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Psychometric evaluation of the revised Sense of Humor Scale and the construction of a parallel form

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Abstract: McGhee (1996, *Health, healing and the amuse system: Humor as survival training*. Dubuque: Kendall/Hunt; 1999, *Health, healing and the amuse system: Humor as survival training (3rd edition)*. Dubuque: Kendall/Hunt) proposed a model of the sense of humor including the six “humor skills” of enjoyment of humor, laughter, verbal humor, finding humor in everyday life, laughing at yourself, and humor under stress, measured with the Sense of Humor Scale (SHS). The purpose of the present study is to evaluate the psychometric properties of the SHS (revised version from 1999) and to develop a parallel form of the SHS to double the amount of items for each humor skill. Combining these two forms should yield reliable and factorially valid scales of the six humor skills. Participants in two online studies ($n = 315$ and 542) completed the SHS and its parallel form, along with measures of various outcomes. The psychometric properties of the SHS were of mixed quality, and those of the parallel form were uniformly good. The parallel-test reliability was sufficiently high to regard the two scales as parallel versions. Combining the two measures resulted in reliable and distinguishable scales of the six humor skills. All humor skills correlated positively with humor-related attitude and mood, cheerfulness, and life satisfaction. Importantly, they spanned different dimensions of the sense of humor, underscoring the usefulness of each humor skill.

Keywords: Sense of Humor Scale, psychometrics, sense of humor model, humor training, humor skills

1 Introduction

In 1996, McGhee proposed a multi-faceted concept of the sense of humor, an assessment tool for its measurement, and a training program for enhancing the

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sense of humor. McGhee (1979) stated that humor is a form of play – the play with ideas. Without a playful frame of mind, the same event may be seen as interesting, puzzling, annoying, frightening, etc., but not as funny. Playfulness and seriousness were assigned core roles in the sense of humor model. While people in general might be capable of spotting incongruities, absurdities, and ironies of life, only the mentally playful will find humor in them. A habitually serious attitude or frame of mind will hinder treating incongruities humorously. McGhee (1996) postulated that playfulness is inherited and that all children play, but that socialization (entering school, the workplace) may counteract this tendency to play and may cause individuals to lose their ability to be playful. The humor-training program for the “terminally serious” aims at rediscovering a playful attitude or outlook on life with the claim that rediscovery is a key element for positive changes (McGhee 1996; Ruch and McGhee 2014).

While playfulness is the foundation of the sense of humor, it is not a quality specific to humor. McGhee (1996) proposed six genuine humor skills, namely: enjoyment of humor, laughter, verbal humor, finding humor in everyday life, laughing at yourself, and humor under stress. In the first version of the model, these six elements were hierarchically organized from enjoyment of humor to finding humor under stress, inasmuch as the ones higher in the hierarchy were assumed to be more difficult to develop. To measure these skills, McGhee (1996) introduced the sense of humor scale (SHS), which later (McGhee 1999) underwent a revision. [This revised version is also printed in McGhee (2010).] Both versions of the SHS were deductively developed. They differ with respect to the number of items (five vs. four per humor skill) and the answer format of the response scale (four-point vs. seven-point, 1 = strongly disagree, 4/7 = strongly agree). The six humor skills are the same in both versions and may be added together to form a “total sense of humor” (SoH) score or a “humor quotient”. In the first version of the SHS, this score was also weighted (i. e., laughing at yourself weighted by a factor of 1.5 and humor under stress weighted by 2).

A first psychometric evaluation (Ruch and Carrell 1998), which investigated the SHS along with McGhee’s scales of the foundation of humor (i. e., mental frame of mind and mood quality) yielded high internal consistencies for an overall score (SHS and two scales of “seriousness and negative mood” and “playfulness and positive mood”) in both an American and a German sample (0.90 to 0.92). However, the five-item skills laughter and enjoyment of humor yielded Cronbach’s alphas lower than 0.70 (see also Wrench and McCroskey 2001). Furthermore, it was more fruitful to build bipolar scales of positive vs. negative mood and playful vs. serious attitude. The revision of the scale was partly successful, as investigated mostly with the German version of the SHS.

The number of items for the SHS humor skills was dropped from five to four without a substantial loss of reliability for four of the scales; however, enjoyment of humor and laughter again yielded coefficients below 0.70 (Proyer et al. 2010; only for enjoyment of humor in Proyer 2014). Positive vs. negative mood and playfulness vs. seriousness yielded satisfactory internal consistencies (Müller and Ruch 2011; Proyer et al. 2010, 2012; Proyer 2014). Also the SoH score and laughing at yourself proved to be internally consistent in several studies (Beermann and Ruch 2011; Proyer et al. 2012; Proyer 2014; Ruch and Heintz 2016).

Several studies investigated the validity of the SHS, but some essential information is still missing. A principal component analysis of the eight scales (positive and negative mood/attitude and the SHS) in German and English samples yielded separate but highly correlated factors for the six humor skills and the playful vs. serious dimensions (Ruch and Carrell 1998). However, no factor analysis at the item level has been undertaken yet to see whether the six concepts can be distinguished. Wrench and McCroskey (2001) conducted a factor analysis of 48 items (24 SHS items and 24 inverted items) and it “[...] revealed a strong primary factor” (p. 148), suggesting the use of the total SoH score only. Thus, it yet remains to be demonstrated that the six humor skills can be recovered as separate factors.

There is ample evidence that the SHS correlated very highly (0.60– 0.74) with other humor scales. For example, the SoH score correlated with the VIA-IS humor scale, the self- and peer rated socially warm (vs. socially cold) style of humorous conduct, and trait cheerfulness (Müller and Ruch 2011; Ruch and Carrell 1998; Ruch et al. 2011; Wrench and McCroskey 2001). In fact, all facets of trait cheerfulness and the six humor skills belonged to the same factor, suggesting these might be almost interchangeable concepts (Ruch and Carrell 1998). This was also found for the revised SHS, in which all scales and the SoH score loaded strongly on a cheerful-engaged playfulness factor (Proyer 2014).

