


Measuring Driving Fear

Development and Validation of the Instrument for Fear of Driving (IFD)

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Abstract: Presently, there is no instrument to support the diagnosis of driving fear and its severity. To enable a reliable and valid diagnosis, the 5-item German-language Instrument for Fear of Driving (IFD) was developed. The items, by DSM-5 criteria for a specific phobia, measure the emotional, cognitive, and physiological components of driving fear as well as the degree of avoidance and impairment. The present paper comprises two studies that describe the development of the IFD and its psychometric properties. In Study 1, the IFD was administered to 810 non-clinical participants in an online survey and demonstrated good reliability and construct validity. In Study 2, fifty-four people with a clinical diagnosis, including clinically relevant driving fear, completed the IFD and a clinical interview. The IFD demonstrated good sensitivity and specificity, and a cut-off score resulted in 95% sensitivity and 97% specificity. While the findings are preliminary and further studies with larger samples are needed, the IFD is a promising screening instrument for driving fear and its severity.

Keywords: driving fear, self-report measure, psychometric properties, sensitivity, specificity



Driving fear is a highly heterogeneous phenomenon, ranging from mild concerns and occasional discomfort to high levels of anxiety (Fischer et al., 2020). It can vary in terms of severity of fear, feared situations, focus of fear, and degree of avoidance (Taylor et al., 2007; Wald & Taylor, 2000). Clinically relevant driving fear can occur within various psychological diagnoses. Diagnostically, it can be classified as a specific phobia, the most common anxiety disorder (Rinck et al., 2002), with a 6–20% lifetime prevalence, depending on the study (Fredrikson et al., 1996; Magee et al., 1996). While the animal type is the most common subtype of specific phobia, a driving phobia is one of the most common situational-specific phobias, with an estimated lifetime prevalence of 1.1% (Becker et al., 2007). Clinical practice shows cases with extreme impairment in everyday life requiring treatment, as there is limited access to social and occupational activities. According to DSM-5, driving fear as a situational specific phobia is characterized by an intense and consistent fear of driving a car evoked when driving or by the mere anticipation of driving (American Psychiatric Association, 2013). Anxiety while

driving is either endured or avoided, the fear is out of proportion to the actual danger posed by the driving situation, and it results in a reduction in independence, mobility, and well-being. Fear of driving can be classified as a specific phobia of the situational type when the duration of symptoms is at least six months, and the fear is persistent (American Psychiatric Association, 2013; Taylor et al., 2002).

However, driving fear can also be classified as panic disorder (free-floating panic attacks occur while driving and in other situations), agoraphobia (situations such as being away from home and in public evoke fear and the fear of driving is not the only concern), social phobia (fearing the judgment of others in driving situations and others in everyday life), or post-traumatic stress disorder (Blanchard & Hickling, 1997; Fischer et al., 2020; Hickling & Blanchard, 1992; Kuch et al., 1985). Clinically relevant driving fear can occur in the various diagnoses mentioned above, consisting of the fear of driving, cognitive fear components, safety and avoidance behavior, and impairment in everyday life. Established inventories of those correlates such as phobia, social anxiety, and post-traumatic symptoms exist but do not explicitly address driving fear and are therefore vague to solely measure driving fear and its severity (e.g., Turner et al., 1996). Some existing measures only focus on driving fear after motor vehicle crashes, such as the Accident Fear Questionnaire, the Safety Behaviors Questionnaire, or the

Travel Phobia Beliefs Questionnaire (Ehring et al., 2006; Kuch et al., 1985). Further questionnaires assess specific driving situations or maladaptive coping strategies (e.g., Driving Behavior Survey, Driving Situations Questionnaire; Clapp et al., 2011; Ehlers et al., 1994). There is a need for a validated screening tool for driving fear for both applied research and clinical practice (Taylor et al., 2021). A brief measure will help move the research field forward and identify individuals early enough to provide treatment, reduce symptoms, and generally improve health outcome at low cost (Iragorri & Spackman, 2018).

The measure developed here, the Instrument for Fear of Driving (IFD), is intended to be used to diagnose driving fear (categorical diagnosis) and to measure the intensity of the fear (dimensional supplement). This paper aims to present the IFD, which is a new, brief, theoretically-derived self-report measure of fear of driving (in German), as well as to describe its clinical utility and psychometric properties. In order to explore the capacity of the IFD to capture various degrees of driving fear, samples with a wide range of sub-clinical to clinical severity were included in the present paper. While the IFD does not capture the full range of facets of driving fear or specific situations, its use as a brief screening instrument fills a gap in the driving fear research. In addition to enabling a categorical diagnosis, the IFD is supposed to assess the intensity of driving fear, discriminating between mild, subclinical and clinically relevant driving fear. Study 1 examined the reliability, construct validity, and dimensionality of the IFD with 810 non-clinical participants, and Study 2 investigated the sensitivity and specificity of the IFD with a clinical sample of 54 people.

Item Development

For the development of the IFD as a screening instrument, the brief self-rated scales for anxiety disorders by Lebeau et al. (2012), which follow a dimensional approach to measuring DSM-5 anxiety disorders, were taken into consideration (Lebeau et al., 2012; Rinck et al., 2002). Their scales assess the frequency and intensity of cognitive and physical symptoms and the frequency of escape and avoidance behaviors. A 1-item instrument (e.g., “Are you afraid of driving?”) was considered unsuitable as it did not capture the different components of driving fear. Instead, assessment of driving fear and its cognitive, emotional, and behavioral facets added significant clinical information beyond just asking individuals if they are afraid of driving and would be more useful for research and therapeutic contexts.

