

## Blood-injection Phobia Inventory (BIPI): Development, reliability and validity

Mercedes Borda Mas<sup>1\*</sup>, Ana M<sup>a</sup> López Jiménez<sup>2</sup> y M<sup>a</sup> Ángeles Pérez San Gregorio<sup>1</sup>

<sup>1</sup> *Departamento de Personalidad, Evaluación y Tratamiento Psicológicos. Universidad de Sevilla*

<sup>2</sup> *Departamento de Psicología Experimental. Universidad de Sevilla*

**Título:** Inventario de fobia a la sangre (BIPI): Desarrollo, fiabilidad y validez.

**Resumen:** El objetivo de este trabajo es construir el Inventario de Fobia a la Sangre-Inyecciones (BIPI) y determinar la fiabilidad y validez de un instrumento para medir la ansiedad y fobia a la sangre, adaptado a la población española. El BIPI recoge las propiedades psicométricas en 174 participantes. Es un inventario compuesto de 18 situaciones o estímulos relacionados con la sangre y 27 síntomas fóbicos, valorados en una escala de Likert con cuatro opciones de respuesta. El coeficiente alfa de Cronbach es .98 y posee una buena validez concurrente, convergente y discriminante. El análisis factorial identifica un factor significativo, lo que sugiere que la fobia a la sangre es un constructo unitario. Los resultados revelan que el BIPI posee unas medidas psicométricas adecuadas y es un instrumento válido y fiable para evaluar la fobia a la sangre en población española.

**Palabras clave:** Ansiedad a la sangre; construcción, validación; Inventario de Fobia a la Sangre; población española; estudio instrumental.

**Abstract:** The aim of this study was to develop the Blood-Injection Phobia Inventory (BIPI) and thus provide a valid and reliable assessment instrument for measuring blood anxiety and blood phobia in Spanish population. This study examined the psychometric properties of the BIPI in 174 Spanish-speaking subjects. The BIPI is a self-administered questionnaire of 18 items or stimulus content and 27 phobic responses that can be used on a 4-point Likert-type format. The scale had a Cronbach's alpha of .98 and showed good concurrent, convergent, and discriminant validity. Factor analysis of the BIPI identified one significant factor, suggesting that blood phobia is a unitary psychometric construct. This factor explained 76% of stimulus content and 74% of phobic responses of the total variance. Results of this study suggest that the BIPI has adequate psychometric properties that make it a valid and reliable instrument to assess blood phobia in Spanish-speaking individuals.

**Key words:** Blood anxiety; construction, validation; Blood-Injection Phobia Inventory; Spanish-speaking subjects; instrumental study.

### Introduction

Over the last decades, research on treatment efficacy of the approach of specific phobias has undergone an interesting development (Choy, Fyer, & Lipsitz, 2007). All the controlled studies with *in vivo* exposure in the treatment of people with phobias have shown that it is effective to reduce subjective anxiety and avoidance behaviors in phobics (Öst, Alm, Branderg, & Breitholtz, 2001; Walder, McCracken, Herbert, James, & Brewitt, 1987; Williams, Dooseman, & Kleinfield, 1984).

Cognitive factors are considered an important component of anxiety. Phobic beliefs, such as an irrational fear of the possible danger of the stimuli, play an important role in specific phobias (Thorpe & Salkovskis, 1995), but only recently has been acknowledged the cognitive therapy as a treatment modality. There are no follow-up studies of cognitive therapy in blood phobia.

In parallel to the study of the different treatment modalities of blood phobia, diverse assessment measurements have been designed. A review of the literature shows that there are various types, depending on the characteristics of the instruments. The first questionnaires elaborated in the 1960-70s are general and measure a limited number of contexts associated with fears and phobias. For example, the Fear Survey Schedule FSS-III (Wolpe & Lang, 1964, 1977) assesses distress in 72 different phobic situations (being alone, automobiles, injuries, diseases, birds, etc.). The Fear Ques-

tionnaire (FQ; Marks & Mathews, 1979) assesses avoidance in 15 situations (agoraphobia, social anxiety, and blood phobia), the degree of concern and difficulty produced in the person's life.

Since the 1970s, specific instruments were developed to identify situations related to blood phobia, for example, injections, injuries, or medical or dental examinations. The Mutilation Questionnaire (MQ; Klorman, Weerts, Hastings, Melamed, & Lang, 1974) is a 30-item true/false scale that assesses the cognitive component when facing stimuli related to injuries, cuts, deformities, organs, or mutilations. The Medical Fear Survey (MFS; Kleinknecht, 1991), from the decade of the 1990s, has 70 items and measures the degree of fear in situations related to fear of medical aspects, for example, blood, hypodermic needles, or physical symptoms. The Medical Avoidance Survey (MAS; Kleincknecht, Thorndike, & Walls, 1996) is made up of 21 items and evaluates the avoidance of treatments or the anticipation of the consequences. The Blood-Injection Symptom Scale (BISS; Page, Bennet, Carter, Smith, & Woodmore, 1997) has 17 items and measures the presence of physical symptoms when facing situations involving blood or injections. Although the MQ, the MFS, the MAS, and the BISS show more specificity than the FQ and the FSS-III, the main limitation of these instruments is only assess blood phobic's some situations.

Recently, the Multidimensional Blood/Injury Phobia Inventory (MBPI; Wenzel & Holt, 2003) was designed. It comprises 40 items and assesses in four types of stimuli (injections, hospitals, blood, and injuries) the presence/absence of five types of coping responses (fear, avoidance, worry, distress, and fainting), with both a self versus other focus. This instrument has good psychometric properties and characterizes the totally of blood phobia.

\* **Dirección para correspondencia** [Correspondence address]: Mercedes Borda Mas. Departamento de Personalidad, Evaluación y Tratamiento Psicológicos. Facultad de Psicología. Universidad de Sevilla. C./ Camilo José Cela, s/n. 41018 Sevilla (España).  
E-mail: [mborda@us.es](mailto:mborda@us.es)

Although there are several measurements to assess blood/injection phobia, no instrument adapted to the Spanish population with similar characteristics as the MBPI has been designed. The Blood-Injection Phobia Inventory (BIPI) comprises 18 situations involving blood and injections. It assesses in vivo anxiety and anticipatory anxiety in three types of responses (cognitive, physiological, and behavioral), with the phobic stimulus affecting either oneself or other persons.

