that these different scales all assess dispositional greed, although the results also suggest that some items may be deleted from the scales.

Keywords: greed, Dispositional Greed scales, psychometric properties, scale comparison



Greed is the insatiable desire for more. It applies to any valuable thing, such as money, goods, friends, love, or sex. The experience of greed combines a feeling of dissatisfaction with the current state of affairs with a longing for something better or more (Seuntjens, Zeelenberg, Breugelmans, et al., 2015). Greed is seen as an important motivation in economics and is thought to have been an important cause of the financial crisis and fraud (e.g., Mussel et al. 2018). Pathological personality traits (Sekhar et al., 2020) and the dark triad have been positively associated with greed (Veselka et al., 2014) and greed has been found to be a cause of unethical behaviors that lead people to take more than they are entitled to (Seuntjens et al., 2019).

Recently, there has been an increase in academic attention for greed. For example, research has focused on perceptions of greed (Gilliland & Anderson, 2014; Helzer & Rosenzweig, 2020) or on how the greed of a CEO influences shareholder wealth (Haynes et al., 2017; Sajko et al., 2020). It has been found that environmental unpredictability during childhood is positively associated with greed (Chen, 2018), that childhood luxury is positively associated with greed (Liu, Sun, & Tsydypov, 2019), and that mindful parenting may inhibit children from becoming greedy (Liu, Sun, Guo, et al., 2019). Thus, greed is both relevant and influential.

Different scales have been developed to assess individual differences in greediness. In this article, we present two

studies that empirically examine how these scales and their individual items are related. Our main goal was to find out whether different scales assess the same underlying construct or that they assess different aspects of greed. Study 1 compares the scales developed by Krekels and Pandelaere (2015), Mussel et al. (2015), Seuntjens, Zeelenberg, Van de Ven, et al. (2015), and Veselka et al. (2014). Study 2 is a preregistered and higher-powered replication of Study 1, in which we also include the GREED scale (Mussel & Hewig, 2016), which was not yet available at the time we collected the data of Study 1. For an overview of all scales and their individual items, see Table 2.

This article can be seen as an addition to Mussel et al. (2018), who assessed the convergent validity of these scales in a sample with 159 participants, predominantly economics and psychology students. When we collected the data of our first study, we expected substantial convergence of the scales (Mussel et al., 2018). However, we also wondered whether differences in the conceptualization of greed underlying the different scales would show-up in their psychometric properties and relationships. For example, Lambie and Haugen (2019) noted that there are some conceptual differences between various scales for assessing dispositional greed, which led to a number of questions, such as “Does greed need to come at a cost to others?” or “Does greed include both acquisition and retention?”. Our comparison of the different scales allows for an empirical examination of the questions raised by Lambie and Haugen and others.

Our starting point for this investigation was the Dispositional Greed Scale (DGS; Seuntjens, Zeelenberg, Van de Ven, et al., 2015). The items for this scale were based on

a prototype analysis that consisted of five studies with more than 7,000 Dutch and American participants (Seuntjens, Zeelenberg, Breugelmans, et al., 2015), and led to the following definition: “Greed is the experience of desiring to acquire more and the dissatisfaction of never having enough.” (p. 518). The 7-item DGS demonstrated to be reliable, temporally stable, and valid (Study 1: 4 samples, total $N = 6,092$). Study 2-5 (total $N = 1,496$) found that the DGS was distinct from materialism, and predicted greedy behavior in dictator, ultimatum, and public good games. Several of these findings were replicated with a Japanese (Masui et al., 2018), a Brazilian Portuguese (Alves Freires et al., 2019), a Chinese (Liu, Sun, Ding, et al., 2019), and a Russian adaptation of the DGS (Shirko & Furmanov, 2020). In other research, the DGS predicted the financial behavior of adolescents (Seuntjens et al., 2016), a variety of immoral attitudes and behaviors (Seuntjens et al., 2019), working and earning in the laboratory (Zeelenberg et al., 2020), benign and malicious envy (Crusius et al., 2021), but not individual trading behavior in experimental asset markets (Hoyer et al., 2021). Van Muijen and Melse (2015) collected data from 123,836 respondents in a survey about various aspects of work motivation and payment, and they included the DGS. They found that people that score higher on the DGS were more likely to work in extractive industries, real estate and banking, and those scoring lower on the DGS were more likely to work in education, social work, and healthcare.