To ensure content validity, the development of the items for the IFD was based on the current DSM-5 criteria for specific phobia, and the recommendations of the DSM-5 Taskforce and the Specific Phobia Dimensional Scale

(SP-D) were taken into consideration (Helzer et al., 2007; Lebeau et al., 2012). In order to provide a brief self-report instrument for fear of driving (categorical diagnosis) and to measure its intensity (dimensional supplement), five items were designed. To avoid redundancy and meet the goal of providing a brief screening instrument, only one item per DSM criterion was designed. The A-criterion for specific phobia in DSM-5 (persistent fear) was conceptualized by an item referring to the emotional components of fear (“I am afraid of driving”) and by an item referring to the cognitive component of fear (“When I think of driving, I envision what could happen”), which is also intended to capture the anticipatory anxiety and the anxious expectation that is typical in driving fear and other specific phobias. The B-criterion (anxiety response) was conceptualized by an item referring to the physiological sensations of fear (“When I drive, I experience fear physically, e.g., racing heartbeat, sweating, shaking, chest tightness, muscle tension etc.”). To conceptualize the C-criterion (avoidance), the fourth item was designed to assess the degree of avoidance behavior (“I avoid driving”). In accordance with the F-criterion (impairment and distress), a fifth item referred to the degree of impairment and burden due to the experienced driving fear (“My fear of driving is a burden to me”). To propose a measure sensitive to change, the items should be answered with regard to the last month, as is the case in the SP-D. Each item is rated on a 4-point scale, ranging from 0 (= *not at all applicable*) to 3 (= *fully applicable*), with 1 = *sometimes applicable* and 2 = *oftentimes applicable*. A 5-point scale, which was used in the SP-D, was not used to avoid attenuated psychometric precision and avoid the tendency toward the center (Simms et al., 2019). A total score is created by summing the 5-item scores (range of possible scores: 0–15). The items are found in Table 1. The IFD was developed and validated in German. The English translation was done for this article and is yet to be validated.

Study 1: Psychometric Properties, Unidimensionality, Reliability, and Construct Validity

Aim

The aim of Study 1 was to examine item characteristics, unidimensionality, reliability, and construct validity of the IFD. Given the high correlations between anxiety sensitivity and alternative constructs measuring anxiety and body vigilance (Kemper et al., 2009), the IFD was expected to be moderate to highly positively correlated with measures

Table 1. IFD: German items and their English translation

German Item	English Translation
1. Ich habe Angst vor dem Autofahren.	1. I am afraid of driving.
2. Bei dem Gedanken Auto zu fahren male ich mir aus, was alles passieren könnte.	2. When I think of driving, I envision what could happen.
3. Wenn ich Auto fahre, spüre ich die Angst körperlich (z.B. Herzrasen, Schwitzen, Zittern, Engegefühl in der Brust, muskuläre Anspannung o.ä.).	3. When I drive, I experience fear physically, e.g., racing heartbeat, sweating, shaking, chest tightness, muscle tension, etc.
4. Ich vermeide das Autofahren.	4. I avoid driving.
5. Meine Angst vor dem Autofahren belastet mich.	5. My fear of driving is a burden to me.

of anxiety sensitivity, general anxiety symptom ratings, and driving fear-related cognitions. For further examination of the construct validity of the measure, the World Health Organization's well-being index and measures of impulsivity and willingness to take risks were administered (Topp et al., 2015). These measures were expected to have negative associations with the IFD, given the low correlation between impulsivity and anxiety sensitivity (Kemper et al., 2009). Additionally, impulsivity and the willingness to take risks are associated with the personality trait of sensation seeking, which is characterized by reduced risk perception and a higher tendency to take risks (Roth & Hammelstein, 2003). These habits contradict typical driving fear-related components such as higher risk and danger perception and the overrated chance of being involved in crashes, hence the expectation of low impulsivity in individuals experiencing driving fear. Because all five IFD items measured driving fear, unidimensionality was expected and was examined using confirmatory factor analysis.

Method

Participants and Procedure

A sample of 810 people (602 women, 204 men, 4 gender identities not listed) participated in the online study in Germany between January and May 2019. This convenience sample was recruited through social media, medical facilities, email lists of the university, and self-help platforms on the Internet. Written consent was obtained before the commencement of the study. The questionnaire was completed anonymously online via "Limesurvey" (version 2.67.3). A positive ethic vote was received from the local ethics commission of the University (registration number 175_2019). Participants were between the age of 16 and 79 years, with a mean age of 27.91 years ($SD = 11.69$). 49.5% of the participants ($n = 401$) held a high school diploma, while 36.2% ($n = 293$) held a university degree.

