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## Towards A Behavioural Screening Tool for Primary Psychological Triage

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### ABSTRACT

**Rationale:** Following a mass casualty event, the primary psychological triage of survivors based on clinical symptomatology is difficult for volunteer rescuers who lack the necessary knowledge of mental health issues and are under significant time pressure. To address this concern, descriptive screening tools are needed. In this context, propositions for a triage tool have taken the form of means to describe traumatic exposure or the survivors' comorbidity factors.

**Objective:** Alternatively, we propose a behaviour-based screening tool built on the Defence Cascade Model. This model assumes that survivors' behaviours involve a range of motor and physiological defensive reactions. After developing this new kind of screening tool, we tested its reliability and validity.

**Method:** Forty professionals who usually intervene in early psychological intervention units randomly rated a series of survivors' profiles with either the behavioural tool or a tool based on classical categories of symptoms used as a control condition. The two screening tools were developed by a group of nine experts. Inter-rater reliability (unweighted kappa and Fleiss' Kappa indexes), criterion validity (Spearman's Rho and Kendall's Tau indexes), face validity (subjective evaluation) and construct validity (modal classes of items) were calculated and compared between the two tools.

**Results:** The results show that behavioural screening is significantly more reliable, while showing a significant correlation with symptom-based screening in terms of prioritisation. It also appears to be simpler than symptom screening, with most references to similar clinical concepts.

### Keywords

Screening tool, Defence Cascade Model, Behavioural cues, Early psychological intervention unit, Mass-casualty triage.

it aims to guide survivors in a smooth and timely manner towards psychological relief or simply support for basic needs (food, clothing, contact with family, etc).

### Introduction

After a large-scale emergency event (natural disaster, major accident, terrorist attack, ...), medical triage is followed by primary psychological triage. This latter phase is a critical one, as

However, this triage task is often carried out by civil rescue forces composed of volunteers who lack the necessary knowledge of mental health issues to ensure an accurate and objective screening of the survivors [1]. They may use inappropriate terminology or

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under/overestimate the critical meaning of a particular behaviour [2-4]. For instance, a person sitting in a chair without moving may be considered as not needing psychological care, whereas he/she is in deep shock. In addition, even though qualified professionals may perform the primary triage, a rigorous interpretation of pathological signs is difficult in a time-pressured situation.

Research on this topic has found solutions in the development of triage screening tools that are easy to rate, since they refer to factual elements of the situation, and valid since they offer a predictive value regarding the possible emergence of Post-Traumatic Stress Disorder (PTSD). A first kind of tool involves focusing the screening on traumatic exposure, as with the PsySTART tool [5]. By factually describing the events experienced by victims, PsySTART brings a degree of objectivity to the screening. Longitudinal studies have shown that traumatic events are predictive of PTSD [6,7]. A second kind of tool is based on the search for comorbidity factors (e.g., medical conditions, prescribed health medicines or services). The Alsept Price Mental Health scale and the Fast Mental Health Triage algorithm have been developed for this purpose [8]. Again, objectivity relies on the descriptive nature of the information gathered by such tools. In addition, studies have shown associations between comorbidity factors and PTSD. Pre-existing anxiety disorders increase the risk of developing PTSD [9].

However, both strategies are likely to trigger a long phase of verbalisation, causing the primary triage phase to drift towards a time-consuming exchange with a rescuer who lacks the required assessment skills. In this paper, we propose a third type of screening tool. This alternative posits that survivors' behaviours can be viewed as motor and physiological defensive reactions in response to a traumatic event. Some responses may lead to alterations in the nervous system function associated with a significant risk of psychiatric disorders [10,11].

In the next section, we present a first version of a behavioural screening tool for primary psychological triage and its theoretical foundations: the Defence Cascade Model. Next, a first evaluation of the reliability and validity of the tool is presented in comparison with a control condition involving a tool based on some categories of clinical symptoms typically used in current practices of screening. For both tools, inter-rater reliability was calculated using the unweighted kappa and Fleiss' Kappa indexes. We also measured the degree of similarity in the prioritisation of victims with both tools (Spearman's Rho and Kendall's Tau correlation indexes). The level of the prioritisation is the result that comes out of the screening task (criterion validity). Face validity was also measured. This is the extent to which a tool seems subjectively appropriate for assessing a dimension. Face validity was measured by means of a questionnaire on the difficulty of screening with the two tools and on the task of prioritisation. Construct validity, or the extent to which the tool accurately measures what it is supposed to measure, was estimated by comparing the items used to describe each victim with each tool. If both screening tools provide similar

items to describe a given victim profile, we can assume that they measure an invariant content.

### **A Behavioural Tool Based on the Defence Cascade Model**

The Defence Cascade Model is a framework used to conceptualise behavioural and neurophysiological responses to an acute event [12]. It describes a sequence of defence responses through an inverted-U arousal function along with an increasing risk of dissociative symptoms (Figure 1). Each survivor's state included in this sequence may be observed through the occurrence of behavioural and physiological changes during and after a traumatic event.