Another, 6-item DGS was independently and in parallel developed by Krekels and Pandelaere (2015). More details about how this scale was developed and more studies using this DGS are described in Krekels (2015). Krekels and Pandelaere (2015, p. 225) define greed as “an insatiable desire for more resources, monetary or other”. Building upon insights from the existing literature and focus groups, they developed and tested the scale in two studies ($N = 317$, $N = 218$). Dispositional greed was related to materialism, competition, and productivity orientation. This scale was used by, for example, Haesevoets et al. (2019) and Shao et al. (2019). A difference with the scale of Seuntjens, Zeelenberg, Breugelmans, et al. (2015) is that Krekels and Pandelaere included two reverse-coded items to address issues of inattention and acquiescence. Thus, these two DGS are very similar in the definition on which they are based, at the item level, and in the empirical associations with related constructs. Both DGS scales focus primarily on acquisitiveness as central in greed.

The third scale was the 7-item Greed Trait Measure (GTM) developed by Mussel et al. (2015), who see greed as the “desire to get more at all costs, including the excessive striving for desired goods and the willingness to accept that such striving may be at the expense of others” (p. 126).

The authors present a study with 20 male economics students, who engaged in a risky decision-making task while their electroencephalogram (EEG) was assessed. They found that high levels of greed were related to more risk-taking. The article states that the items assessing greed were developed in studies with several convenience samples of students (total $N = 640$). The online supplemental materials describe a number of projects that were used to validate this trait-greed measure. Greed was negatively associated with agreeableness and positively with neuroticism ($N = 71$), greed was associated with a higher aimed income, related to risky but not secure investments (3 projects, total $N = 162$), and taking more in a common goods dilemma (2 projects, total $N = 92$). In addition to items about the insatiable desire for more, the GTM also includes specific items about cheating and damaging others (e.g., “When I play on my own, I sometimes cheat a little.” “In order to get what I want, I can accept the fact that other people may suffer damage.”). These authors thus included harming others in their definition and measurement of greed.

The 70-item Virtues and Vices Scale (VAVS) by Veselka et al. (2014), which assesses individual differences in the propensity to engage in the seven deadly sins, was developed in two studies ($N_1 = 1,507$, $N_2 = 253$). The items to assess each of the seven sins were written by the authors based on existing literature. The VAVS includes a 10-item greed subscale. Because neither the title nor the abstract of this article mentions the word greed, the greed subscale was not easily found by researchers interested in greed. Veselka et al. define greed as the “tendency to manipulate and betray others for personal gain” (p. 76) and thus see harming others as intrinsic to greed. The items of the scale (see Table 2), however, do not seem to address this element. The items are formulated to assess a dislike for sharing, an interest in money, acquisitiveness, and insatiability. The scale includes one reverse-coded item. In their research, the greed subscale correlated with all other vices, as well as with Machiavellianism, narcissism, and psychopathy.

These four scales discussed above were included in our Study 1. Study 2 additionally includes the newer GREED scale (Mussel & Hewig, 2016), which is an extension of Mussel et al.’s (2015) GTM scale, and used in Mussel et al. (2018) and in Mussel and Hewig (2019). The 12-item GREED shares 5 items with the 7-item GTM (see Table 2 for the specific items). Mussel et al. (2018, p. 250) wrote the following about the different greed scales:

“Some, but not all these scales share the idea that greed may negatively affect others. The Greed Trait Measure, as well as the GREED scale (an extended version of the Greed Trait Measure), are based on a definition of greed as the ‘desire to get more at all

costs' (Mussel et al., 2015, p. 126), thereby indicating that the selfish and excessive striving for desired goods of greedy individuals might include the willingness to accept that such striving may be at the expense of others. This aspect is also captured by Veselka et al. (2014) (e.g., the tendency to manipulate and betray others, as noted above), but not by the two Dispositional Greed Scales."

To summarize, although the different greed scales that are currently used converge on important core characteristics of greed, they also differ in their conceptual background, most notably in the area of (willingness to) inflicting harm to others. We compared different scales that assess dispositional greed in terms of psychometric properties (coherence and structure). All scales were reliable and correlated strongly, suggesting that all scales can be used to assess dispositional greed. Exploratory factor analyses (EFAs) on all items of the different scales point to a one-factor solution. The design of both Studies 1 and 2 was very similar, therefore we report them together below.