To thoroughly investigate the characteristics of the sample, further driving-related items were included in the survey. With regard to the possession of a driver's license, 797 individuals (98.4%) affirmed that, while the

13 participants (1.6%) not holding one was either still in training or never attempted to receive a license due to driving fear. More than 50% of the participants had held their licenses for more than 7 years. Considering driving practice, 310 individuals (38.3%) drove daily, 270 individuals (33.3%) drove multiple times a week, and only 57 (7.0%) drove less than once a month. Participants were asked to rate their level of driving fear on a 3-point rating scale: 571 participants (70.5%) stated not to be afraid of driving, while 176 individuals (21.7%) were partly afraid, and 63 participants (7.8%) were afraid of driving according to their self-report. More than 50% of those stating to be afraid of driving experienced their driving fears for at least 36 months. A complete driving avoidance due to driving fear was indicated by 24 participants (3.0%). A partial driving avoidance was indicated by 188 individuals (23.2%), driving only on familiar roads or taking short trips close to home. With regard to feared driving situations, 160 participants (19.8%) feared driving during bad weather conditions (e.g., rain, fog, or icy roads), while 135 participants (16.7%) were afraid of driving unknown routes. Using highways and freeways was chosen as a fear-evoking driving situation by 117 participants (14.4%) and driving during high traffic density and waiting in traffic jams by 115 people (14.2%).

Of the 810 participants in the sample, 652 participants (80.5%) had witnessed car crashes, 581 individuals (71.7%) were involved in car crashes while being in the passenger seat, 505 of the participants (62.3%) had experienced a car crash as the driver, and around 80% of the sample experienced one to three car crashes while being the driver, in the passenger seat or as a witness. During the worst experienced car crash, 414 individuals (51.1%) were physically injured, 403 participants (49.8%) thought their life was threatened, and in 359 cases (44.3%), others were physically injured. Three hundred forty-one participants (42.1%) experienced great fear during the car crash, and 306 (37.8%) experienced (increased) driving fear since then.

Measures

Instrument for Fear of Driving

We developed the 5-item Instrument for Fear of Driving (IFD; see Table 1) to provide a brief screening instrument

for driving fear, enabling a dimensional approach (e.g., assessing the intensity) besides the categorical diagnosis. The IFD measures the core characteristics of specific phobia according to DSM-5. Participants were instructed to rate the applicability of the driving-related statements during the last month on a 4-point Likert scale from 0 (= *not at all applicable*) to 3 (= *fully applicable*). In the current study, scores are summed, with higher scores indicating greater driving fear (scores ranging from 0 to 15).

Driving Fear-Related Cognitions

The German version of the Driving Cognitions Questionnaire (DCQ) was used to measure driving-related fear cognitions and test the convergent validity of the IFD (Heider et al., 2018). Due to feedback received during the publication process of the German DCQ and due to a few items loading on more than one factor, the wording of six items was revised, leading to the German Driving Cognitions Questionnaire – Revised (DCQ-R). Yet, only minor changes were made. The German DCQ-R is a 20-item measure assessing panic-related (e.g., “I will tremble and not be able to steer”), accident-related (e.g., “I will cause an accident”), and social-related concerns or cognitions while driving (e.g., “People will criticize me”). Responses are recorded on a 5-point Likert scale from 0 (= *I never have this thought*) to 4 (= *this thought always occurs*). The mean of each subscale (6 and 7 items, respectively per scale) is calculated, with higher means indicating more driving-related fear cognitions. The DCQ-R has demonstrated good psychometric properties, sufficient reliability, factorial validity, and construct validity (Fischer et al., 2020; Heider et al., 2018). Large associations between the three subscales and the IFD are expected.

Anxiety Sensitivity

The Anxiety Sensitivity Index-3 (ASI-3) was included in the current study to test the convergent validity of the IFD (Kemper et al., 2009). The ASI-3 is an 18-item measure assessing anxiety sensitivity on the three scales of physical concerns (e.g., “It scares me, when my heart beats rapidly”), cognitive concerns (e.g., “When I cannot keep my mind on a task I worry that I might be going crazy”), and social concerns (e.g., “It’s important for me not to seem nervous”). Responses are recorded on a 5-point Likert scale from 0 (= *not at all*) to 4 (= *very much*). The measure is scored by summing responses across the six items per scale, with higher scores indicating greater anxiety sensitivity on the particular concern-subscale. The German ASI-3 has demonstrated good psychometric properties, sufficient reliability, factorial validity as well as construct validity, and measurement invariance with the English version (Kemper et al., 2009). A moderate association between anxiety sensitivity and IFD is expected.

Anxiety Symptoms

The ICD-10 Symptom Rating (ISR) was included assessing the extent of psychological distress in line with the syndrome structure of the ICD-10 (Tritt et al., 2008). The ISR consists of 29 items on 6 syndrome scales: depression, anxiety, obsessive/compulsive, somatoform, eating disorders, and a supplementary scale covering a variety of symptoms. Responses are recorded on a 5-point Likert scale from 0 (= *not applicable*) to 4 (= *fully applicable*). A mean of each subscale is calculated, with higher means indicating greater symptom manifestation on the particular syndrome-subscale. The ISR showed a high degree of internal consistency and good psychometric properties (Tritt et al., 2008). In order to keep the survey as short as possible, only the 4-item anxiety subscale was included as a convergent validity measure (e.g., “I try to avoid situations, that make me anxious”). The association between the anxiety subscale and the IFD is expected to be moderately high.

Well-Being

The 5-item self-report well-being index (WHO-5) of the World Health Organization (WHO) was used to test the construct validity of the IFD (Topp et al., 2015). Participants are asked to rate statements on their subjective positive well-being in the last 2 weeks on a 6-point Likert scale from 0 (= *at no time*) to 5 (= *all of the time*) (e.g., “I feel calm and relaxed”). The measure is scored by summing responses across the five items, with higher scores indicating better well-being. It has shown good internal consistency and to be a valid measure of subjective well-being and depression in various samples (Newnham et al., 2010). A moderate negative association is expected between the well-being index and the IFD.