This instrumental study (Carretero-Dios & Pérez, 2007) has three goals. In the first time, we explored the psychometric characteristics of the BIPI. For reliability we used Cronbach's alpha coefficient and for convergent validity we used Pearson's correlation coefficient, both from BIPI. The discriminant validity was obtained from the same correlation coefficient, using the FQ and the BIPI.

We used a sample from the general population to examine whether this instrument discriminates between people diagnosed with blood-injection-injury phobia (according to the *Diagnostic and Statistical Manual of Mental Disorders, 4<sup>th</sup> edition* (American Psychiatric Association, 1994) from people without this phobia. In the second time, we determined whether blood phobia is a one-dimensional construct. We included stimuli related to different specific phobias (injuries, injections, and medical interventions) and different types of responses (cognitive, physiological, and behavioral). In the third time, we examined whether the BIPI is a sensitive instrument to evaluate the therapeutic change in people diagnosed with blood-injection-injury phobia according to the DSM-IV (APA, 1994). For all participants, treatment consisted of six group sessions of exposure in vivo. One of the two groups was treated with applied tension (exposure in vivo + tension technique).

## Method

### Participants

The sample was made up of two groups of participants: (a) a clinical sample comprising 39 patients, 30 female (77.5%), diagnosed with specific phobia, blood-injection-injury type, according to the criteria of the DSM-IV (APA, 1994), by means of the Structured Clinical Interview for DSM-III-R (SCID, Spitzer & Williams, 1987) and not affected by any other kind of phobia or anxiety disorder, aged between 15 and 30 years ( $M = 23.73$ ,  $SD = 3.49$ ). Participants completed the Fear Questionnaire (Marks & Mathews, 1979) ( $M$  FQ-Blood/Injection = 20.26,  $SD = 8.96$ ). Of the sample, 82.5% were married and 64.15% had a degree or higher education; (b) a normal sample of 135 people selected from the population, 67 male (49.6%) and 68 female (50.4%), aged between 15 and 30 years ( $M = 22.87$  years,  $SD = 3.87$ ). Of the sample, 73.6% were married and 94.23% had degree or higher education. This sample was paired with the patients in the variables age and gender. There were no significant differences in age, marital status or education level.

All the participants were from the Region of Andalusia (Spain).

In order to determine the characteristics of blood phobia in the clinical sample, we elaborated an interview with specific information: gender, age, age at onset disorder and presence of family history (yes/no). Furthermore, it was assessed on a scale with five response options the interference of blood phobia at the time of interview: the presence of episodes of fainting (from never to always), the perceived ability/capacity to control the problem (from nothing at all to total). Finally, information was obtained about past and present medical, psychological and psychopharmacological treatments received because of any mental disorder, especially related to blood phobia, or health-related complication.

In 72.1%, the problem had appeared in childhood, and in 46%, there were direct family antecedents with blood-injury phobia. Regarding the degree of impairment or interference in daily life, a notably high percentage (86.1%) reported that the phobia caused them *pretty much/a lot of impairment*. Moreover, 70.8% of the clinical sample reported having low capacity of self-control. And in almost one half of the blood phobics, fainting behavior was present, with a frequency of *sometimes/almost always*.

People who, after medical examination, presented certain medical complications (i.e., coronary problems or neurological injuries) and people who reported having suffered or suffering some psychopathological disorder—except for blood phobia—and/or who were receiving psychopharmacological or psychological treatment were excluded from the study.

### Assessment Instruments

*Fear Questionnaire (FQ)* (Marks & Mathews, 1979).- This is a self-report designed to measure agoraphobic fear, social anxiety, and blood-injection-injury type phobia. The first part has 15 items that measure the degree to which the person avoids each situation on a 9-point Likert scale, ranging from 0 (*I don't avoid it*) to 8 (*I always avoid it*). The subscale of blood/injury phobia is made up of 5 items about blood and/or injuries (range: 0 - 40 points). The second part of the questionnaire allows subjects to appraise the concern caused by certain symptoms or thoughts and the current state of their phobic symptoms, anxiety and depression conjointly as well as the global appraisal of the impairment produced by the phobia.

The first part of the FQ has been shown to have high internal consistency, as well as being a reliable and valid measurement to discriminate agoraphobia from social phobia (Cox, Swinson, & Shaw, 1991). In the Spanish adaptation (Sandín, Valiente, & Chorot, 1999), the internal consistency alpha coefficients of this questionnaire were: .78 (FQ total), .75 (blood-injections-injuries), .64 (social anxiety) and .55 (agoraphobia).

This instrument has good test-retest reliability ( $r = .96$  for blood phobia and physical injuries). The subscale of blood phobia has been used as a measure of convergent validity and the subscales of social anxiety and agoraphobic fear as a measure of discriminant validity.

*Blood-Injection Phobia Inventory (BIPI).*- This was specifically designed to assess fear of blood. In its preliminary version (See Appendix I), it had 50 items about diverse situations preferably related to blood, injections, and the dentist (32 situations) and, to a lesser degree, animal blood (5 situations) and the color red (4 situations) to check whether produce similar phobic symptoms, agoraphobia (5 situations), and social anxiety (4 situations). It measures the frequency of symptoms on a 4-point scale ranging from 0 (*never*) to 3 (*always*), of the patient's different types of responses (cognitive, physiological, and behavioral), and also appraises both "situational anxiety" and "anticipatory anxiety" responses (see Appendix 1). It developed from a review of the literature of the subject and the clinical experience of researchers. The proposed version in this paper is showed in the Appendix 2.

### Procedure

The clinical sample was obtained by means of the mass media (radio and press). In the information provided, we alluded to the research being carried out from the University and the possibility of participating in the study by receiving free psychological treatment. Likewise, we specified the problem, its characteristics, the goals we hoped to achieve, and we included a contact phone number. After the telephone conversation, we scheduled the first appointment for an individual interview. In the interview, we collected the personal data, the person's history, etc. Subsequently, in a second session, we proceeded with the assessment and the diagnosis, according to the criteria of the DSM-IV (APA, 1994) of specific phobia, subtype blood-injections-injuries. Before beginning the assessment of the participants, we provided information about the investigation, we clarified all their doubts, and they provided written informed consent. They were informed that their participation was voluntary and they could leave the study whenever they wanted to without having to offer any explanations.