Studies 1 and 2

In Study 1, 300 participants completed the combined set of 30 items from 4 greed scales (both DGS scales, GTM, VAVS) in a randomized order. This first study was not pre-registered, because we started preregistering studies only in late 2016, about half a year after we collected these data. Study 2 was preregistered as Dispositional Greed Scales Study 2 (AsPredicted #52730; <https://aspredicted.org/vb6tj.pdf>).¹ As explained in the Introduction, we decided to replicate Study 1 in late 2020 with the inclusion of the GREED scale (Mussel & Hewig, 2016). Because this 12-item scale shares 5 items with the Greed Trait Measure (GTM; Mussel et al., 2015), we included the additional unique 7 items in Study 2, bringing the total to 37 items. Study 2 was also better powered ($N = 1,000$) and preregistered. We studied the internal structure of the scales with Exploratory Factor Analyses (EFAs) and computed the scale reliabilities (Cronbach's α s). We also computed the correlations between the scales and ran an omnibus EFA on all 30 items in Study 1 and all 37 items in Study 2. The data, code, and materials from both studies can be found at <https://osf.io/95gjr> (Zeelenberg et al., 2021), and at <https://researchbox.org/159>. These two studies are the only ones we have conducted in this line of research; we report all measures and exclusions. We report how we determined our sample

size, all data exclusions (if any), all data inclusion/exclusion criteria, whether inclusion/exclusion criteria were established prior to data analysis, all measures in the study, and all analyses including all tested models.

Method

Study 1

We recruited 300 US-based participants (180 males and 120 females; $M_{\text{age}} = 36.51$, $SD = 11.26$, age ranged from 19–68 years) via Amazon Mechanical Turk. Data were collected on May 2, 2016.

Sample size recommendations for factor analysis are complex (MacCallum et al., 1999). Factor analysis is in essence a correlational method. Schönbrodt and Perugini (2013, 2018) used Monte-Carlo simulations and found that sample sizes that approach 250 results in stable correlations. Moreover, to provide an indication of the power, according to G*Power 3.1 (Faul et al., 2007) a sample of 253 would be required to detect a correlation of .2 (small to medium correlation; Cohen, 1988), with 90% power and a 5% α -level. With 300 participants we would be consistent with Everitt's (1975) recommendation to have a sample size that has a minimum 10 participants per item in the factor analysis (although this participants-per-items heuristic may be outdated, see Goretzko et al., 2019), and with Cureton and D'Agostino's (1983) recommendation to have just a large sample of ideally several hundred. Also, according to Comrey and Lee's (1992) suggestion for sample sizes in factor analysis, a sample of 300 would be "good" (100 = poor, 200 = fair, 300 = good, 500 = very good, 1,000 or more = excellent).

Participants responded to all 30 items of the 4 different greed scales (both DGS scales, GTM, VAVS). All items were presented in a different, randomized order for each participant. For each item, participants were asked to indicate the extent to which they agreed that these items were descriptive of themselves. All questions were answered on 5-point Likert-scales (labeled as: 1 = *strongly disagree*, 2 = *disagree*, 3 = *neither agree, nor disagree*, 4 = *agree*, 5 = *strongly agree*). The individual items are shown in Table 2.

Study 2

We recruited 1,000 US-based participants (477 males, 500 females, 23 other; $M_{\text{age}} = 33.43$, $SD = 12.28$, age ranged from 18 to 89 years) via Academic Prolific on December 10, 2020. With 1,000 respondents, the sample is excellent for EFA according to Comrey and Lee (1992). Participants responded to the 37 items of the 5 different greed scales (both DGS scales, GTM, VAVS, GREED scale). All items

¹ Note that there is a small typographical error in the preregistration of Study 2: We reported we would use 35 items but this should read 37 items.

Table 1. Descriptive scale statistics and correlation coefficients (Pearson's r) among greed scales in Study 1 ($N = 300$) and Study 2 ($N = 1,000$)