Impulsivity

The 8-item scale Impulsivity-8 (I-8) measuring the psychological construct of impulsivity was included to test the construct validity of the IFD (Kovaleva et al., 2014). It is a highly economic self-report scale that measures four facets of impulsive behavior with two items each, for urgency, intention, perseverance, and risk appetite. Responses are recorded on a 5-point Likert scale from 1 (= *doesn’t apply at all*) to 5 (= *applies completely*). The measure is scored by summing the two responses per scale, with higher scores on urgency and risk appetite and lower scores on intention, and perseverance indicating higher impulsivity (e.g., “I am happy to take chances”). It shows good psychometric properties and reliability, and findings indicate good construct and criterion validity (Kovaleva et al., 2014). A moderate negative association is expected between impulsivity and IFD.

Risk Appetite

The 1-item scale Risk Appetite-1 (R-1) measuring risk appetite was also included to test the construct validity of the

Table 2. Item characteristics

Item	<i>M</i>	<i>Mdn</i>	Mode	Kurtosis	Skewness	<i>SD</i>	Difficulty (Dahl)	r_{it}
1	0.46	0.00	0	3.11	1.82	0.75	15.35	.81
2	0.67	1.00	0	1.08	1.19	0.80	22.39	.61
3	0.40	0.00	0	3.70	1.95	0.70	13.33	.77
4	0.39	0.00	0	3.58	2.09	0.79	13.13	.69
5	0.37	0.00	0	4.00	2.23	0.80	12.39	.74

Note. *N* = 810.

Table 3. Confirmatory factor analysis results: Factor loadings, robust standard errors (SE), *z*- and *p*-values for each of the IFD Items

Item	Factor loading	Factor loading standardized	SE	<i>z</i> -value	<i>p</i>
Item 1	1.00	.92			< .001
Item 2	0.74	.68	.02	31.67	< .001
Item 3	0.99	.91	.02	41.84	< .001
Item 4	0.90	.82	.03	34.83	< .001
Item 5	1.01	.93	.03	39.95	< .001

IFD. The response is recorded on a 7-point Likert scale from 1 (= *not at all willing to take risks*) to 7 (= *very willing to take risks*) and since the scale consists of only one item (“How do you see yourself – how willing are you in general to take risk?”), the item score is equivalent to the total score, a higher score indicating a higher risk appetite. The R-1 shows good reliability and findings indicate good construct, and criterion validity (Beierlein et al., 2014). A moderate negative association is expected between risk appetite and the IFD.

Data Analysis

Psychometric properties, item characteristics, and reliability scores were calculated using SPSS 25. To test construct validity, correlations between the IFD and the selected measures were calculated (see Construct validity: Convergent Validity Section). Distribution was tested using histograms for the assessment of kurtosis and skewness. Due to not normally distributed data, Spearman rho (ρ) was examined as a non-parametric measure of correlation. The confirmatory factor analysis (CFA) was done using the software R (version 4.0.3) using the lavaan package (version 0.6-8) (R Core Team, 2020; Rosseel, 2012). For the CFA, the estimator DWLS (diagonally weighted least squares) was chosen due to not normally distributed data and ordinally scaled items with less than five categories (Beauducel & Herzberg, 2006; Eid et al., 2011; Hox et al., 2010).

Results

Item Characteristics

The data were not normally distributed and was positively skewed since the online survey was open to anyone, regardless of the presence or intensity of driving fear (see Table 2).

As shown in Table 2, all inter-item total correlations fell within the acceptable range of $> .30$ (Moosbrugger & Kelava, 2012). These item total statistics suggested that the deletion of any of the items would not improve the reliability of the scale.

Factorial Validity

The data was expected to describe best a one-factor (“driving fear”) model. CFA was performed to test the fit of a unidimensional model and evaluate whether the items of the IFD were adequately represented by a single factor. Scale refinement was an iterative process, examining the model fit, standardized parameter estimates (loadings), and modification indices. Fit indices were assessed by employing Schermelleh-Engel et al.’s (2003) recommendations. The Comparative Fit Index (CFI) and the Tucker-Lewis Index (TLI) of equal or greater than .97 are considered as demonstrating good incremental model fit (i.e., compared with a null model). The Root Mean Square Error of Approximation (RMSEA) and Standardized Root Mean Square Residual (SRMR) are considered as demonstrating a good fit when being smaller .05. The chi-square test (χ^2 -test) should not be significant to indicate a good model fit, and χ^2/df should be less or equal to 2 (Schermelleh-Engel et al., 2003). The model subjected to CFA was the one-factor model as described above. The model provided a good fit to the data when examining the robust fit indices: $\chi^2(5) = 7.68$, RMSEA = .03. Additionally, CFI = 1.00, TLI = 1.00 and SRMR = .02 further indicate a good fit of the model. As shown in Table 3, all standardized factor loadings were significant ($p < .001$) and ranged from .68 to .93. Removing any one of the five items led to less convincing fit indices. At the end of the process, the one-factor model was maintained.

Table 4. Characteristics of the IFD

	<i>M</i>	Kurtosis	Skewness	<i>SD</i>	ω	Split-half-reliability (odd-even)		Split-half-reliability (pairs of items according to item total correlation)	
						Spearman-Brown- correction		Spearman-Brown- correction	
IFD	0.46	3.98	2.07	0.63	.92	.74	.86	.80	.89

Note. *N* = 810.