Soury and Devillers (2014) found that the SoH score correlated positively with the frequency and length of recorded laughter in response to four passive and active laughter-inducing tasks (such as watching funny videos or a tongue-twister game). Beermann and Ruch (2011) supported the convergent validity of laughing at yourself with a moderate convergence between self-reports, peer-reports, and the frequency of observed smiling and laughter in response to distorted portraits of oneself (see Hofmann, this issue).

Only indirect evidence exists for the idea that there is a hierarchy in the humor skills. Humor under stress had the lowest mean and enjoyment of humor had the highest mean, but the proposed rank order was not found for all scales

(Ruch and Carrell 1998). However, Müller and Ruch (2011) found that both competent (vs. inept) and reflective (vs. boorish) humor styles tended to correlate most highly with the components of the sense of humor that are most difficult to acquire and low to negative with the ones that are easiest to develop. The ultimate test would be the latency needed to develop these humor skills in a training setting; this would clarify the best order among the concepts. Similarly, it is not known whether playfulness (and low seriousness) are “motors” for the humor skills.

The combination of the six humor skills into the SoH score in both theory and empirical research is reflective of the early notion that sense of humor is unidimensional. The SHS was developed when multi-dimensional measurements and models were as yet unknown, as, for instance, the State-Trait-Cheerfulness-Inventory (STCI; Ruch et al. 1996) and the Humorous Behavior Q-Sort Deck (Craik et al. 1996). Thus, locating the individual humor skills in a multidimensional humor space is of interest. A recent multidimensional model of the sense of humor (Ruch 2012a) was derived from factor analyses of self- and peer-reports of the Humorous Behavior Q-Sort Deck (Craik et al. 1996). This model of four sense of humor dimensions entails social fun (being a funny entertainer and showing prosocial humor in groups), mockery (entailing sarcasm, cynicism, laughing at others, making fun of others, and criticizing others humorously), humor ineptness (not being able to tell jokes or to laugh at oneself, and reacting inappropriately to humor and jokes), and cognitive/reflexive humor (making witty comments and word plays, liking intellectually and sophisticated humor).

1.1 Aims of the present study

The present study has five aims. First, we test the psychometric properties of the revised SHS (McGhee 1999): specifically, the reliability (internal consistency and unidimensionality) of the six scales and the SoH score and the corrected-item total correlations (CITCs) of the 24 items. Second, we develop and psychometrically test a parallel form of the SHS (SHS-P), a form that also entails four items per humor skill. We expect the SHS-P to be at least as psychometrically sound as the SHS. Additionally, the parallel-test reliability of the humor skills of the SHS and the SHS-P is expected to be sufficiently high. Although the SHS-P could potentially be used as a stand-alone instrument to measure the six humor skills, we did not intend this usage in the present study. Instead, our third aim is to combine the items of the SHS and the SHS-P (resulting in the combined SHS) to allow for a longer and

consequently more reliable and factorially valid measurement of the six humor skills. Fourth, the overlap of the six humor skills with humor-related measures (playful vs. serious attitude, positive vs. negative mood, the temperamental basis of the sense of humor, and four dimensions of the sense of humor) and life satisfaction is investigated. As attitude and mood were considered the “motor” of the sense of humor (McGhee 1996, 1999), each humor skill should positively correlate with playful vs. serious attitude and positive vs. negative mood. Next, it is tested whether the combined SHS and cheerfulness could be regarded as more or less interchangeable constructs (as was found by Ruch and Carrell 1998). Also, we examine whether the humor skills differentially relate to the other humor-related concepts. Finally, each humor skill and the SoH score are expected to correlate positively with life satisfaction, in accordance with McGhee’s claims that they would foster positive emotions and resilience, which should eventually result in enhanced evaluations of one’s life. Life satisfaction was also deemed relevant because it complements positive and negative mood (as affective components of subjective well-being) as the cognitive component of subjective well-being.

2 Methods

2.1 Participants

2.1.1 Sample 1

Overall, 324 participants completed all items of the SHS and the SHS-P. A total of 315 participants (42.9 % men) with a mean age of 36.67 ($SD = 14.66$) ranging from 18 to 85 years provided valid responses in this study. Participants were primarily Swiss (67.6 %) or German (18.4 %), but several other nationalities were also represented (13.9 %). Most participants were well educated, with 53.3 % having passed tertiary education, 19.0 % having A-levels, 23.4 % having an apprenticeship, and 4.4 % having up to nine years of education. Two-thirds (65.7 %) of the participants were employed.

2.1.2 Sample 2

Overall, 544 participants completed all items of the SHS and the SHS-P. A total of 542 participants (28.8 % men) with a mean age of 40.45 ($SD = 12.86$) ranging

from 18 to 76 years provided valid responses. Subsets of this sample also provided data on the temperamental basis of the sense of humor ($n=177$, 30.5% men, $M_{\text{age}}=42.54$), the four sense of humor dimensions ($n=140$, 28.6% men, $M_{\text{age}}=39.94$), and life satisfaction ($n=513$, 28.5% men, $M_{\text{age}}=40.68$). Participants were primarily German (66.2%), Swiss (20.8%), and Austrian (8.5%), but several other nationalities were also represented (4.5%). Participants were rather well educated, with 59.8% being university students or having passed tertiary education, 23.3% having up to nine years of education, 11.3% having A-levels, and 5.6% having an apprenticeship. Most participants (76.0%) were employed.

To test the psychometric properties of the SHS, the SHS-P, and the combined SHS, the two samples were analyzed together, resulting in 857 participants (34.0% males) with a mean age of 39.06 ($SD=13.66$).¹

2.2 Instruments

2.2.1 Sense of Humor Scale (SHS; as revised by McGhee 1999)

The SHS comprises 24 items, four each for the six humor skills (enjoyment of humor, laughter, verbal humor, finding humor in everyday life, laughing at oneself, and humor under stress). The scale comprises a seven-point Likert-like answer format from *strongly disagree* (1) to *strongly agree* (7). The scale midpoint (4) is labeled “neutral”.