To obtain the sample population, we requested the collaboration of the associates and colleagues of the research team who had some knowledge of psychology studies (second-cycle students and/or postgraduates). They were responsible for recruiting people between 15 and 30 years. We used the criterion of contact with nine people in the general population of the same age and sex for each participant, so that the composition in terms of these variables were similar for both samples. Recovering rate of self reports was 54%.

They were informed about the goal of the investigation, the aim of the use of the inventory and, particularly, about

the procedure to evaluate the test (response options, situations it comprised, and symptomatology in the triple response system). Along with this information and after signing the Informed Consent, they were given a series of concrete instructions (i.e., self-application) to homogenize the procedure to be followed and to ensure the rigor of the investigation as much as possible.

Each instrument was identified with a code, the age, and gender, as well as other descriptive data (studies/profession, place or residence, etc.), the same characteristics as those to be considered in the clinical sample.

### Construction of the Blood-Injection Phobia Inventory (BIPI)

#### a) Situations

*Descriptive statistic characteristics.*- The first criterion used to select the situations was that they had to discriminate statistically between the normal group and the phobic group. Of the 50 situations included initially, only 40 provided statistically different means ( $p < .05$ ) between the groups. We eliminated the following items: the agoraphobic situations 1, 28, 46, and 50; the situations related to social anxiety 3 and 43; three of the four situations that referred to the color red (situations 10, 16, and 27), and one situation (number 17) of the five that referred to animal blood (see Table 1).

#### b) Symptoms

*Descriptive statistic characteristics.*- To determine the power of discrimination of each of the symptoms of the three types of response, as the first criterion, we proceeded to compare the mean scores of both groups. Out of 32 symptoms, 31 discriminated; in contrast, 1 of the 12 cognitive responses (L symptoms "I think I'm going mad") did not yield any differences between the normal sample and the blood phobics (see Table 2).

## Results

### Exploratory factor analysis of the situations of the BIPI

Exploratory factor analysis with principal components and varimax rotation was applied to the 40 situations resulting from applying the above-mentioned criterion. We used Kaiser's criterion (eigenvalues higher than 1) to retain factors and we selected only the items with loadings over .50 (see Table 3). Using this criterion, we eliminated another four situations: 11, 14, 24, and 44.

**Table 1:** Situations that discriminate between the normal and the blood phobic sample (N = 174).

Situations (rank: 0-96)	Normal (n = 135)		Blood phobics (n = 39)		Value of Contrast Statistic	<i>p</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
	1. When I walk along the beach or in the mountains.	2.98	5.71	1.97		
2. When I see an injured person after an accident, bleeding in the road or on TV.	8.86	8.89	25.46	20.79	-4.755	<.001
3. In a group of friends or coworkers, when they ask my opinion.	3.84	5.99	6.26	8.42	-1.693	.097
4. When going to the dentist for a check-up.	6.02	7.63	22.46	23.83	-4.058	<.001
5. When I see blood on my arm or finger after pricking myself with a needle.	3.64	6.42	29.61	21.66	-6.996	<.001
6. When I feel discomfort in my mouth and think about having to go to the dentist, without considering the possibility of pain.	2.17	4.13	14.51	18.01	-4.100	<.001
7. When I get an intravenous injection.	7.02	8.91	41.64	24.96	-8.055	<.001
8. If I'm in the kitchen and I see a knife with blood on it after cutting meat.	.72	2.08	4.41	8.67	-2.397	.021
9. When having to clean a wound or cut on bloody skin.	2.68	4.65	28.82	24.06	-6.455	<.001
10. When going to buy a present or clothing and they offer me something red.	.17	1.39	.74	3.04	-1.125	.267
11. In a party with acquaintances when I have to join the conversation.	2.89	5.11	7.02	9.91	-2.512	.016
12. When I notice the smell and see the dentist's instruments ready for a dental intervention.	5.65	7.88	25.38	22.05	-5.227	<.001
13. When I feel the needle go into the vein of my arm to extract blood.	8.46	11.37	49.92	23.28	-10.208	<.001
14. When I have to ask for something, make a complaint, or ask a question in public.	8.44	9.48	15.15	16.35	-2.449	.018
15. When I notice an ad about the proper use of hypodermic needles (without considering the possibility of contagion).	1.14	3.52	11.66	15.28	-4.206	<.001
16. When I think of the color red.	.07	.45	.58	2.00	-1.576	.123
17. In a restaurant, when I observe that a piece of meat on the plate is "bloody".	1.78	4.81	3.71	7.75	-1.480	.146
18. When I see a laboratory tube with blood.	1.34	3.96	20.35	26.19	-4.237	<.001
19. When I see the dentist's drill going into my mouth.	8.42	9.97	28.17	24.36	-4.749	<.001
20. When I hear a conversation about blood.	1.93	4.97	24.97	23.99	-5.668	<.001
21. When I think that I have to accompany a relative to have a blood test or to cure an open wound.	2.38	4.67	36.12	24.72	-8.061	<.001
22. While I'm in the dentist's waiting-room.	5.37	8.90	25.17	23.52	-4.990	<.001
23. If I open a meat wrapping and it is smeared with animal blood.	.77	2.23	4.15	8.08	-2.298	.027
24. When I have to talk in front of a group of people.	8.78	11.18	16.35	17.62	-2.544	.014
25. When I see another person getting an intramuscular injection.	3.08	5.53	30.02	23.55	-6.933	<.001
26. When I get local anesthesia.	4.97	8.68	33.61	29.04	-5.772	<.001
27. When I see the color red in a picture or poster.	.38	2.34	.92	5.76	-0.574	.569
28. When I am in an elevator.	2.54	8.15	4.30	10.24	-0.989	.327
29. When I see a bloody wound or cut.	3.21	5.17	31.43	25.06	-6.606	<.001
30. When I see the dentist before the intervention (mask, gown, gloves).	5.04	8.33	22.35	22.88	-4.522	<.001
31. If I go into the butcher's shop and I see the butcher with his apron spotted with blood.	.40	1.26	4.58	10.90	-2.144	.038
32. When I describe to another person an experience or situation involving blood.	1.43	3.97	14.94	17.11	-4.496	<.001
33. When I think that the nurse has to insert the needle in my vein to extract my blood.	5.80	9.68	42.66	24.31	-8.665	<.001
34. If I see an operation or surgical intervention.	9.22	11.53	43.69	29.34	-6.777	<.001
35. When the dentist's nurse cleans blood from my mouth with cotton or gauze.	2.15	4.75	20.79	25.64	-4.364	<.001
36. When I think about having to attend a relative (child, parent) to clean or cure a bleeding wound.	3.48	5.65	31.23	25.21	-6.465	<.001
37. When I see a pool of blood on the floor.	3.79	6.32	23.00	25.27	-4.278	<.001
38. When I go into a hospital.	2.93	5.77	23.33	23.37	-5.240	<.001
39. When I think about having to get a blood test.	4.22	8.33	41.07	24.02	-8.973	<.001
40. When I see a TV or newspaper report involving blood.	1.63	3.74	21.76	23.43	-5.225	<.001
41. When I think that, if I go to the emergency ward of a hospital, I may see a stretcher with blood on the sheet.	1.93	4.38	21.05	23.76	-4.738	<.001
42. When I think about having to have local anesthesia for a minor intervention.	4.42	8.44	33.92	25.72	-6.703	<.001
43. When they invite me to eat at a restaurant with other people.	1.48	3.01	5.38	12.18	-1.983	.054
44. When I think that the color dark red looks like blood.	.14	.53	1.10	2.78	-2.136	.039
45. When I think that if I go to the dentist for a filling or to get a tooth pulled out, they will have to give me an injection in my gum and I will bleed (without considering the possibility of pain).	3.78	7.38	25.33	24.01	-5.277	<.001
46. When I go to a soccer field or to some public spectacle.	2.18	4.09	4.07	11.53	-1.005	.321
47. When I think of the possibility of donating blood for a relative or friend.	3.84	7.99	38.07	24.82	-8.075	<.001
48. When, after bumping my nose, I think I might get a nosebleed.	1.52	3.62	16.56	22.22	-3.916	<.001
49. When I see a report or documentary film about animals or a bull-fight on TV and I think of the possibility of seeing a bleeding animal.	1.07	2.72	6.15	12.70	-2.367	.023
50. When I get onto a bus or train.	.83	2.63	3.25	9.15	-1.634	.110