Table 5. Correlations, means (*M*), and standard deviations (*SD*) for the IFD and its correlates

	1	2	3	4	5	6	7	8	9	10	11	12	13
1. IFD	–												
2. DCQ-R: Panic-related concerns	.71**	–											
3. DCQ-R: Accident-related concerns	.67**	.69**	–										
4. DCQ-R: Social concerns	.67**	.64**	.58**	–									
5. DCQ-R: Overall	.78**	.87**	.88**	.85**	–								
6. ASI: Physical concerns	.21**	.34**	.27**	.15**	.29**	–							
7. ASI: Social concerns	.22**	.27**	.24**	.38**	.34**	.44**	–						
8. ASI: Cognitive concerns	.30**	.40**	.37*	.38**	.44**	.59**	.56**	–					
9. ASI Overall	.29**	.40**	.35**	.37**	.43**	.82**	.82**	.85**	–				
10. ISR: Anxiety	.47**	.48**	.41**	.38**	.48**	.47**	.40**	.51**	.55**	–			
11. WHO-5	–.23**	–.25**	–.19**	–.27**	–.27**	–.19**	–.28**	–.36**	–.33**	–.39**	–		
12. I-8: Risk appetite	–.24**	–.14**	–.20**	–.22**	–.22**	–.15**	–.19**	–.16**	–.20**	–.20**	.21**	–	
13. R-1: Risk appetite	–.23**	–.15**	–.19**	–.20**	–.21**	–.14**	–.17**	–.12**	–.18**	–.18**	.20**	.75**	–
<i>M</i>	0.46	0.27	0.65	0.57	0.50	5.15	8.22	4.44	17.81	0.85	14.73	2.93	3.63
<i>SD</i>	0.63	0.49	0.67	0.72	0.54	4.79	5.18	4.34	11.85	0.90	4.96	0.93	1.35

Note. *N* = 810. IFD = Instrument for Fear of Driving; DCQ-R = Driving Cognitions Questionnaire – Revised; ASI = Anxiety Sensitivity Index; ISR = ICD-10 Symptom Rating; WHO-5 = Well-Being Index of the World Health Organization; I-8 = Impulsivity-8; R-1 = Risk Appetite-1. ***p* < .01.

Reliability/Internal Consistency

The 5-item IFD demonstrated good internal consistency, with McDonald's omega of $\omega = .92$ (see Table 4). The split-half reliability was examined and led to correlations between .74 and .89, depending on the chosen calculation method. To obtain measures of internal consistency, we computed the composite reliability and average variance extracted (Netemeyer et al., 2003). The composite reliability is .93 and the average variance extracted is .73, thus indicating good internal consistency. The examination of the non-parametric inter-item correlation Spearman's rho (ρ) showed that the items were fairly well correlated ($r_s = .38-.65$).

Construct Validity: Convergent Validity

The convergent validity of the IFD was assessed by examining its associations with the DCQ-R, ASI-3, and the anxiety subscale of the ISR. The magnitude of the correlations was assessed by employing Cohen's (1988) recommendations of correlations of 0.1 being small, of 0.3 being medium, and of 0.5 being high. As shown in Table 5, there were large positive associations with negative driving fear-related cognitions on the DCQ-R ($r = .78$) as well as with its subscales, such as panic-related concerns ($r = .71$), accident-related concerns ($r = .67$), and social-related concerns

($r = .67$). There was a small to moderate positive correlation with overall anxiety sensitivity (ASI-3) ($r = .29$), as well as the subscales of cognitive concerns ($r = .30$), social concerns ($r = .22$), and physical concerns ($r = .21$). Furthermore, a moderate positive association was found between the anxiety subscale of the ISR and driving fear ($r = .47$). Associations with the WHO-5, measuring well-being, the risk-appetite subscale of the I-8 and R-1, both measuring risk appetite and the participants' willingness to take risks, were examined. There were small to moderate negative associations with the WHO-5 ($r = -.23$), I-8 ($r = -.24$), and R-1 ($r = -.23$). Thus, all associations demonstrated good convergent validity.

Summary of the Findings of Study 1

The findings suggest that the IFD is a useful brief and unidimensional tool for assessing the syndrome of driving fear. Internal consistency reliability of $\omega = .92$ and composite reliability of .93 indicates that the IFD is a reliable instrument for driving fear. Content validity is reflected by the items being in accordance with DSM-5 criteria. The high correlations ($r = .78$) with, for example, the DCQ-R as an indication of content validity. As expected, the IFD was significantly and sufficiently associated with measures of

driving-related fear cognitions, anxiety sensitivity, and anxiety symptoms according to ICD-10 and showed negative correlations with risk appetite and well-being, indicating adequate convergent construct validity.

Study 2: Sensitivity, Specificity, and Criterion Validity

Aim

In Study 2, the IFD was assessed for its purpose as a brief screening instrument. Criterion validity was evaluated by examining cut-off scores for clinically significant driving fear. Sensitivity and specificity were examined by assessing differences in IFD scores between participants with and without clinically relevant driving fear and/or anxiety disorders. For screening instruments, high sensitivity and acceptable specificity are relevant since false positives can be identified in the subsequent detailed assessment, while false negatives would remain undetected and untreated.