2.2.2 Parallel form of the Sense of Humor Scale (SHS-P)

The SHS-P was developed by having graduate psychology students familiar with test construction write 52 items for the six skills based on McGhee’s descriptions, taking into account the psychometric properties (i. e., CITCs and item intercorrelations) and wording of the SHS items. Experts on test construction and humor supervised the students during this process. The items were adapted and finalized in discussions between the experts and the first author, resulting in 24 new items (four per humor skill). While the item contents should differ from the SHS items, each humor skill should be parallel to the SHS (i. e., the SHS-P should measure the same humor skills as the SHS). The scale comprises the same

¹ Results were similar when the two samples were analyzed separately.

answer format as the SHS. The SHS-P items can be obtained by contacting the authors.

2.2.3 Humor-related attitude and mood (McGhee 1999)

In addition to the SHS, McGhee (1999) also proposed two scales that measure playful vs. serious attitude and positive vs. negative mood with eight items each. The scales employ a seven-point Likert-like answer format, with varying answer options (e. g., from *very sad* [1] to *very happy* [7]). The scale midpoint (4) is always labeled “neutral”. Internal consistencies in the present study ($N=857$) were 0.73 for attitude and 0.86 for mood.

2.2.4 State-Trait-Cheerfulness-Inventory, Trait Version (STCI-T<60>; Ruch et al. 1996)

The STCI-T<60> is a 60-item questionnaire measuring trait cheerfulness, seriousness, and bad mood using a four-point Likert scale from *strongly disagree* (1) to *strongly agree* (4). Internal consistencies in the present study ($n=177$) were 0.94 (cheerfulness), 0.86 (seriousness), and 0.96 (bad mood).

2.2.5 Four Dimensions of Humor Scale (4DHS; Ruch 2012b)

The 4DHS is a short scale containing markers of the four sense of humor dimensions (Ruch 2012a) with six items each. Sample items are “I have a reputation of being a funny entertainer” (social fun), “I have an earthy, salty humor” (mockery), “I cannot laugh about my own weaknesses and failures” (humor ineptness), and “I like hearing and creating witty wordplays” (cognitive/reflective humor). The instrument employs a seven-point Likert-scale from *strongly disagree* (1) to *strongly agree* (7). Internal consistencies in the present study ($n=140$) were 0.79 (social fun), 0.82 (mockery), 0.54 (humor ineptness), and 0.73 (cognitive/reflective humor).

2.2.6 Satisfaction With Life Scale (SWLS; Diener et al. 1985)

The SWLS assesses general satisfaction with life, employing a seven-point Likert-scale from *strongly disagree* (1) to *strongly agree* (7). Cronbach’s alpha was 0.86 in the present study ($n=513$).

2.3 Procedure

Sample 1 was recruited by several graduate students via personal invitations (e-mails and online social networks). Participants received no compensation. Other variables were collected that are not relevant for the present study.

Sample 2 was collected via a website for research purposes (www.charakterstaerken.org). This website hosts research instruments related to positive psychology, personality, and humor. It has been promoted by different means, such as press coverage, publishing the link on different websites, by sending regular newsletters, and also by contacting particular groups to obtain heterogeneous samples. Selection criteria for participants are an age of 18 years and above and a reasonable command of German. Participants who completed the SHS and the SHS-P, humor-related attitude and mood, the STCI-T <60>, the 4DHS, or the SWLS in 2014 were included in the present study. Participants received an automated and personalized feedback after completing each questionnaire. All instruments were administered in German in both samples.

2.4 Data analysis

Cronbach's alpha and the mean inter-item correlations served as indicators of the internal consistencies of the scales. The quality of the items was assessed by comparing the CITCs with the median correlations with the remaining humor skills of the SHS and the SHS-P. Unidimensionality of the SHS and SHS-P scales, parallel-test reliability, and the factor structure of the six combined SHS humor skills were tested in confirmatory factor analyses (CFA) using the *lavaan* package (Rosseel 2012) in R (R Core Team 2015). The Satorra-Bentler's maximum likelihood mean-adjusted (MLM) estimator was used in the CFA models. Both fit indices with (χ^2 , χ^2/df , comparative fit index [CFI], root mean square error of approximation [RMSEA], and standardized root mean square residual [SRMR]) and without recommended cut-offs (Akaike information criterion [AIC] and sample-size adjusted Bayesian [BIC], with smaller values indicating a better fit) were employed to compare different structural models of the combined SHS scales. The interpretation of the fit indices was based on Schermelleh-Engel et al. (2003), who recommend for an acceptable fit: χ^2 at $p > 0.01$, $\chi^2/df \leq 3$, CFI ≥ 0.95 , RMSEA ≤ 0.08 , and SRMR ≤ 0.10 . Standard multiple regression analyses were conducted to test the overlap between the combined SHS scales and the scales of the STCI-T <60> and the 4DHS.

3 Results

3.1 Psychometric properties of the SHS and SHS-P scales and items

3.1.1 Scale-level analyses

Table 1 shows the descriptive statistics of the SHS and SHS-P scales to evaluate their psychometric properties.

As can be seen in Table 1, Cronbach's alphas of the SHS scales ranged from 0.56 (enjoyment of humor) to 0.84 (humor under stress) with a median

Table 1: Descriptive statistics and internal consistencies of the scales of the Sense of Humor Scale (SHS) and the Parallel Form of the SHS (SHS-P).