**Table 2:** Symptoms of blood phobia that discriminate between the normal and the blood phobic sample (N = 174).

Symptoms (rank: 0-150)	Normal (n=135)		Blood phobics (n=39)		Value of Contrast Statistic	<i>p</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
<b>Cognitive responses</b>						
(a) I don't think I will be able to bear the situation.	1.51	2.51	10.87	8.40	-6.867	<.001
(b) I think that "something bad is going to happen to me."	.56	1.57	5.87	8.35	-3.950	<.001
(c) My mind goes blank.	.66	2.13	4.51	6.88	-.439	<.001
(d) I perceive that not much time will go by before I get dizzy.	.82	1.79	12.589	9.70	-7.539	<.001
(e) I feel confused, disoriented.	1.42	2.25	9.66	9.80	-5.213	<.001
(f) I think people will notice how distressed I feel.	1.33	2.72	8.76	9.63	-4.768	<.001
(g) I don't think I'll know how to react.	.80	1.94	9.76	9.11	-6.107	<.001
(h) I remember past experiences and anticipate panic.	.86	2.31	11.10	11.03	-5.742	<.001
(i) I think I'm going to faint.	.45	1.47	9.51	9.83	-5.730	<.001
(j) I must get out of here before I make a fool of myself.	.33	1.45	7.87	10.52	-4.461	<.001
(k) I think I should have avoided the situation, because this feeling is nothing new to me.	.77	2.23	10.38	9.62	-6.186	<.001
(l) I think I shall go mad.	.13	.81	1.35	5.03	-1.515	.138
<b>Physiological responses</b>						
(a) My heartbeat speeds up.	5.46	6.70	26.66	12.58	-10.112	<.001
(b) My palms or armpits sweat.	3.08	6.29	18.10	15.61	-5.868	<.001
(c) My muscles start to tense.	3.04	4.66	11.66	10.34	-5.061	<.001
(d) I feel that I am getting dizzy.	1.69	3.97	17.89	13.08	-7.629	<.001
(e) I breathe more quickly.	3.34	5.49	19.58	14.13	-7.027	<.001
(f) I feel a cold sweat all over my body.	1.57	2.49	9.56	8.94	-5.515	<.001
(g) I feel more blood pumping in my body.	1.91	3.92	11.82	11.46	-5.310	<.001
(h) I feel my face is hot.	.96	2.12	5.84	7.90	-3.820	<.001
(i) I lose consciousness.	.11	.61	4.17	6.15	-4.117	<.001
(j) I get pale.	2.00	4.08	16.76	13.96	-6.524	<.001
(k) I faint.	.28	1.40	7.89	10.43	-4.544	<.001
(l) I feel a lump in my throat.	2.05	2.83	10.20	9.98	-5.038	<.001
(m) I feel stomach discomfort.	1.82	3.38	12.10	12.74	-4.989	<.001
<b>Behavioral responses</b>						
(a) I avoid going. I avoid it.	3.05	4.69	16.64	9.457	-8.671	<.001
(b) I am paralyzed and cannot move.	1.23	2.74	4.40	4.68	-4.032	<.001
(c) My legs and/or hands shake.	1.98	3.53	11.92	10.334	-5.906	<.001
(d) I escape from the situation immediately.	1.55	3.39	12.48	10.417	-6.455	<.001
(e) I shift around in my seat nervously, etc.	1.37	3.18	12.48	11.341	-6.053	<.001
(f) My words don't come out fluidly or my voice is uneven.	1.56	3.97	14.43	14.576	-5.457	<.001
(g) I keep quiet, speechless.	1.91	3.92	11.82	11.46	-5.310	<.001
Σ Total responses	69.77	83.91	537.76	349.13	-7.354	<.001