	M	SD	# items	α	1.	2.	3.	4.
Study 1								
1. DGS (Seuntjens, Zeelenberg, Van de Ven, et al., 2015)	2.47	0.86	7	.88	–			
2. DGS (Krekels & Pandelaere, 2015)	2.44	0.79	6	.84	.86	–		
3. GTM (Mussel et al., 2015)	2.34	0.73	7	.82	.85	.79	–	
4. VAVS-G (Veselka et al., 2014)	2.46	0.71	10	.84	.85	.81	.83	–
Study 2								
1. DGS (Seuntjens, Zeelenberg, Van de Ven, et al., 2015)	2.50	0.88	7	.86	–			
2. DGS (Krekels & Pandelaere, 2015)	2.56	0.75	6	.76	.83	–		
3. GTM (Mussel et al., 2015)	2.48	0.83	7	.85	.82	.72	–	
4. VAVS-G (Veselka et al., 2014)	2.50	0.73	10	.83	.84	.76	.82	–
5. GR€ED scale (Mussel & Hewig, 2016)	2.81	0.78	12	.89	.85	.80	.89	.86

Note. α = Cronbach's alpha; DGS = Dispositional Greed Scale; GTM = Greed Trait Measure; VAVS-G = Greed subscale of the Virtues and Vices Scale. The GTM and the GR€ED scale share five items. All questions were answered on 5-point Likert-scales (1 = *strongly disagree*, 2 = *disagree*, 3 = *neither agree nor disagree*, 4 = *agree*, 5 = *strongly agree*). All correlations are significant at the .001 level.

were presented in a different, randomized order to each participant. Participants indicated their responses as in Study 1. After participants had responded to these questions, they also responded to some questions about socioeconomic status and the number of siblings, that we collected for another study.

Results

We first examined each scale individually. The upper part of Table 1 provides means and standard deviations of all four scales from Study 1, including their reliabilities and correlations among the scales. All four scales had reliability coefficients (Cronbach's α) larger than .80. Correlations among the scales were high ($r_s > .79$). The lower part of Table 1 provides the results for all five scales in Study 2. All five scales had reliability coefficients larger than .76 and correlations among the scales were high ($r_s > .72$). This could be seen as a first indication that these scales measure very similar constructs, if not the same construct.

We next conducted an EFA with principal axis-factoring on each scale individually. The results are shown in Table 2. The column called EFA shows the factor loadings, eigenvalues, and percentage of variance explained for each scale for Study 1. The columns called EFA-1 and EFA-2 show the same factor analytic results for Study 2.

A key issue in EFA is to determine how many factors to retain (Auerswald & Moshagen, 2019). We used the R-package EFATools (<https://github.com/mdsteiner/EFA-tools>) and based our decision on three extraction methods that according to Auerswald and Moshagen show very high accuracy for unidimensional factor models. We chose these because the various greed scales that we examined are supposed to be unidimensional scales. The three extraction

methods were the Empirical Kaiser Criterion (EKC; Braeken & Van Assen, 2017), the Hull method (Lorenzo-Seva et al. 2011), and Parallel Analysis-PCA (PA; Garrido et al., 2013). When at least two of the three were in agreement about the number of factors, we followed that guideline. Below we report per EFA Bartlett's test of sphericity and the Kaiser-Meyer-Olkin criterion (KMO), and the number of factors to retain according to the EKC, Hull, and PA.

The results for each of the scales were as follows:

- Seuntjens, Zeelenberg, Breugelmans, et al.'s (2015) DGS: We retained a single-factor for both studies (Study 1 – Bartlett's test of sphericity $\chi^2(21) = 947.99$, $p < .001$, KMO = .902; EKC: 1, Hull: 1, PA: 1; Study 2 – Bartlett's $\chi^2(21) = 2,776.71$, $p < .001$, KMO = .903 EKC: 1, Hull: 2, PA: 1).
- Krekels and Pandelaere's (2015) DGS: We retained a single-factor for Study 1, and two factors for Study 2 (Study 1 – Bartlett's $\chi^2(15) = 702.47$, $p < .001$, KMO = .844; EKC: 1, Hull: 1, PA: 1; Study 2 – Bartlett's $\chi^2(15) = 1704.75$, $p < .001$, KMO = .769, EKC: 2, Hull: 1, PA: 2).
- Mussel et al.'s (2015) GTM: We retained a single-factor for both studies (Study 1 – Bartlett's $\chi^2(21) = 688.05$, $p < .001$, KMO = .845; EKC: 1, Hull: 1, PA: 1 Study 2 – Bartlett's $\chi^2(21) = 2,364.35$, $p < .001$, KMO = .894, EKC: 1, Hull: 2, PA: 1).
- Veselka et al.'s (2014) VAVS-G: We retained a single-factor for both studies (Study 1 – Bartlett's $\chi^2(45) = 1,039.42$, $p < .001$, KMO = .885; EKC: 1, Hull: 1, PA: 1; Study 2 – Bartlett's $\chi^2(45) = 3,238.6$, $p < .001$, KMO = .894, KMO = .894, EKC: 1, Hull: 2, PA: 1).
- Mussel and Hewig's (2016) GR€ED scale, which was only included in Study 2, retained two factors (Study 2 – Bartlett's $\chi^2(66) = 4,633.94$, $p < .001$, KMO = .914; EKC: 2, Hull: 4, PA: 2).