Scales	M^a	SD	Sk	K	Alpha	MIIC	r_{gender}	r_{age}
Enjoyment of humor								
SHS	4.17	1.07	0.02	-0.42	0.56	0.24	0.05	-0.13***
SHS-P	4.59	1.16	-0.52	0.22	0.71	0.38	-0.04	-0.12***
Laughter								
SHS	4.12	1.08	-0.28	0.06	0.65	0.32	0.05	-0.14**
SHS-P	5.43	1.01	-0.80	0.77	0.77	0.47	0.19***	0.05
Verbal humor								
SHS	4.33	1.16	-0.37	-0.03	0.74	0.42	-0.12***	-0.08*
SHS-P	4.91	1.20	-0.53	0.03	0.86	0.60	-0.05	-0.12***
Everyday life								
SHS	5.16	1.07	-0.80	1.20	0.82	0.53	0.07*	-0.09*
SHS-P	4.98	1.00	-0.59	0.68	0.84	0.56	0.02	-0.04
Laughing at yourself								
SHS	4.93	1.16	-0.72	0.75	0.80	0.50	0.07	-0.04
SHS-P	5.10	1.10	-0.78	0.93	0.82	0.54	0.05	0.03
Humor under stress								
SHS	4.54	1.26	-0.45	-0.13	0.84	0.58	0.00	-0.01
SHS-P	4.74	1.23	-0.54	0.18	0.88	0.65	-0.02	0.00
Total sense of humor								
SHS	4.54	0.89	-0.59	0.54	0.92	0.34	0.03	-0.10**
SHS-P	4.96	0.85	-0.62	0.64	0.93	0.36	0.03	-0.05

Note: $N = 857$ ($n = 856$ for age). Everyday life = finding humor in everyday life, Sk = skewness, K = excess kurtosis, Alpha = Cronbach's alpha, MIIC = mean inter-item correlation, r_{gender} = correlation with gender (male = 1, female = 2), r_{age} = correlation with age. * $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$. ^atheoretical minimum = 1 and maximum = 7.

of 0.80. The scales of the SHS-P showed higher internal consistencies, ranging from 0.71 (enjoyment of humor) to 0.88 (humor under stress) with a median of 0.84. The SoH scores had good internal consistencies. Mean inter-item correlations were numerically larger for the SHS-P (median = 0.54) than for the SHS (median = 0.42). Gender and age differences were generally small.

A CFA model with one latent factor for each scale of the SHS and the SHS-P and the SoH scores tested their unidimensionality (homogeneity). Table 2 shows the fit indices of the CFA models.

As shown in Table 2, most of the fit indices indicated an acceptable fit for all scales except for the verbal humor and laughing at yourself SHS scales and both SoH scales. Thus, for 10 of the 14 scales unidimensionality can be supported. Importantly, the SoH score was not homogenous, indicating that separating the humor skills could provide a better fit to the data.

Table 2: Fit indices of the unidimensionality models of the Sense of Humor Scale (SHS) and the Parallel Form of the SHS (SHS-P) and range of the standardized loadings.

Scales	χ^2	df	χ^2/df	CFI	RMSEA	SRMR	Loadings
Enjoyment of humor							
SHS	6.19*	2	3.10	0.98	0.05	0.02	0.33–0.69
SHS-P	12.13**	2	6.07	0.98	0.08	0.02	0.52–0.74
Laughter							
SHS	5.80	2	2.90	0.99	0.05	0.02	0.42–0.68
SHS-P	3.21	2	1.61	1.00	0.03	0.01	0.61–0.74
Verbal humor							
SHS	50.05***	2	25.03	0.93	0.17	0.04	0.56–0.81
SHS-P	7.24*	2	3.62	1.00	0.06	0.01	0.76–0.87
Everyday life							
SHS	1.88	2	0.94	1.00	0.00	0.01	0.71–0.79
SHS-P	11.48**	2	5.74	0.99	0.07	0.02	0.71–0.84
Laughing at yourself							
SHS	22.82***	2	11.41	0.97	0.11	0.03	0.58–0.85
SHS-P	0.10	2	0.05	1.00	0.00	0.00	0.55–0.82
Humor under stress							
SHS	8.50*	2	4.25	0.99	0.06	0.01	0.65–0.81
SHS-P	3.55	2	1.78	1.00	0.03	0.01	0.73–0.89
Sense of humor score							
SHS	1623.03***	252	6.44	0.80	0.08	0.06	0.20–0.74
SHS-P	2302.47***	252	9.14	0.72	0.10	0.08	0.29–0.77

Note: $N = 857$. Everyday life = Finding humor in everyday life. * $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$.

3.1.2 Item analyses

Table 3 shows the psychometric properties of the 24 SHS and SHS-P items.

As shown in Table 3, the CITCs were higher than the median of all remaining correlations with the SHS and SHS-P scales, except for Item 19 of the SHS. This

Table 3: Psychometric properties of the 24 items of the Sense of Humor Scale (SHS) and the Parallel Form of the SHS (SHS-P).

Scale and item number	SHS items				SHS-P items			
	<i>M</i>	<i>SD</i>	CITC	<i>Mdn r</i>	<i>M</i>	<i>SD</i>	CITC	<i>Mdn r</i>
Enjoyment of humor								
1	3.63	1.92	0.44	0.21	5.32	1.39	0.49	0.30
7	3.07	1.70	0.25	0.17	4.10	1.63	0.43	0.28
13	4.26	1.62	0.40	0.18	4.79	1.69	0.58	0.27
19	5.72	1.22	0.29	0.54	4.17	1.64	0.50	0.24
Laughter								
2	3.46	1.49	0.50	0.45	6.00	1.10	0.61	0.38
8	4.17	1.56	0.49	0.38	5.90	1.09	0.61	0.39
14	4.57	1.43	0.40	0.35	4.57	1.56	0.53	0.37
20	4.26	1.68	0.34	0.32	5.25	1.45	0.58	0.38
Verbal humor								
3	3.18	1.65	0.47	0.39	5.01	1.42	0.72	0.40
9	4.41	1.53	0.64	0.55	4.90	1.43	0.70	0.43
15	4.76	1.66	0.49	0.36	5.06	1.34	0.76	0.47
21	4.96	1.33	0.56	0.46	4.68	1.53	0.62	0.33
Everyday life								
4	5.18	1.38	0.64	0.55	4.98	1.22	0.66	0.53
10	5.14	1.36	0.69	0.52	4.96	1.24	0.73	0.51
16	5.01	1.26	0.63	0.52	5.23	1.12	0.64	0.43
22	5.32	1.31	0.62	0.53	4.76	1.31	0.65	0.45
Laughing at yourself								
5	5.00	1.57	0.53	0.31	5.65	1.25	0.71	0.48
11	5.29	1.37	0.70	0.49	5.21	1.36	0.68	0.47
17	4.98	1.45	0.62	0.52	4.63	1.52	0.51	0.34
23	4.46	1.47	0.59	0.46	4.90	1.31	0.69	0.45
Humor under stress								
6	4.55	1.62	0.59	0.49	4.96	1.40	0.77	0.53
12	4.38	1.50	0.72	0.50	4.63	1.41	0.80	0.52
18	4.71	1.42	0.70	0.49	4.80	1.44	0.68	0.54
24	4.52	1.55	0.70	0.52	4.56	1.47	0.72	0.48