**Table 3:** Items included in the rotated factor solution of BIPI.

Original Situations	Components			Final Situations	Component
	1	2	3		
13. When I feel the needle go into the vein of my arm to extract blood.	.800	.425		21(6). When I think that I have to accompany a relative to have a blood test or to cure an open wound.	.944
39. When I think about having to get a blood test.	.796	.466		39(14). When I think about having to get a blood test.	.922
33. When I think that the nurse has to insert the needle in my vein to extract my blood.	.780	.478		33(9). When I think that the nurse has to insert the needle in my vein to extract my blood.	.918
47. When I think of the possibility of donating blood for a relative or friend.	.776	.460		36(11). When I think about having to attend a relative (child, parent) to clean or cure a bleeding wound.	.918
7. When I get an intravenous injection.	.758	.456		25(7). When I see another person getting an intramuscular injection.	.886
21. When I think that I have to accompany a relative to have a blood test or to cure an open wound.	.742	.434	.403	20(5). When I hear a conversation about blood.	.884
25. When I see another person getting an intramuscular injection.	.713	.440	.386	34(10). If I see an operation or surgical intervention.	.880

42. When I think about having to have local anesthesia for a minor intervention.	.698	.551	41(15). When I think that, if I go to the emergency ward of a hospital, I may see a stretcher with blood on the sheet.	.879
29. When I see a bloody wound or cut.	.660	.574 .319	47(17). When I think of the possibility of donating blood for a relative or friend.	.873
20. When I hear a conversation about blood.	.659	.572	37(12). When I see a pool of blood on the floor.	.871
9. When having to clean a wound or cut on bloody skin.	.657	.550 .321	18(4). When I see a laboratory tube with blood.	.863
34. If I see an operation or surgical intervention.	.640	.470 .367	7(3). When I get an intravenous injection.	.856
41. When I think that, if I go to the emergency ward of a hospital, I may see a stretcher with blood on the sheet.	.623	.613	42(16). When I think about having to have local anesthesia for a minor intervention.	.851
36. When I think about having to attend a relative (child, parent) to clean or cure a bleeding wound.	.617	.573 .389	5(2). When I see blood on my arm or finger after pricking myself with a needle.	.847
5. When I see blood on my arm or finger after pricking myself with a needle.	.609	.435 .420	38(13). When I go into a hospital.	.837
38. When I go into a hospital.	.605	.464 .406	48(18). When, after bumping my nose, I think might get a nosebleed.	.822
23. If I open a meat wrapping and it is smeared with animal blood.	.864		32(8). When I describe to another person an experience or situation involving blood.	.820
8. If I'm in the kitchen and I see a knife with blood on it after cutting meat.	.830		2(1). When I see an injured person after an accident, bleeding in the road or on TV.	.750
31. If I go into the butcher's shop and I see the butcher with his apron spotted with blood.	.824			
49. When I see a report or documentary film about animals or a bull-fight on TV and I think of the possibility of seeing a bleeding animal.	.820			
32. When I describe to another person an experience or situation involving blood.	.460	.699 .308		
37. When I see a pool of blood on the floor.	.571	.696		
18. When I see a laboratory tube with blood.	.574	.672		
40. When I see a TV or newspaper report involving blood.	.520	.662 .343		
48. When, after bumping my nose, I think might get a nosebleed.	.557	.657		
15. When I notice an ad about the proper use of hypodermic needles (without considering the possibility of contagion).	.410	.598 .449		
2. When I see an injured person after an accident, bleeding in the road or on TV.	.491	.532		
4. When going to the dentist for a check-up.		.892		
30. When I see the dentist before the intervention (mask, gown, gloves).	.302	.868		
6. When I feel discomfort in my mouth and think about having to go to the dentist, without considering the possibility of pain.		.863		
19. When I see the dentist's drill foing into my mouth.	.314	.852		
22. While I'm in the dentist's waiting-room.	.376	.842		
12. When I notice the smell and see the dentist,s instruments ready for a dental intervention.		.374 .838		
45. When I think that if I go to the dentist for a filling or to get a tooth pulled out, the will have to give me an injection in my gum and I will bleed (without considering the possibility of pain).	.423	.804		
26. When I get local anesthesia.	.619	.648		
35. When the dentist's nurse cleans blood from my mouth with cotton or gauze.	.426	.507 .575		

Note: ( ) Number that appear in the proposed version

Note. Extraction method: principal component analysis, rotation method: Varimax normalization with Kaiser, the rotation converged at 6 iterations.

The adequacy of factor analysis was assessed by three indexes: KMO (.94), the determinant of the correlation matrix ( $2.56 \times 10^{-13}$ ), and Bartlett's sphericity test,  $\chi^2(153) = 4933.8$ ,  $p < .001$ . All of them yielded values that indicated that factor analysis was appropriate.

As the first factor explained 69% of the variance, a sufficient quantity to consider the instrument one-dimensional, we carried out a one-dimensional factor analysis with the 36 situations that are displayed in Table 3. For the fit of the factor solution, we used the following indexes: the non-normed fit index (NNFI, Bentler & Bonnett, 1980), the comparative fit index (CFI, Bentler, 1989), the value of the goodness-of-fit index (GFI), and the adjusted goodness of fit index (AGFI), Kelly's criterion (Lorenzo-Seva & Ferrando, 2006), and the root mean square of residuals (RMSR, Bentler, 1995). The model was considered acceptable if it met the criteria  $\text{RMSR} < .08$  (Hu & Bentler, 1999);  $\text{GFI}$ ,  $\text{AGFI}$ ,  $\text{CFI}$ , and  $\text{NNFI} > .90$ .

In addition to the former global fit indexes, we refined the instrument, progressively eliminating the situations whose standardized residuals were beyond the range (-2.58, 2.58). The standardized residuals refer to the differences between the observed correlations and those estimated by the factor solution. After applying this latter criterion, 18 situations remained, which are shown in Appendix 2.

As seen in Table 3, which shows the one-dimensional model, the goodness-of-fit indexes indicate that the fit of the model was adequate,  $\chi^2(135) = 1230.45$ ,  $p < .001$ ;  $\text{GFI} = .99$ ,  $\text{AGFI} = .99$ ,  $\text{CFI} = .77$ ,  $\text{NNFI} = .74$ , Kelly's criterion = .075;  $\text{RMSR} = .059$ . The range of smallest and largest standardized residual was (-1.38, 1.96). There are 18 situations that constitute a single factor of "blood phobia" that explained 76% of the variance (see Table 3).