Method

Participants and Procedure

The sample consisted of 54 people recruited in the outpatient clinic for psychotherapy at the University between July 2019 and December 2019. They were recruited among all patients who recently had begun psychotherapy at the outpatient clinic. Two trained and supervised interviewers informed participants about the nature of the study and its procedure. The participants provided written informed consent before a clinical interview. They filled out two questionnaires regarding fear of driving, the Driving Cognitions Questionnaire-Revised (DCQ-R) and the IFD. Subsequently, the interview was administered, consisting of the specific phobia items of the Structured Clinical Interview for DSM-4 (SCID-I), adjusted to assess the fear of driving. Additionally, SCID-I sections for panic disorder, agoraphobia, social phobia, and generalized anxiety disorder additional anxiety disorders were administered to diagnose anxiety disorders. Furthermore, there was a diagnostic classification of the participants in accordance with the DSM-4 International Diagnostic Checklists (IDCL). The interviewer asked further self-report questions with regard to driving history, such as year of obtaining their driver's license, driving frequency (daily, 2-3 times a week, once a week, once a month, less frequently), the onset of driving fear (no idea about reasons for onset, accident as reason for onset, other) and self-evaluation of their driving skill (very good, fairly good, average, rather poor, poor). The obtained information was used to further describe the participants. The procedure took 45 min on average.

Of the 54 participants, 40 were female (74.1%), while 14 were male (25.9%). Participants were between 20 and 69, with a mean age of 44 years ($SD = 14.66$). All participants possessed a driver's license, which was the inclusion criterion for participation in the study. With regard to their level of education, 26 (48.1%) indicated a completed vocational training as their highest degree, while 17 (31.5%) held a secondary school diploma, and the remainder possessed a university degree. The majority ($n = 34$, 63%) said they drove daily. Concerning the subjectively perceived driving skill, 22 individuals (40.7%) rated their driving skill as very good. Forty-four participants (81.5 %) did not know the reasons for the onset of their driving fear, while 4 individuals (7.5 %) had experienced an accident before the onset of their driving fear and the remaining 6 participants (11.1 %) stated other reasons for the onset.

As shown in Table 6, 20 participants were diagnosed with a clinically relevant driving fear in the context of either specific phobia or agoraphobia. Sixteen participants met the criteria for the diagnosis of any anxiety disorder without meeting the criteria for driving fear, and 18 participants belonged to the control group of individuals without any anxiety disorder and driving fear. Due to an ongoing treatment program for driving fear at the outpatient clinic at the time of recruitment, a substantial amount of people with the diagnosis of a specific phobia of driving could be included in the study. A positive ethic vote was received from the local ethics commission of the University (registration number 2019_193).

Measures

Instrument for Fear of Driving

The 5-item Instrument for Fear of Driving (IFD; see Table 1) was administered.

Driving-Related Fear Cognitions

The 20-item Driving Cognitions Questionnaire-Revised (DCQ-R), as described above, was used to measure driving-related fear cognitions with the foci on panic-related, accident-related, and social concerns (Ehlers et al., 2007; Heider et al., 2018).

DSM-4 International Diagnostic Checklists (IDCL)

The IDCL is a set of semi structured instruments for the clinician assessment of mental and behavioral disorders according to DSM-4 criteria. Psychiatric symptoms and syndromes of the following categories are examined: affective, somatoform, and psychotic disorders, as well as substance abuse disorders, eating disorders, and organically caused disorders (Hiller et al., 2008).

Structured Clinical Interview for DSM-4 (SCID-I)

The section for a specific phobia of the Structured Clinical Interview for DSM-4 was used to examine fear of driving

Table 6. Description of sample

Clinically relevant driving fear (<i>N</i> = 20)		No clinically relevant driving fear but any other kind of anxiety disorder (<i>N</i> = 16)		Control group: no anxiety disorder, no clinically relevant driving fear (<i>N</i> = 18)	
... as part of a specific driving phobia (F40.2)	18	any other kind of anxiety disorder and comorbid affective disorder	12	any kind of affective disorder	11
additional affective and/or other anxiety disorder	6	any other kind of anxiety disorder and comorbid personality disorder (F60.30, F60.6)	2	any kind of somatoform disorder (F45) and comorbid affective disorder	4
additional psychological and behavioral factors associated with disorders or diseases classified elsewhere (F54)	1	any other kind of anxiety disorder and comorbid substance abuse (F10.1)	1	sleeping disorder (F51)	1
additional personality disorder (F60.6)	1	any other kind of anxiety disorder and comorbid eating disorder (F50.01)	1	eating disorder (F50.1)	1
... as part of an agoraphobia with/without panic disorder (F40.00/F40.01)	2			other neurotic disorders (F48.0)	1

Note. *N* = 54.

and other specific phobias in a clinical interview (Kübler, 2013). The sections assessing panic disorder, agoraphobia, social phobia, and generalized anxiety disorder were also administered to screen for other anxiety disorders. With regard to keeping participants' time required for the examination low, only the F4-section of the SCID-I was administered.

Data Analysis

Analyses were conducted using SPSS version 25. Due to non-normally distributed data, a Kruskal-Wallis-Test was used to examine the differences in IFD scores between different subgroups of the data set. A receiver operation characteristics (ROC) analysis was used to examine sensitivity and specificity as well as to determine a cut-off score for the diagnosis of a clinically relevant driving fear.