Note: $N = 857$. Everyday life = Finding humor in everyday life, CITC = corrected item-total correlations, $Mdn r$ = median correlation with the five remaining scales of the SHS or SHS-P, respectively.

item referred to the importance of having a large amount of humor in one's life and reflected SoH in general rather than its specific humor skill (enjoyment of humor). CITCs ranged from 0.25–0.72 for the SHS items and from 0.43–0.80 for the SHS-P items, underscoring that they were related to their corresponding scale, but were not redundant. The median of the CITCs was numerically higher for the SHS-P (0.66) than for the SHS items (0.58), and the discrimination to the other scales was slightly better for the SHS-P (median correlation = 0.43) than for the SHS items (0.48). All items showed sufficient variability ($SD > 1$) and were approximately normally distributed. The means across the 24 SHS-P items were numerically higher ($M = 4.96$, $SD = 1.39$) than those of the SHS ($M = 4.54$, $SD = 1.50$). Both means were above the neutral answer option, indicating that participants – on average – tended to agree with the items.

3.2 Parallel-test reliability

Next, parallel-test reliability is investigated, indicating the extent to which the six SHS and SHS-P humor skills overlap. Table 4 shows the intercorrelations of the SHS and SHS-P scales and the parallel-test reliabilities.

As shown in Table 4, parallel-test reliabilities (median 0.77) were high (with the only values below 0.70 for enjoyment of humor and laughter) and always numerically higher than the correlations with the other humor skills (median 0.51). The convergence of the SHS and SHS-P scales was also supported in CFA models. The four items of each SHS and SHS-P scale were modeled to load on one latent factor, and these two latent factors were allowed to correlate with one another. Separate models were estimated for each of the six humor skills. The factor correlations (which reflect the *true-score* correlations between the constructs, accounting for measurement error) ranged from 0.93 (laughter) to 1.00 (humor under stress) with a median of 0.97, indicating that the SHS and the SHS-P humor skills virtually measured the same. Thus, the six scales of the SHS-P can be regarded as sufficiently parallel to the SHS scales.

3.3 Psychometric properties of the combined SHS

Given the sufficient psychometric properties of the SHS-P and its high convergence with the SHS, we aimed at combining their items to create more internally consistent and factorially valid scales of the six humor skills. For this purpose, Item 19 (SHS enjoyment of humor) was excluded, as it would have undermined the separation of the six skills (see Table 3). Table 5 shows the descriptive

Table 4: Scale intercorrelations and parallel-test reliabilities of the Sense of Humor Scale (SHS) and the Parallel Form of the SHS (SHS-P).

Scales	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Enjoyment of humor													
(1) SHS													
(2) SHS-P	<i>0.64</i>												
Laughter													
(3) SHS	0.48	0.39											
(4) SHS-P	0.40	0.38	<i>0.67</i>										
Verbal humor													
(5) SHS	0.39	0.35	0.55	0.42									
(6) SHS-P	0.37	0.39	0.50	0.48	<i>0.76</i>								
Everyday life													
(7) SHS	0.40	0.36	0.57	0.55	0.70	0.71							
(8) SHS-P	0.33	0.37	0.53	0.53	0.65	0.73	<i>0.80</i>						
Laughing at yourself													
(9) SHS	0.35	0.28	0.50	0.49	0.56	0.60	0.72	0.60					
(10) SHS-P	0.29	0.24	0.47	0.50	0.43	0.47	0.60	0.59	<i>0.78</i>				
Humor under stress													
(11) SHS	0.39	0.33	0.56	0.47	0.63	0.62	0.69	0.68	0.62	0.58			
(12) SHS-P	0.37	0.36	0.58	0.52	0.60	0.65	0.67	0.71	0.61	0.65	<i>0.88</i>		
Total sense of humor													
(13) SHS	0.63	0.50	0.77	0.63	0.82	0.76	0.87	0.76	0.80	0.67	0.84	0.79	
SHS-P	0.52	0.60	0.68	0.73	0.70	0.82	0.80	0.85	0.73	0.75	0.78	0.85	<i>0.89</i>

Note: $N = 857$. Everyday life = finding humor in everyday life. Parallel-test reliabilities marked in italics. All correlations $p < 0.001$.

Table 5: Descriptive statistics, CITC ranges, internal consistencies, and scale intercorrelations of the combined sense of humor scale.

<i>Combined Sense of Humor Scales</i>	<i>M</i>	<i>SD</i>	<i>CITC range</i>	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) Enjoyment of humor	4.19	1.07	0.30–0.60	<i>0.76</i>						
(2) Laughter	4.77	0.95	0.34–0.63	0.44	<i>0.82</i>					
(3) Verbal humor	4.62	1.11	0.49–0.78	0.38	0.57	<i>0.88</i>				
(4) Finding humor in everyday life	5.07	0.98	0.65–0.77	0.36	0.63	0.78	<i>0.90</i>			
(5) Laughing at yourself	5.01	1.06	0.50–0.75	0.28	0.57	0.58	0.70	<i>0.89</i>		
(6) Humor under stress	4.64	1.20	0.66–0.83	0.35	0.60	0.69	0.75	0.67	<i>0.93</i>	
(7) Total sense of humor	4.72	0.84	0.21–0.73	0.59	0.79	0.84	0.88	0.80	0.86	<i>0.96</i>

Note: $N = 857$. CITC = corrected item-total correlation. Cronbach's alpha in italics. All correlations $p < 0.001$.

statistics, CITC ranges, internal consistencies, and intercorrelations of the combined SHS scales.