Table 2. Items of the dispositional greed scales in Study 1 ($N = 300$) and Study 2 ($N = 300$), with descriptive statistics, and factor loadings, eigenvalues, and explained variance in different EFA

	Study 1				Study 2				
	<i>M</i>	<i>SD</i>	EFA	EFA-30	<i>M</i>	<i>SD</i>	EFA-1	EFA-2	EFA-37
Dispositional Greed Scale (Seuntjens, Zeelenberg, Breugelmans, et al., 2015)	2.47	0.86			2.50	0.88			
1. I always want more.	2.51	1.12	.81	.81	2.68	1.17	.80		.78
2. Actually, I'm kind of greedy.	2.26	1.11	.72	.73	2.36	1.22	.70		.69
3. One can never have too much money.	3.02	1.26	.60	.60	2.76	1.32	.50		.53
4. As soon as I have acquired something, I start to think about the next thing I want.	2.56	1.15	.77	.79	2.63	1.20	.69		.71
5. It doesn't matter how much I have. I'm never completely satisfied.	2.23	1.09	.75	.74	2.41	1.15	.74		.71
6. My life motto is "more is better."	2.24	1.02	.76	.77	2.25	1.12	.79		.81
7. I can't imagine having too many things.	2.46	1.18	.62	.61	2.40	1.19	.60		.59
Eigenvalue			4.10				3.87		
Explained variance			58.6%				55.35%		
Dispositional Greed Scale (Krekels & Pandelaere, 2015)	2.43	0.79			2.56	0.75			
1. No matter how much I have of something, I always want more.	2.30	1.07	.83	.84	2.40	1.13	.81	-.16	.81
2. One can never have enough.	2.30	1.04	.77	.79	2.30	1.16	.70	-.17	.75
3. Even when I am fulfilled, I often seek more.	2.47	1.09	.76	.73	2.80	1.17	.72	-.15	.71
4. The pursuit of more and better is an important goal in life for me.	2.68	1.16	.71	.71	2.91	1.19	.63	-.07	.67
5. A simple basic life is sufficient for me. (R)	2.38	1.02	.54	.51	2.45	1.01	.41	.53	.26
6. I am easily satisfied with what I've got. (R)	2.50	0.97	.50	.43	2.50	0.97	.32	.56	.19
Eigenvalue			3.36				2.81	1.23	
Explained variance			56.0%				46.48%	20.42%	
Greed Trait Measure (Mussel et al., 2015)	2.34	0.73			2.48	0.83			
1. When I think about all the things I have, my first thought is about what I would like to have next.	2.40	1.05	.74	.77	2.50	1.17	.73		.74
2. My actions are strongly focused on material things.	2.15	1.00	.76	.71	2.26	1.12	.75		.74
3. Sometimes I feel a real urge to possess something.	3.06	1.17	.57	.57	3.16	1.18	.54		.51
4. When something is being shared, I try to get as big a share as possible.	2.23	0.98	.70	.69	2.36	1.13	.70		.66
5. In order to get what I want, I can accept the fact that other people may suffer damage.	2.03	0.98	.66	.61	2.00	1.10	.67		.66
6. I get the most fun out of buying myself all sorts of things.	2.39	1.09	.59	.63	2.66	1.18	.70		.69
7. When I play on my own, I sometimes cheat a little.	2.14	1.06	.45	.41	2.39	1.19	.57		.49
Eigenvalue			3.47				3.67		
Explained variance			49.53%				52.38%		
VAVS – Greed subscale (Veselka et al., 2014)	2.46	1.17			2.50	0.73			
1. I enjoy being a part of exclusive clubs or groups that are not open to everyone.	2.41	1.14	.64	.61	2.44	1.21	.60		.58
2. I do not enjoy sharing positions of power.	2.56	1.09	.44	.45	2.48	1.10	.46		.45
3. I like to collect expensive things.	2.11	1.05	.68	.66	2.29	1.20	.70		.70
4. At work/school, I keep good ideas to myself so that only I can get credit for them in the long run.	2.23	1.01	.61	.57	2.36	1.11	.62		.59