### Factor analysis of the cognitive, physiological, and behavioral responses of the BIPI.

Exploratory factor analysis with principal components and varimax rotation was applied to the 31 symptoms resulting from applying the above-mentioned criterion. We used Kaiser's criterion (eigenvalues higher than 1) to retain factors and we selected only the items with loadings  $> .50$  (see Table 4). We eliminated 4 symptoms with this criterion: 1 of the 12 cognitive responses (C symptoms "My mind goes blank"), 1 of the 13 physiological symptoms (I "I lose consciousness"), and 2 of the 7 behavioral symptoms (B "I am paralyzed and cannot move" and G "I keep quiet, speechless").

The adequacy of the factor analysis was assessed with three indexes: KMO (.94), the determinant of the correlation matrix ( $1.10 \cdot 10^{-14}$ ), and Bartlett's sphericity test,  $\chi^2(351) = 7294.9$ ,  $p < .001$ . All of them yielded values that indicated that factor analysis was appropriate.

As the first factor explained 74% of the variance, a sufficient quantity to consider the instrument one-dimensional,

we carried out a one-dimensional factor analysis with the 27 symptoms that are displayed in Table 4. For the fit of the factor solution, we used the same indexes as those of the factor analysis of the situations.

In Table 4, which shows the one-dimensional model, the goodness of fit indexes indicate that the fit of the model was adequate,  $\chi^2(324) = 2061.33$ ,  $p < .001$ ;  $\text{GFI} = 1.00$ ,  $\text{AGFI} = 1.00$ ,  $\text{CFI} = .75$ ,  $\text{NNFI} = .73$ , Kelly's criterion = .076,  $\text{RMSR} = .049$ . The range of smallest and largest standardized residual was (-1.62, 2.14). There are 27 symptoms that constitute a single factor of "symptoms in blood phobia" that explained 74% of the variance.

The BIPI is a self-report made up of 18 items or situations related to blood. The content of the items meets the diagnostic criteria of the DSM-IV (APA, 1994), and is adapted to the modifications introduced in the DSM-IV-R (APA, 2000); specifically, blood, injections, and injuries. It includes an array of symptoms corresponding to the cognitive, physiological, and behavioral responses, with a total of 27 anxiety symptoms (see Appendix 2).

It is presented in a self-report format. In each situation, the person should indicate the frequency with which each one of the responses occurs. Each item is rated on a 4-point Likert-type scale, ranging from 0 (*never*) to 3 (*always*). The rating of 0 represents the absence of the response or symptom that is being assessed and 3 corresponds to the maximum occurrence. Total score was obtained by adding scores in each of the 27 symptoms. The normal participants' mean score was 69.97 ( $SD = 83.91$ ), and in the blood phobics, it was 537.76 ( $SD = 349.13$ ),  $t_{(172)} = -8.30$ ,  $p < .001$ .

### Psychometric properties

#### Reliability

The internal consistency index of the inventory, obtained with Cronbach's alpha coefficient, was .98 in the total sample of participants (normal and blood phobics,  $N = 174$ ), for both the symptoms and the situations. The reliability or internal homogeneity coefficient, obtained by means of the method of Guttman's split halves with the entire sample of participants, was .98, and the Pearson coefficient between both halves was .96.

#### Validity

The convergent validity among response types, assessed by the correlation both in the sample of normal participants and in the blood phobics, indicates that the cognitive, physiological, and behavioral responses are significantly associated with each other in the measurements of the BIPI and that this association is higher in the sample of blood phobics (see Table 5).

**Table 4:** Symptoms included in the rotated factor solution of BIPI.

Original Symptoms	Compo- nents	Final Symptoms	Compo- nent
I don't think I'll know to react.	.933	I don't think I'll know to react.	.933
I perceive that not much time will go by before I get dizzy.	.930	I perceive that not much time will go by before I get dizzy	.929
I think I'm going to faint.	.928	I think I'm going to faint.	.928
I don't think I will be able to bear the situation.	.924	I don't think I will be able to bear the situation.	.924
I breathe more quickly.	.918	I breathe more quickly.	.917
I think I should have avoided the situation, because this feeling is nothing new to me.	.917	I think I should have avoided the situation, because this feeling is nothing new to me.	.915
I escape from the situation immediately.	.895	I escape from the situation immediately.	.894
I shift around in my seat nervously, etc.	.891	I shift around in my seat nervously, etc.	.890
I must get out of here before I make a fool of myself.	.887	I must get out of here before I make a fool of myself	.886
I get pale.	.886	I get pale.	.885
I feel that I am getting dizzy.	.885	I feel that I am getting dizzy.	.885
My legs and/or hands shake.	.871	My legs and/or hands shake.	.871
I think people will notice how distressed I feel.	.860	I think people will notice how distressed I feel.	.859
My words don't come out fluidly or my voice is uneven.	.856	My words don't come out fluidly or my voice is un-even.	.857
My heartbeat speeds up.	.855	My heartbeat speeds up.	.854
I feel a cold sweat all over my body.	.852	I feel a cold sweat all over my body.	.852
I avoid going. I avoid it.	.852	I avoid going. I avoid it.	.850
I remember past experiences and anticipate panic.	.847	I feel confused, disoriented.	.847
I feel confused, disoriented.	.845	I remember past experiences and anticipate panic.	.846
I faint.	.838	I faint.	.840
My palms or armpits sweat.	.835	My palms or armpits sweat.	.834
I feel a lump in my throat.	.822	I feel a lump in my throat.	.822
I think that "something bad is going to happen to me".	.804	I think that "something bad is going to happen to me".	.808
My muscles start to tense.	.795	My muscles start to tense.	.793
I feel stomach discomfort.	.782	I feel stomach discomfort.	.781
I lose consciousness.	.774	I feel more blood pumping in my body.	.690
I feel my face is hot.	.694	I feel my face is hot.	.690
I keep quiet, speechless.	.688		
I feel more blood pumping in my body.	.688		
My mind goes blank.	.621		
I am paralyzed and cannot move.	.523		

Note.- Extraction method: principal component analysis, rotation method: Varimax normalization with Kaiser.