As shown in Table 5, the scales correlated positively and significantly with one another (median = 0.55). Importantly, the internal consistencies of the scales were always larger (0.76–0.93, median = 0.87), indicating that each scale had unique reliable variance not shared with the other scales.

To test the factor structure of the combined SHS scales and to compare different models with one another, the items were modeled as indicators of the six humor skills in a CFA. Four different structural models were tested (see Figure 1 for a depiction of each model): (a) A one-factor model (modeling the SoH score only), (b) a six-factor model (modeling the six intercorrelated humor skills), (c) a six-factor model with a second-order factor (modeling the six humor skills and the SoH score in a hierarchical structure), and (d) a bifactor six-factor model (modeling the six humor skills as correlated specific factors and the SoH score as an independent general factor). In this model, each item can relate to both SoH (i. e., a general sense of humor factor) and its specific humor skill (i. e., a specific group factor).

Table 6 shows the fit indices of these four CFA models based on the combined SHS.

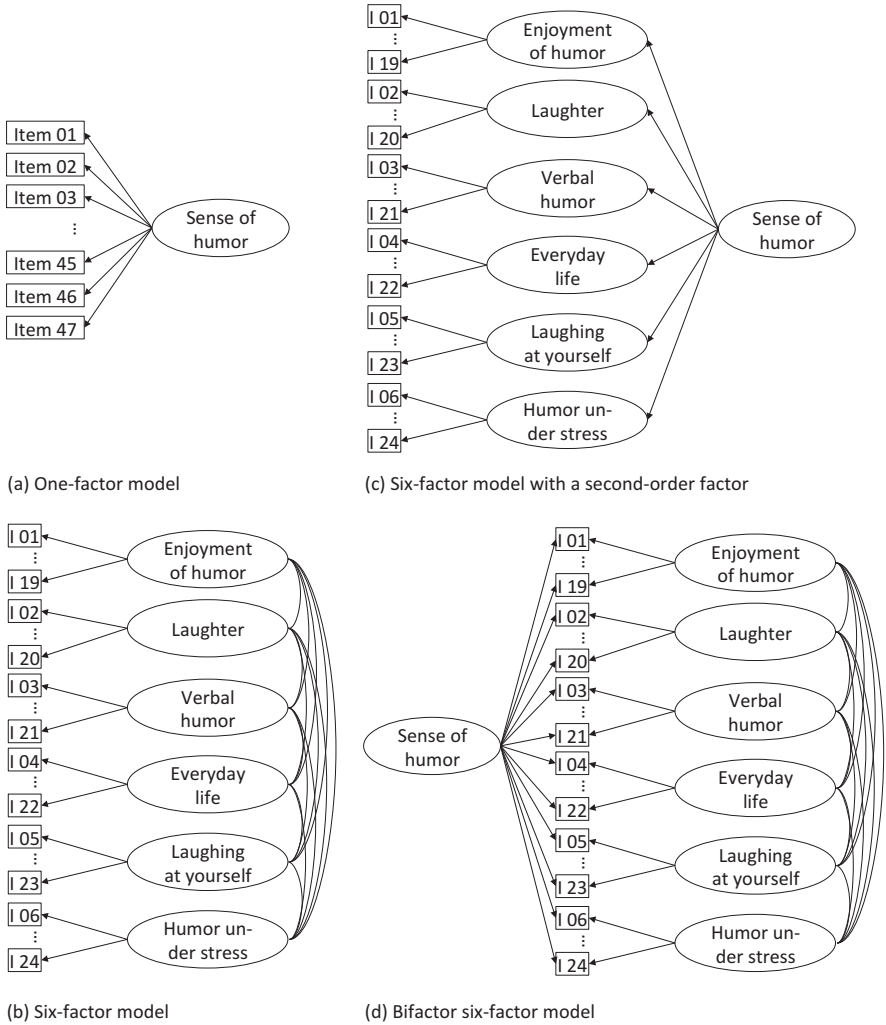


Figure 1: Depiction of the four structural models of the combined Sense of Humor Scale tested in the CFA. Everyday life = finding humor in everyday life.

As shown in Table 6, the one-factor model had an unacceptable fit, indicating that more than one SoH factor is needed to explain the relationships between the items. The bifactor six-factor model had the best fit, indicated by the lowest AIC and BIC values and the best fit indices of all models. This supports the importance of both a general SoH factor and each of the six humor skills. The specific factors (i. e., humor skills) correlated between -0.06 (enjoyment of

Table 6: Fit indices of the CFA models of the humor skills of the combined Sense of Humor Scale.

	χ^2	<i>df</i>	χ^2/df	CFI	RMSEA	SRMR	AIC	BIC
One-factor model	6'901.66***	1034	6.67	0.66	0.08	0.07	127'698.70	127'921.16
Six-factor model	3'708.78***	1019	3.64	0.85	0.06	0.05	123'583.41	124'324.94
Hierarchical six-factor model	3'785.06***	1028	3.68	0.84	0.06	0.06	123'663.45	123'895.38
Bifactor six-factor model	3'128.34***	972	3.22	0.88	0.05	0.04	122'921.75	123'242.02

Note: $N = 857$. *** $p < 0.001$.

humor and verbal humor) and 0.62 (finding humor in everyday life and humor under stress; median = 0.41). Despite measurement error being accounted for, this median is numerically lower than the median of the observed intercorrelations of the six humor skills, indicating that the general SoH factor contributed to the relationships between the humor skills.

3.4 Overlap with other humor measures and life satisfaction

Having established the combined SHS scales as reliable and factorially valid, their usefulness can be tested by allocating them in humorous temperament and the four humor factors. Table 7 shows the correlations and multiple correlations (derived from standard multiple regressions) of the six scales of the combined SHS with humor-related attitude and mood, the STCI-T, the 4DHS, and the SWLS.