(Continued on next page)

Table 2. (Continued)

	Study 1				Study 1				
	<i>M</i>	<i>SD</i>	EFA	EFA-30	<i>M</i>	<i>SD</i>	EFA-1	EFA-2	EFA-37
5. Financially supporting the less fortunate is a priority for me. (R)	3.16	1.08	.11	.13	2.78	1.07	-.04		-.04
6. I believe that money is essential; friends are replaceable.	2.05	1.07	.59	.58	2.09	1.16	.67		.62
7. Being financially wealthy is my number one goal.	2.53	1.24	.73	.70	2.68	1.24	.68		.68
8. I consider myself successful if I have a job that pays a lot of money.	3.03	1.15	.55	.53	3.14	1.18	.55		.53
9. No matter how much I have, I always want more.	2.40	1.12	.77	.83	2.53	1.15	.71		.79
10. "I want it all" would be a good motto for me.	2.10	1.10	.81	.81	2.19	1.19	.79		.80
Eigenvalue			4.40				4.34		
Explained variance			44.00%				43.36%		
GR€€D scale (Mussel & Hewig, 2016) – only in Study 2					2.81	0.78			
1. I have great appetite for more.					2.81	1.16	.72	-.17	.73
2. My actions are strongly focused on material things.					2.26	1.12	.54	-.04	-
3. Sometimes I feel a real urge to possess something.					3.16	1.18	.65	-.22	-
4. When something is being shared, I try to get as big a share as possible.					2.36	1.13	.66	-.26	-
5. In order to get what I want, I can accept the fact that other people may suffer damage.					2.00	1.10	.50	-.34	-
6. My foremost goal is to earn a lot of money.					2.80	1.23	.72	.10	.68
7. When I play on my own, I sometimes cheat a little.					2.39	1.19	.70	.21	-
8. I'm always looking for ways to improve my financial situation.					3.87	0.93	.36	.61	.28
9. I would stop at nothing to get what I want.					2.22	1.22	.67	-.05	.68
10. It's my ambition to be able to buy myself lots of things.					2.81	1.22	.72	.04	.73
11. It gives me satisfaction to possess something that other people do not have.					2.64	1.21	.64	-.12	.65
12. I will always try to increase my income and my assets.					3.57	1.05	.53	.53	.47
Eigenvalue				13.65			5.23	1.49	15.58
Explained variance				45.49			43.61%	12.37%	42.09

Note. Items were given to each participant in randomized order. Participants indicated their agreement with the item on a 5-point Likert scale (1 = *strongly disagree*, 2 = *disagree*, 3 = *neither agree nor disagree*, 4 = *agree*, 5 = *strongly agree*). Reverse-coded items are indicated with (R). Items 2, 3, 4, 5, and 7 of the GR€€D scale are the same as items 2, 3, 4, 5, and 7 of the GTM. The names of the different scales, the accompanying mean scores (*M*), and standard deviations (*SD*) are printed in bold. The EFA columns display the results of exploratory factor analysis with principal axis factoring for that particular scale (with oblimin rotation when there are two factors); the columns (in italics) EFA-30 (EFA-37) display the results of exploratory factor analysis with principal axis factoring on all 30 (37) items in Study 1 (Study 2).

Factor loadings for the retained factors are shown in Table 2. Oblimin rotation was used for the two cases in which the EFA suggested a two-dimensional solution (i.e., the GR€€D scale, and Krekels and Pandelaere's [2015] DGS in Study 2). The different EFAs show that most items behaved well (had factor loadings above .30), with the exception of the 5th item of the VAVS ("Financially supporting the less fortunate is a priority for me."), which is one of the few reverse-coded items. The two other

reverse-coded items (items 5 and 6 of Krekels and Pandelaere's DGS, also scored a bit lower than the rest, and loaded higher on the second factor in Study 2). The other item that loaded higher on the second factor was item 8 of Mussel and Hewig's (2016) GR€€D scale ("I'm always looking for ways to improve my financial situation").