**Table 5:** Pearson correlation coefficients among the different types of cognitive, physiological, and behavioral responses and the total BIPI score

Responses	Total BIPI score		
	Total (N=174)	Normal (n=135)	Blood phobics (n=39)
	<i>r</i>	<i>r</i>	<i>r</i>
Cognitive-Physiological	.94** <i>p</i> < .001	.87** <i>p</i> < .001	.94** <i>p</i> < .001
Physiological-Behavioral	.85** <i>p</i> < .001	.44** <i>p</i> < .001	.90** <i>p</i> < .001
Behavioral-Cognitive	.84** <i>p</i> < .001	.48 <i>p</i> = .138	.91** <i>p</i> < .001

Convergent validity with other instruments, assessed with the subscale of blood phobia of the FQ (Marks & Mathews, 1979) and the three response types of the BIPI obtained from the sample of blood phobic participants, indicates a significant correlation between the cognitive responses ( $r = .59, p < .001$ ), the physiological responses ( $r = .56, p < .001$ ), and the behavioral responses ( $r = .55, p < .001$ ) with the blood phobia subscale of the FQ, respectively.

Sensitivity to change, appraised by comparative analysis of the responses given by the sample of the 39 blood phobic

participants before and after the treatment, indicates that the BIPI discriminates between pre and post-treatment responses and therefore serves to detect therapeutic change in blood phobia,  $t(37) = 8.45, p = .001$  ( $M$  pret = 536.76,  $SD = 347.13$ ;  $M$  post = 137.28,  $SD = 173.80$ ).

Discriminant validity, obtained using the agoraphobia subscale and the fear subscale of the social situations of the FQ (Marks & Mathews, 1979) shows nonsignificant correlations, indicating that the BIPI measures a different construct from agoraphobia and/or social anxiety.

### Diagnostic efficacy of the BIPI

The diverse dimensions of the self-report discriminate well between the normal and the blood phobic samples. In fact, it correctly classified 92.5% of the participants, so the value of the diagnostic efficacy of the BIPI is high. Moreover, it has a specificity of 97.1%, and a sensitivity of 76.9% (see Table 6). The proposed cut-off point for the global inventory, corresponding to percentile 75 in the normal sample, is 95 points.



**Table 6:** Diagnostic efficacy of the BIPI (N = 174).

Observed groups	Predicted groups		TOTAL
	Normal	Blood phobics	
Normal	131 (97.1%)	4 (2.9%)	135
Blood phobics	9 (23.1%)	30 (76.9%)	39
Sensitivity	True positives /total patients x 100 = 30 / 39 x 100 = 76.92		
Specificity	100- False positives /total normals x 100 = 100 - 4 /135 x 100 = 97.10		
Diagnostic efficacy	Total correctly classified /total global x 100 = 161 / 174 x 100 = 92.52		

## Discussion

Diverse instruments have been used in studies of the efficacy of the assessment and psychological treatment of blood phobia. The first questionnaires elaborated, such as the FQ and the FSS-III, are general, and measure a limited number of contexts associated with fears and phobias. Other instruments focus on identifying specific situations related to blood (MQ, MFS, MAS, and BISS). Whereas these assessment measurements do not reflect the totality of blood phobia, the MBPI is a multidimensional inventory that assesses four types of stimuli (injections, hospitals, blood, and injuries) and the presence of five kinds of response (fear, avoidance, worry, distress, and fainting). The BIPI, a self-report measure with similar characteristics to the MBPI, was elaborated to assess the severity of phobic symptoms in certain contexts or when facing situations involving blood, injections, and injuries.

The first goal of this study is to explore the psychometric characteristics of the BIPI. As mentioned, in order to validate the instrument, we used participants from the general population residing in the Region of Andalusia (Spain). It is, therefore, the first inventory elaborated in the Spanish language and adapted to the Spanish population.

The results revealed that it has excellent reliability and internal consistency, as well as good convergent validity with the subscale of blood phobia of the FQ (Marks & Mathews, 1979), the most frequently used inventory. The BIPI discriminates individuals who meet the criterion of specific phobia, subtype blood/injury phobia, from individuals with other types of fears such as social phobia and agoraphobia. It does not correlate significantly with these FQ subscales, thus indicating that blood phobia is a measure of a specific fear with different characteristics from other phobias. Moreover, it presents adequate sensitivity, good specificity, and diagnostic efficacy. It discriminates satisfactorily between blood phobics/nonphobics.

The second goal was to determine, by exploratory factorial analysis, whether blood phobia is a one-dimensional construct. The single factor, extracted with principal component analysis, for situations and phobic symptoms explained 76% and 74% of the variance, respectively. These results suggest that blood phobia is a unitary psychometric

construct and that it adequately taps a broad array of phobic contexts and symptoms that configure the severity of the specific phobia in individuals with blood phobia.

The good convergent validity of the responses indicates that the inventory is a one-dimensional measurement of this subtype of phobia that satisfactorily assesses blood phobia. In contrast, most of the other instruments, such as, for example, the MBPI, are multidimensional. In this case, the first factor -blood phobia- of the six factors yielded by the factor solution explained 42.5% of the total variance (Wenzel & Holt, 2003).

In contrast to other instruments, the inventory integrates symptoms proceeding from the three response types (cognitive, physiological, and behavioral). It reflects the most notable characteristic of blood phobia, the predisposition to vasovagal syncope, which is a biphasic physiological response in this phobia. It identifies individuals with fainting episodes and the relation of such episodes with the rest of the symptoms of the vasovagal syncope. Various investigators have offered diverse explanations of this dysfunction in the last few years (Accurso *et al.*, 2001; Gerlach *et al.*, 2006).

Two relevant characteristics that are derived from the BIPI are that it separates phobic symptoms involving one's own blood from that of other people's blood. Moreover, it also distinguishes the individual's cognitive, physiological, and behavioral symptoms in phobic contexts and the cognitive, physiological, and behavioral symptoms when anticipating future exposure to phobic stimuli. In other words, it allows the appraisal of the severity of the 27 symptoms in the 18 phobic contexts. Despite that the factor analysis suggests that blood phobia is a unitary phenomenon (Borda, 2001), the variability of the clinical profiles indicates that it would be very useful to assess the particular profile of each person for successful treatment.

Lastly, the third goal of the study was to determine whether it is an efficacious tool to detect therapeutic improvement in blood phobics. The BIPI is sensitive to therapeutic change, as it discriminates between responses before and after treatment in people diagnosed with blood phobia. Of the 39 patients who were treated with in vivo exposure, 19 were also trained in the technique of applied tension. After treatment, the BIPI scores indicated a notable change in the severity of the blood phobia. The improvement was detected by the self-report (Borda *et al.*, 1997; Borda *et al.*, 1998).