As shown in Table 7 and in accord with McGhee's assumptions, playful vs. serious attitude and positive vs. negative mood correlated positively with all combined SHS scales (small to large effects, median = 0.60 for attitude and 0.33 for mood). In addition, the six combined SHS scales explained a large amount of the reliable variance in attitude and mood. The three temperamental bases of the sense of humor explained between 14 % (enjoyment of humor) and 61 % (laughter) of the variance in the combined SHS scales (median 46 %). Also, each SHS scale correlated significantly and positively with cheerfulness and negatively with seriousness and bad mood (though the latter correlation was not significant for enjoyment of humor). As expected, the combined SHS scales explained most of the reliable variance in cheerfulness (suggesting that they were highly

Table 7: Zero-order correlations and multiple correlations (derived from standard multiple regressions) of the six scales and the Sense of Humor (SoH) score of the combined Sense of Humor Scale with the State-Trait-Cheerfulness Inventory (STCI-T), the Four-Dimensions of Humor Scale (4DHS), and the Satisfaction with Life Scale (SWLS).

	Enjoy	Laughter	Verbal	Everyday	LAY	Stress	<i>R</i>	<i>R</i> ²	SoH score
Playful vs. serious attitude	0.27***	0.61***	0.53***	0.62***	0.59***	0.61***	0.76***	0.57	0.68***
Positive vs. negative mood	0.09*	0.38***	0.19***	0.30***	0.35***	0.35***	0.66***	0.43	0.35***
STCI-T									
Cheerfulness	0.31***	0.77***	0.57***	0.69***	0.68***	0.66***	0.86***	0.74	0.77***
Seriousness	-0.22**	-0.27***	-0.24**	-0.22**	-0.25***	-0.25***	0.40*	0.16	-0.31***
Bad mood	-0.14	-0.53**	-0.25***	-0.44***	-0.57***	-0.47***	0.72***	0.52	-0.50***
<i>R</i>	0.38***	0.78***	0.65***	0.71***	0.69***	0.67***			0.79***
<i>R</i> ²	0.14	0.61	0.42	0.51	0.47	0.45			0.63
4DHS									
Social fun	0.27**	0.45***	0.72***	0.52***	0.43***	0.43***	0.71***	0.50	0.60***
Mockery	0.13	0.09	0.32***	0.17*	0.08	0.14	0.39*	0.16	0.20*
Humor ineptness	0.17*	-0.18*	-0.07	-0.20*	-0.40***	-0.22**	0.55***	0.29	-0.18*
Cognitive/reflective	0.24**	0.22**	0.60**	0.56**	0.37**	0.38**	0.72***	0.52	0.50**
<i>R</i>	0.36***	0.49***	0.79***	0.66***	0.61***	0.52***			0.68***
<i>R</i> ²	0.13	0.24	0.62	0.44	0.37	0.27			0.46
SWLS	0.10*	0.32***	0.22***	0.26***	0.28***	0.26***	0.35***	0.12	0.30***

Note: *N* = 857 (attitude and mood), *n* = 177 (STCI-T), *n* = 140 (4DHS), and *n* = 513 (SWLS). Enjoy = enjoyment of humor, Verbal = verbal humor, Everyday = finding humor in everyday life, LAY = laughing at yourself, Stress = humor under stress. **p* < 0.05. ***p* < 0.01. ****p* < 0.001.

similar). Overlaps with bad mood were also large, while they were somewhat smaller with seriousness.

The 4DHS explained 13% (enjoyment of humor) to 62% (verbal humor) of the variance in the combined SHS scales (median = 32%). All combined SHS scales correlated significantly and positively with social fun and cognitive/reflective humor. Verbal humor, finding humor in everyday life, and the SoH score also correlated positively with mockery, although these relationships were numerically smaller than the correlations with social fun and cognitive/reflective humor. Most combined SHS scales also showed significant negative correlations to humor ineptness, while verbal humor was uncorrelated with it and enjoyment of humor correlated positively with it. The six combined SHS scales overlapped most strongly with social fun, cognitive/reflective humor, and humor ineptness, and to a lesser extent with mockery.

Lastly and as expected, the relationships with life satisfaction were positive and significant for all combined SHS scales (median = 0.26). Still the size of relationships varied across the humor skills, ranging from 0.10 (enjoyment of humor) to 0.32 (laughter). Comparing the correlation of the SoH score and the multiple correlations across the six humor skills across all outcomes, it can be seen that the overlap was always numerically larger for the six skills than the SoH score. This further supports the importance of taking the individual skills into account.

4 Discussion

The first aim of the present study was to examine the psychometric properties of the revised SHS (McGhee 1999). The internal consistencies of all of the skills and the total score were > 0.70 with the exception of enjoyment of humor (0.56) and laughter (0.65). This is in accord with previous findings (Proyer et al. 2010). Unidimensionality (or homogeneity), as tested in the CFA, was supported for four humor skills (enjoyment of humor, laughter, finding humor in everyday life, and humor under stress), but not the SoH score. This implies that it is worthwhile to study the SHS humor skills in more detail, as they cannot be mapped onto a single SoH factor. At the item level, the CITCs were sufficient and larger than the correlations with the other humor skills. The only exception was Item 19 (“It is important for me to have a lot of humor in my life”), which was less representative of the humor skill it was assigned to (enjoyment of humor), but was related to SoH in general. Overall, the SHS scales had mixed psychometric properties, with the SoH score being internally consistent (though not

unidimensional). The humor skills could, in general, be distinguished from one another, yet their reliability could be improved. The revised SHS can thus be recommended as a broad indicator of the sense of humor (by using the SoH score across the six humor skills) and for reliably assessing the two humor skills finding humor in everyday life and humor under stress.