Results

Differences Among Subgroups

Due to non-normally distributed data, differences in the mean values on the IFD were examined using a Kruskal-Wallis-Test, and there were significant differences between participants with a clinically relevant driving fear ($M = 8.85$, $SD = 3.41$, $N = 20$), those with an anxiety disorder but no driving fear ($M = 1.15$, $SD = 1.15$, $N = 16$) and those with neither driving fear nor any other kind of anxiety disorder ($M = 1.06$, $SD = 1.06$, $N = 18$): $\chi^2(2, N = 54) = 36.38$, $p < .01$. The Dunn-Bonferroni post hoc test, adjusted for multiple tests, was used. Participants with clinically relevant driving fear had a larger mean IFD score than the control group ($z = 5.26$, $p < .05$, $r = .85$) and the other anxiety disorder group ($z = 5.03$, $p < .05$, $r = .84$). There was no difference in IFD scores between the group with other anxiety disorders and the control group.

Cut-Off, Sensitivity, and Specificity

A ROC curve of individuals with and without driving fear based on the IFD score was examined. The area under the curve (AUC) is 0.99. High sensitivity and acceptable specificity are desirable when determining the cut-off-score for the IFD to serve as a good screening instrument for diagnosing driving fear. A cut-off-score of 3.5 shows both good sensitivity of 95% and good specificity of 97%. With this cut-off-score, the highest Youden Index of 0.92 indicates the excellent ability of the IFD to discriminate between individuals with and without driving fear. The positive predictive value of 95% shows the probability of 95% that a person with a positive screening result ($IFD \geq 4$) does have a clinically relevant fear of driving. The negative predictive value of 97% demonstrates the high probability of a person with a negative screening result ($IFD \leq 3$) not meeting the criteria for driving fear, hence the probability of then meeting the criteria is only 3%.

Choosing a different cut-off score rather than 3.5 involves mutual concessions for sensitivity and specificity. The cut-off was chosen at 3.5 since a screening instrument should be sensitive in order to examine the true positives, and false positives could still be assessed in subsequent more elaborate diagnostics, while false negatives would remain misdiagnosed and untreated. At 3.5, sensitivity and specificity are balanced out, and reach their highest possible score (see Table 7). In order to maximize the sensitivity score, even more, the cut-off score of 1.5 could have been chosen, with the cost of a much lower specificity of 71%, meaning a lower rate of true negatives and, in consequence, a much higher probability of 29% for false alarms (false positives). Hence, a cut-off at 3.5 seemed more reasonable.

Table 7 presents the cut-off scores, values of sensitivity and specificity, the positive and negative predictive values, and the Youden Indices.

Table 7. Cut-Off-Scores and values of sensitivity, specificity, positive and negative predictive values, and Youden Indices

Cut-off-score	Sensitivity	1-Specificity	Specificity	Positive predictive value	Negative predictive value	Youden Index
0.5	1.00	0.65	0.35	0.48	1.00	0.35
1.5	1.00	0.29	0.71	0.67	1.00	0.71
2.5	0.95	0.12	0.88	0.82	0.97	0.83
3.5	0.95	0.03	0.97	0.95	0.97	0.92
4.5	0.90	0.00	1.00	1.00	0.94	0.90
5.5	0.80	0.00	1.00	1.00	0.89	0.80
7.0	0.70	0.00	1.00	1.00	0.85	0.70
8.5	0.60	0.00	1.00	1.00	0.81	0.60

Note. $N = 54$.

Summary of the Findings of Study 2

Given these findings, the German-language IFD can be used as a good, sensitive, and specific screening instrument for driving fear and assessing individual symptom severity. With a cut-off score of 3.5, the instrument showed 95% sensitivity and 97% specificity, so the probabilities of detecting true positives and true negatives are extremely high. There is only a 3% chance of diagnosing driving fear when there is none (false alarm). The area under the curve, as well as the Youden Index, indicates the IFD's ability to discriminate between individuals with and without fear of driving. The positive and negative predictive values of 95% and 97%, respectively are satisfying since there are very high chances of diagnosing driving fear due to the IFD-score correctly.

Discussion

Prior research has shown that driving fear can be part of many different psychological disorders and that a diagnostic instrument with a clear theoretical framework and the ability to assess symptom severity is timely (Fischer et al., 2020). The German-language IFD is a brief, reliable, and valid instrument for assessing driving fear and its symptom severity. The findings suggest the IFD can be used in research and clinical practice to gain information on the prevalence and extent of driving-related fear. Findings should be considered preliminary due to the unrepresentative sample. Future studies with large sample sizes should further assess the IFD's ability to dimensionally assess driving fear, guide treatment options, and monitor symptoms over time.

The present study has several limitations. One such limitation is that the IFD items were not tested in a pilot study. However, the items were developed to be consistent with the DSM-5 criteria and according to the DSM-5 self-rating scales by Lebeau et al. (2012), so content validity was a consideration at the outset. Since the items were used in other studies of the ongoing treatment program for

driving fear, item vetting consisted of testing the appropriate wording for the population and the questionnaire's ability to capture the typical symptoms from the standpoint of individuals experiencing driving fear. However, it can be argued that building a broader measure with more than one item per DSM-criterion first would have been ideal to obtain an even more reliable measure of driving fear. An increased breadth in symptom severity and presentation of facets could have led to forming more than one meaningful factor with multiple items per DSM-criterion prior to reducing the scale to create a brief alternate version. Moreover, it can be argued whether the decision for a scale with only four categories restricted variation in the data. However, a benefit of the chosen 4-point rating scale can be seen in avoiding the tendency toward the center.