The final step in comparing the scales and the relations among the items was a factor analysis using principal axis factoring on all 30 items in Study 1 and on all 37 items in

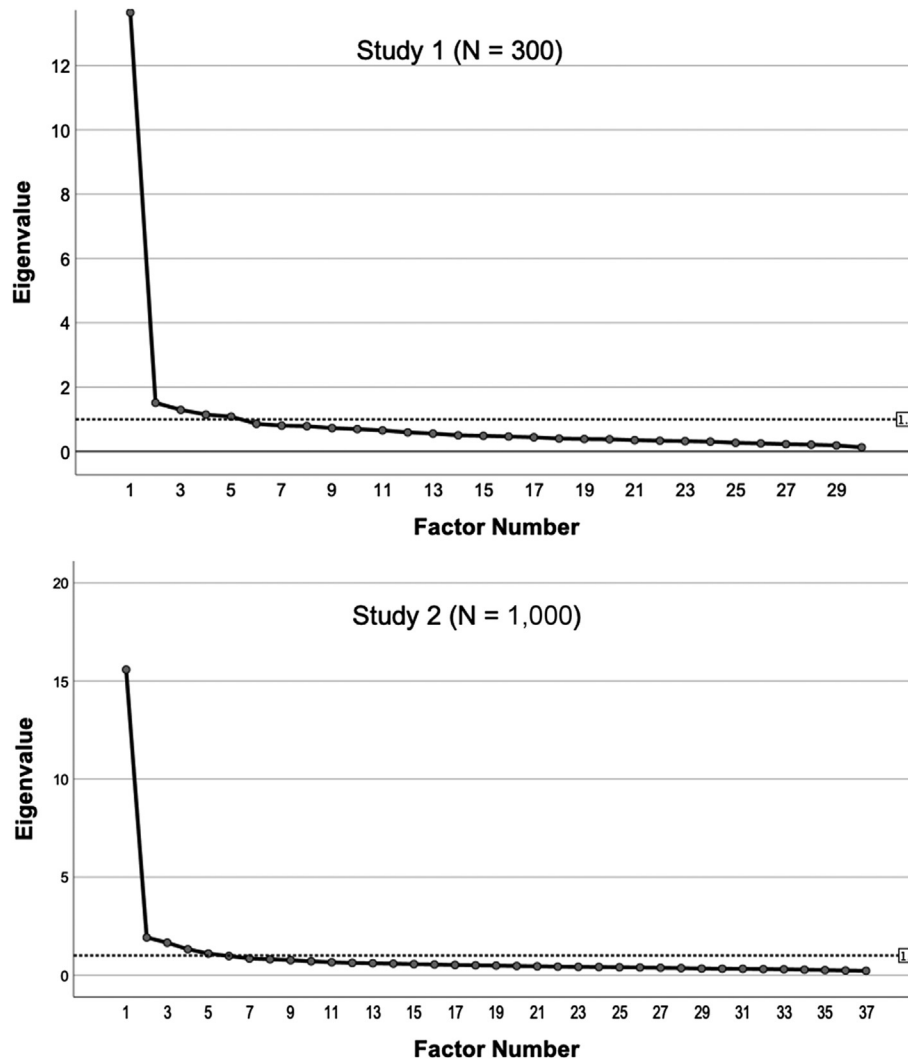


Figure 1. Scree plots for the exploratory factor analyses on all items of Study 1 and Study 2.

Study 2. The data were suitable for EFA, and we retained a single factor for both studies (Study 1 – $\chi^2(435) = 5,504.37$, $p < .001$, KMO = .960; EKC: 1, Hull: 1, PA: 1; Study 2 – $\chi^2(666) = 21,020.5$, $p < .001$, KMO = .974; EKC: 3, Hull: 1, PA: 4). For Study 1 all indicators were in agreement, pointing toward a one-factor solution. For Study 2 there was less agreement among the three indicators. As suggested by Auerswald and Moshagen (2019) we additionally used Cattell's scree test (Cattell, 1966) to decide on dimensionality. Figure 1 shows the scree plots for Study 2 (and for Study 1). We interpret these as very clearly suggesting a one-factor solution for both studies.

Thus, we ran two EFAs with principal axis-factoring retaining only one factor. The results are shown in Table 2 in the columns in italics, labeled EFA-30 for Study 1, and EFA-37 for Study 2. If we look at the results of Study 2, the one that is best powered and that includes all 37 items

from the 5 scales, it is apparent that most items load sufficiently high ($> .30$) on the factor. Items that do not fit that well are the ones that we mentioned before when discussing the EFAs on the separate scales. These are the two reverse-coded items from Krekels and Pandelaere's (2015) DGS, the reverse-coded item from Veselka et al.'s (2014) VAVS-G, and item 8 of Mussel and Hewig's (2016) GR€€D scale.