In conclusion, as noted by Marks & Mathews (1979), a valid instrument to assess treatment success should adequately measure the globality of the specific characteristics of the clinical samples with this subtype of phobia. In this sense, the BIPI meets this need satisfactorily. It responds to an unidimensional construct and it integrates the current phobic behaviors, the physical symptoms, and the thoughts present in blood-related contexts.

As limitations of the study included the age range of the composition of the sample, with a predominance of women, in order to generalization of the results.

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### Appendix 1: Development of the 50 preliminary situations and measurement of each item .

	Blood		Injection		Dentist		Animal blood		Color red		Agoraphobia	Social anxiety
	S <sup>(1)</sup>	A <sup>(2)</sup>	S	A	S	A	S	A	S	A		
1. When I walk along the beach or in the mountains											X	
<sup>(*)</sup> 2. When I see an injured person after an accident, bleeding in the road or on TV.	X											
3. In a group of friends or coworkers, when they ask my opinion.												X
4. When going to the dentist for a check-up.						X						
<sup>(*)</sup> 5. When I see blood on my arm or finger after pricking myself with a needle.	X		X									
6. When I feel discomfort in my mouth and think about having to go to the dentist, without considering the possibility of pain.						X						
<sup>(*)</sup> 7. When I get an intravenous injection.			X									
8. If I'm in the kitchen and I see a knife with blood on it after cutting meat.							X					
9. When having to clean a wound or cut on bloody skin.	X											
10. When going to buy a present or clothing and they offer me something red.								X				
11. In a party with acquaintances when I have to join the conversation.												X
12. When I notice the smell and see the dentist's instruments ready for a dental intervention.						X						
13. When I feel the needle go into the vein of my arm to extract blood.	X		X									
14. When I have to ask for something, make a complaint, or ask a question in public.												X
15. When I notice an ad about the proper use of hypodermic needles (without considering the possibility of contagion).			X									
16. When I think of the color red.									X			
17. In a restaurant, when I observe that a piece of meat on the plate is "bloody".							X					
<sup>(*)</sup> 18. When I see a laboratory tube with blood.	X											
19. When I see the dentist's drill going into my mouth.						X						
<sup>(*)</sup> 20. When I hear a conversation about blood.	X											
<sup>(*)</sup> 21. When I think that I have to accompany a relative to have a blood test or to cure an open wound.		X										
22. While I'm in the dentist's waiting-room.						X						
23. If I open a meat wrapping and it is smeared with animal blood.							X					
24. When I have to talk in front of a group of people.												X
<sup>(*)</sup> 25. When I see another person getting an intramuscular injection.				X								
26. When I get local anesthesia.				X								
27. When I see the color red in a picture or poster.								X				
28. When I am in an elevator.											X	
29. When I see a bloody wound or cut.	X											
30. When I see the dentist before the intervention (mask, gown, gloves).						X						
31. If I go into the butcher's shop and I see the butcher with his apron spotted with blood.							X					
<sup>(*)</sup> 32. When I describe to another person an experience or situation involving blood.	X											
<sup>(*)</sup> 33. When I think that the nurse has to insert the needle in my vein to extract my blood.			X	X								
<sup>(*)</sup> 34. If I see an operation or surgical intervention.	X											
35. When the dentist's nurse cleans blood from my mouth with cotton or gauze.	X					X						
<sup>(*)</sup> 36. When I think about having to attend a relative (child, parent) to clean or cure a bleeding wound.			X									
<sup>(*)</sup> 37. When I see a pool of blood on the floor.	X											
<sup>(*)</sup> 38. When I go into a hospital.											X	
<sup>(*)</sup> 39. When I think about having to get a blood test.			X									
40. When I see a TV or newspaper report involving blood.	X											
<sup>(*)</sup> 41. When I think that, if I go to the emergency ward of a hospital, I may see a stretcher with blood on the sheet.			X									
<sup>(*)</sup> 42. When I think about having to have local anesthesia for a minor intervention.						X						
43. When they invite me to eat at a restaurant with other people.												X
44. When I think that the color dark red looks like blood.									X			
45. When I think that if I go to the dentist for a filling or to get a tooth pulled out, they will have to give me an injection in my gum and I will bleed (without considering the possibility of pain).			X	X	X							
46. When I go to a soccer field or to some public spectacle.											X	
<sup>(*)</sup> 47. When I think of the possibility of donating blood for a relative or friend.			X	X								
<sup>(*)</sup> 48. When, after bumping my nose, I think I might get a nosebleed.			X									
49. When I see a report or documentary film about animals or a bull-fight on TV and I think of the possibility of seeing a bleeding animal.			X				X					
50. When I get onto a bus or train.											X	

<sup>(1)</sup> Situational anxiety

<sup>(2)</sup> Anticipatory anxiety

<sup>(\*)</sup> Situations that appear in the proposed version

## Appendix 2: Items of the proposed version of the BIPI

In next page you have a list of situations where you can find yourself and that could create distress, tension, etc. to you. The objective is to evaluate the different reactions that occur to you in each of the described situations.

The task is to rate from 0 to 3, the frequency of each symptom. Use the following scale:

- 3 = Always
- 2 = Almost always
- 1 = Sometimes
- 0 = Never

The procedure is the following: Read each of the situations shown on the left side, and then score from 0 to 3 each symptom that is listed in the top of the page.

## Apéndice 2: Items en la versión definitiva del BIPI

A continuación, se le presenta un listado de situaciones en las que Ud puede encontrarse y que podrían suscitarle malestar, tensión, etc. El objetivo es valorar las diferentes reacciones que se producen en Ud. ante cada una de las situaciones expuestas.

La tarea consiste en puntuar de 0 a 3 la *frecuencia* de cada uno de los síntomas. Utilice la siguiente escala:

- 3 =Siempre
- 2 =Casi siempre
- 1 =A veces
- 0 =Nunca

El procedimiento a seguir es el siguiente: Lea cada una de las situaciones que aparecen en la parte izquierda y, a continuación, puntúe de 0 a 3 cada síntoma que se indica en la parte superior de la página.