The data in Study 1 was not normally distributed due to many non-clinical participants without driving fear. The prompt for participation in the online survey explicitly invited anyone to take part maximize the sample size and, more importantly, to receive data with a wide range of symptom severity, from no driving fear and mild symptoms to severe driving fear. Consequently, the convenience sample was not representative of the German population, which should be considered when interpreting the results. The constitution of the data required the estimator DWLS in confirmatory factor analysis. Simulation studies have shown that DWLS are a superior estimation method compared to ML or robust ML estimation when dealing with ordinal data (with less than five categories) and especially when the distributions are highly skewed like in our dataset (Li, 2016). Given the non-normality of the item scores, it can be argued that in future studies, the mean and variance-adjusted standard errors and fit measures are to be computed using the estimator "weighted least square mean and variance adjusted" (WLSMV). The findings regarding reliability, factor structure, and validity need to be replicated in a more homogenous and representative sample.

Moreover, applying only the SCID-I-section for anxiety disorders in the clinical interviews in Study 2 is a limitation. The administration of the complete SCID-I would have led

to a more sophisticated overview of the diagnoses in the sample. However, due to keeping the interviews short, the given diagnoses from their therapists were included with the consent of the participants. The focus was on anxiety disorders since individuals experiencing driving fear tend to show comorbid anxiety disorders, a factor impeding the interpretation of empirical data. In addition, the sample size was small ($N = 54$), and a representative sample of a clinical anxiety population would be ideal for determining cut-offs. Hence, the results should be interpreted with caution, bearing in mind the small sample size and the small numbers in each group. However, the higher proportion of females (74.1%) in the study seems to represent the typical gender distribution in anxiety populations (Currow et al., 2020).

Further studies should be conducted to verify these preliminary findings in larger and representative samples. Additionally, research should be done on the English language version of the IFD to validate the English items. Moreover, divergent validity should be tested, for example, using an instrument measuring intelligence as a divergent construct that seems unrelated to driving fear.

The wording of items 2 and 4 may require revision because of imprecision concerning the fear content. Specifically, item 2 could be changed to “When I think of driving, I think of possible danger to myself and others”, referring to the anticipated danger or panic attack. This would define more precisely that non-fear-content, such as the anticipated next steps like getting petrol, is not the focus of the item. Similarly, item 4 could be revised to “I avoid driving due to my driving fear” to highlight the fear-content of the item.

Also, more concise instruction for the IFD could be considered to avoid distorted findings, since many people only tend to fear specific driving scenarios (e.g., highway, tunnel) and seem to answer the items either according to the specific situation they fear or average their chosen answers, with as well the feared scenarios as the not-feared scenarios in mind. An alternative instruction to ask participants to answer in accordance with their individual feared situation could be,

“For the following five items, we are interested in your own experience during the past month. Please choose the answer that best fits your experience when driving or when thinking about driving. Make sure to choose your answer with regard to the driving scenario/s that you fear. Please specify:

I am generally afraid of driving:

I am afraid of the following driving situation(s):
_____.”

Results concerning the factorial validity of the IFD are in line with empirical findings of other anxiety research. There was no theoretical reason to believe any kind of fear and specifically driving fear should be positively correlated to impulsivity and willingness to take risks. On the contrary, research on anxiety disorders showed a relationship between behavioral inhibition and anxiety sensitivity as risk factors for developing an anxiety disorder later on in life (Barlow, 2000). This is reflected in the present results of highly significant correlations between anxiety sensitivity, symptoms of anxiety, and driving fear.

With regard to clinical implications, the IFD can be proposed as a screening instrument for clinicians and can be used in populations where a higher risk for driving fear is assumed (e.g., individuals with anxiety disorders). The total score and the cut-off can be taken into consideration for interpreting individual data. The generalizability of the findings is yet to be examined due to the small sample used in the present study. In future studies, the IFD’s sensitivity to change needs to be examined to use the instrument for repeated measurements (e.g., at the beginning and end of therapy, after certain interventions, such as in vivo exposure).

Conclusion

The German-language IFD is an efficient and economical instrument for the assessment of driving fear and fills a research gap. Based on the current findings, its good psychometric properties, sensitivity, and specificity, it can be used as a screening instrument for driving fear and symptom severity. The IFD can be recommended for further scientific research on the epidemiology of driving fear and can be used for clinical purposes.

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History

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Conflict of Interest

All authors declare that they have no conflict of interest. The presented data was not disseminated before this article, and there was no narrative interpretation of the research appearing in the manuscript.

Publication Ethics

A positive ethic vote was received from the local ethics commission of the University for both studies (Study 1: registration number 175_2019; Study 2: registration number 193_2019).

Authorship

This research article was written in the context of the first author's dissertation process. All authors contributed to the writing process, drafted and critically revised the work. All authors contributed to and have approved the final manuscript.

Open Science

Design and Analysis Transparency: We report how we determined our sample size, all data exclusions (if any), all data inclusion/exclusion criteria, whether inclusion/exclusion criteria were established before data analysis, all measures in the study and all analyses including all tested models. Using inferential tests, we report exact *p* values, effect sizes, and 95% confidence or credible intervals.

Open Data: I confirm that there is sufficient information for an independent researcher to reproduce all of the reported results, including codebook if relevant, available at the online repository “PsychArchives”, <http://dx.doi.org/10.23668/psycharchives.4754> (Fischer et al., 2021a)

Open Materials: I confirm that there is sufficient information for an independent researcher to reproduce all of the reported methodology, available at the online repository “PsychArchives”, <http://dx.doi.org/10.23668/psycharchives.4754> (Fischer et al., 2021a). The research material used consists mainly of the newly developed Instrument for Fear of Driving (IFD) which is made public in this manuscript.

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