Discussion

Over the last couple of years, different instruments have been developed to measure dispositional greed. At this moment, we are aware of the 7-item Dispositional Greed Scale of Seuntjens, Zeelenberg, Van de Ven, et al. (2015),

the 6-item Dispositional Greed Scale of Krekels and Pandelaere (2015), the 7-item Greed Trait Measure of Mussel et al. (2015), the 10-item greed subscale of the 70-item Virtues and Vices Scale by Veselka et al. (2014), and the 12-item GR€€D scale of Mussel and Hewig (2016), that was not yet available when we collected the data of Study 1. As was discussed in the Introduction, the conceptual background of these scales shows strong enough convergence to compare them all as measures of greed, but also enough divergence, such as the discussion on whether to include willingness to inflict harm on others, to warrant a further comparison of the extent to which they are similar or different.

In two studies, we examined and compared these scales in terms of their psychometric properties, and we factor analyzed the individual scales as well as the pooled set of items from all scales in single exploratory factor analysis. This helps to answer the question posed by Lambie and Haugen (2019), who noted the problems that all dispositional greed scales seemed to operationalize slightly differently. The results first and foremost show that all scales can be used to assess dispositional greed, as all the scales are reliable and correlate highly. We think that this is theoretically a reassuring finding because it does not seem to matter much who developed the scale as all assess greed in a similar way. It implies that scholars independently developed convergent scales to assess dispositional greed. As such, there is no one clear recommendation for use of a single scale over another. All five scales appeared to be reliable and all five correlated substantially with each other, so it does not really seem to matter as the core component of greed is the same in all scales.

Despite the fact that the scales as such worked well, were reliable, and mostly had a one-factor structure, not all of the times they performed equally well. In the EFAs on the large set of items, we found that the reverse-coded items did not work well. Historically, reverse-coded items have been included in questionnaires to prevent inattention and response biases such as acquiescence. However, some scale development research argues that there are both statistical and theoretical considerations not to include reverse-coded items when developing a scale (Swain et al., 2008). The reason is that Likert scales that include reverse-coded items may also produce unexpected factor structures. There is a second potential problem with reverse-coded items when assessing greed, namely the conceptual problem of what is the opposite of greed or being greedy? There are several potential answers, but none are convincing. For example, one could argue that not being greedy is being generous, but one could equally well argue that it is being easily satisfied. Clearly, generosity and satisfaction are very different constructs. Maybe this is the reason why the reverse-coded items performed less well. Whatever the reason,

for the moment it would appear wise not to use reverse-coded items when measuring how greedy a person is.

As was said in the Introduction, the current article is intended as an addition to Mussel et al. (2018), who assessed the convergent validity of these scales. These researchers found that the different scales behaved similarly in predicting greed-related behaviors. This result is very important to stress because in the current studies we limit ourselves to self-reported greed. We add to the findings of Mussel et al. by showing all scales and the individual items also statistically converge, in a large sample with a relatively diverse sample of respondents in age. We think that is good news. Different teams of researchers, from different countries, have independently developed scales to assess individual differences in dispositional greed, and all teams arrived at scales that measure the same underlying construct.

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All authors contributed to the conceptualization of this research, Terri G. Seuntjens carried out the data collection and preparation of Study 1, Marcel Zeelenberg carried out the data collection and preparation of Study 2, Marcel Zeelenberg and Terri G. Seuntjens did the data analysis, Marcel Zeelenberg and Terri G. Seuntjens took the lead in writing the manuscript. All authors provided critical feedback and helped shape the research, analysis, and manuscript.

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Open Data: We confirm that there is sufficient information for an independent researcher to reproduce all of the reported results, including the codebook if relevant. All information can be found at <https://osf.io/95gjr>, and at <https://researchbox.org/159>.

Open Materials: We confirm that there is sufficient information for an independent researcher to reproduce all of the reported methodology. All information can be found at <https://osf.io/95gjr>, and at <https://researchbox.org/159>.

Preregistration of Studies and Analysis Plans: This first study was not preregistered, because we started preregistering studies only in late 2016, about half a year after we collected these data. Study 2 and the analysis plan was preregistered as Dispositional Greed Scales Study 2 (AsPredicted #52730; <https://aspredicted.org/vb6tj.pdf>).

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