The second aim was to develop a parallel form of the SHS (SHS-P) with four items per humor skill. All skills and the total score of the SHS-P turned out to be internally consistent (Cronbach's alphas > 0.70). The skills were also unidimensional while the total score was not; this finding further supports the idea that the humor skills had a unique variance that cannot be explained by a single sense of humor factor. Item CITCs were sufficient and they were always larger than the correlations with the other five humor skills. Thus, the SHS-P was at least as psychometrically sound as the SHS and, in some areas, superior. The parallelism of the humor skills of the SHS and the SHS-P was supported in sufficient parallel-test reliabilities (0.76–0.89). The lower values obtained for enjoyment of humor (0.64) and laughter (0.67) might be due to the low internal consistencies of these SHS scales. This interpretation is supported by the finding that the latent correlations between the SHS and SHS-P factors in the CFA ranged from 0.93 to 1.00, indicating that they were virtually identical once measurement error was accounted for. This high degree of convergence confirmed the parallelism of the SHS and its parallel form, the SHS-P.

The third aim was to combine the items of the SHS and the SHS-P (to form the combined SHS) to allow for a longer and therefore more internally consistent and factorially valid measurement of the six humor skills. As Item 19 of the SHS did not match with its humor skill (but with sense of humor in general), it was excluded from the combined SHS as it would have hampered the separation of the six humor skills. As expected, internal consistencies were good for all scales (0.76 to 0.96). Comparing four different CFA models (one-factor, six-factor, hierarchical six-factor, and bifactor six-factor model) yielded the best fit for the bifactor six-factor model, in which each item was explained by a general factor (presumably SoH) and one of the six humor skills.

The bifactor six-factor model model supported the notion that each item in the combined SHS was determined by a general sense of humor component, which was shared across all items, and the specific humor skill. The six humor skills could be well distinguished in this model (median intercorrelation 0.41 vs. 0.55 in the observed correlations). Also, their relationships might be captured more realistically in this model than in the observed correlations, as the overlap between the six humor skills was partly caused by the general sense of humor factor that their items shared. For example, the observed correlation between enjoyment of humor and verbal humor dropped from 0.38 to -0.06 in the bifactor

six-factor model, indicating that once general sense of humor was accounted for, the two humor skills were essentially unrelated to one another. Passively seeking out humorous stimuli and actively producing humor can thus be regarded as independent skills. By contrast, the correlation between finding humor in everyday life and humor under stress dropped only slightly from 0.75 to 0.62. Thus these two humor skills were similar beyond general sense of humor, and they also make use of similar skills (e. g., humor under stress could be conceived as finding humor in stressful situations, representing a more elaborate and specific humor skill similar to finding humor in everyday life).

The fourth aim was to investigate the overlap of the six humor skills with humor-related measures and life satisfaction. Each humor skill and the SoH score correlated significantly and positively with playful vs. serious attitude and positive vs. negative mood, supporting McGhee's (1999) idea that they represent the "motor" of the sense of humor. The six combined SHS humor skills showed an overlap of 74 % with cheerfulness, which supports the notion that they are highly related and almost interchangeable concepts (as proposed by Ruch and Carrell 1998). In addition, each SHS humor skill could be differentially located within other humor-related concepts: They correlated positively and significantly with social fun and cognitive/reflective humor, and negatively with seriousness. All humor skills except enjoyment of humor correlated negatively with bad mood. Verbal humor and finding humor in everyday life correlated positively with mockery. Finally, enjoyment of humor correlated positively with humor ineptness, verbal humor was uncorrelated with it, and the other four humor skills correlated negatively with it. Thus, each humor skills covered slightly different aspects of the sense of humor dimensions, and also the sizes of their relationships varied. For example, laughing at yourself correlated more strongly with humor ineptness than humor under stress did (-0.40 and -0.22 , respectively). Lastly, every humor skill and the SoH score were found to correlate positively with life satisfaction, with the smallest effects emerging for enjoyment of humor and verbal humor and the strongest ones occurring for laughter and laughing at yourself.

Overall, both the pattern of correlations across the six humor skills and the size of the relationships varied. Similar effects can be expected for other measures of humor and well-being, which should be investigated in future research. Importantly, assessing the individual humor skills allows evaluating the effectiveness of practicing each humor skill in McGhee's humor training program. For example, it could show which of them (and their improvements by the humor training) are more or less relevant for obtaining well-being outcomes. The current study merely describes the existence of a relationship; causality needs to be established in an experimental design.

4.1 Limitations and suggestions for future research

Both samples were convenience samples, in which females and well-educated participants were overrepresented. Replications of the present findings (especially regarding the performance of the combined SHS) with more varied samples are desirable. The SHS was developed in the U.S., whereas the SHS-P was developed in (German-speaking) Switzerland. Thus, replications with English-speaking and more culturally diverse samples are needed. Regarding the factor structure of the combined SHS, none of the CFA models had acceptable values in all fit indices. The suggestion for the bifactor six-factor model should thus be seen as a preliminary one. Specifically, optimizations of the combined SHS (i. e., by selecting the best items for each humor skill) would be an important next step in future research. This would potentially increase the fit in the CFA models and would allow assessing the six humor skills more economically. Finally, other assessment methods are needed to further support the validity of the (combined) SHS scales (e. g., expert ratings, self-other-convergence, and behavioral observations).

4.2 Conclusions

In conclusion, the (revised) SHS can mainly be recommended if a general SoH score (similar to cheerfulness) is of interest. The SoH score mainly spanned two humor factors (social fun and cognitive/reflective humor), representing a specific subfacet of prosocial, entertaining, but at the same time thoughtful and witty humor. This also fits well with Craik et al.'s (1996) finding that the lay concept of the sense of humor is based on the socially warm (vs. cold) and competent (vs. inept) styles of humorous conduct. The present study shifts the focus from the SoH score to the six humor skills, which could be differentially allocated in the four dimensions of the sense of humor. The SHS-P can be used interchangeably with the SHS and additionally allows a reliable measurement of each humor skill. The combined SHS can be recommended if the measurement of the six humor skills is of primary interest. Being able to assess the individual humor skills and by modeling them in the bifactor six-factor model can yield insights into subfacets of the sense of humor that have not been frequently studied so far. This can benefit both theory and practice by better understanding the active ingredients in McGhee's humor training program and the differential relationships of the six humor skills to well-being and health.

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