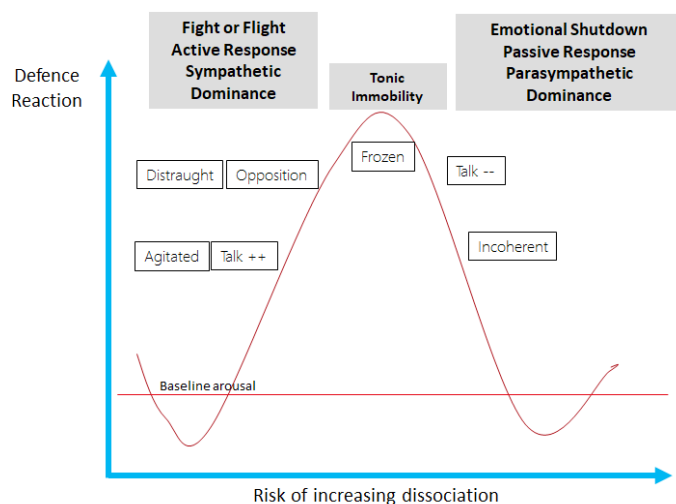
More precisely, according to the arousal level, two phases can be identified. First, in the increasing activation phase, the threat-provoked defence is expressed by active behavioural responses with a hyperarousal state to cope with the situation. These responses are observable for instance through fight-or-flight strategies. These strategies involve a physiological dominance of the sympathetic nervous system.

Whereas the arousal level continues to increase, the over-activation of the sympathetic nervous system may lead to an acute state of tonic immobility. This catatonic state (fright) paradoxically combines a high physiological arousal with the inability to execute voluntary movements of the body. This state is due to the simultaneous activation of the sympathetic and parasympathetic nervous systems [13].

In the decreasing phase, the sympathetic system is inhibited whereas the parasympathetic system is activated through a shut-down reaction with reduction of heart rate, blood pressure, and core body temperature. This reaction is due to the feeling of an inescapable situation involving an overwhelming threat. Tonic immobility and the shut-down reaction increase the risk of psychological dissociation, i.e., drifting into psychological escape, when physical escape seems impossible.

Based on the Defence Cascade Model, we designed a first version of a screening tool for primary triage, named ICI (in French, "Indicateurs Comportement Interaction"). This tool comprises a short set of behavioural cues referring to some states composing the defence response curve of the Defence Cascade Model (Figure 1).

The ICI screening tool is composed of eight items: four items are related to active/passive physical behaviours, three items to verbal interaction, and one item excludes the presence of the other items (Table 1). The items "Agitated", "Talks a lot," "Distraught, panicked", and "Does not do what is asked, shows opposition" represent an active response to the situation underpinning basic strategies of flight or fight. The "Frozen" item describes the survivor's extreme shock. "Speaks very little" might reveal an emotional shutdown, and "Incoherent remarks, out of step with the situation" is likely to reflect a critical dissociative state.



**Figure 1:** The Defence Cascade Model showing the items of the ICI screening tool.

**Table 1:** A first version of the ICI screening tool for primary psychological triage.

(in parentheses and italics, the French original version used in the study)

Behaviour:

- Does not do what is asked, shows opposition (*Ne fait pas ce qu'on lui demande, montre son opposition*)
- Distraught, panicked (*Affolé, paniqué*)
- Agitated (*Agité*)
- Frozen (*Figé*)

Interaction :

- Talks a lot (*Parle énormément*)
- Incoherent remarks, out of step with the situation (*Propos incohérents, décalés avec la situation*)
- Speaks very little (*Parle très peu*)

None of the precedent elements (*Aucun des éléments précédents*)

To develop the ICI screening tool, a group of nine experts (seven team coordinators in early psychological intervention units, one teacher in psychiatry nursing, and one researcher in cognitive psychology) iteratively selected and validated items that simultaneously satisfied the following criteria: their content validity regarding the Defence Cascade Model, parsimony, and ease of understanding. As recommended in best practice guidelines, a pre-testing stage was performed after this phase of item development [14].

In the ICI tool, items are expressed as adjectives or verbs (“Does not do what is asked, shows opposition”, “talks a lot”) rather than nouns. As well as verbs that describe actions, adjectives tend to describe behaviour, whereas nouns tend to prime semantic categories. Nouns categorise people by assigning them to a particular group or type of person. They are less factual than verbs and adjectives [15,16]. For example, the noun 'panic' refers to an internal mental attribute imputed to the victims, whereas 'panicked' is a property imputed to the observed behaviour of the victims.

We hypothesise that this lexical specificity of ICI items based on adjectives and verbs would allow observers to focus on what

they perceived in the victim's behaviour, rather than inferring a hypothetical internal state based on abstract clinical categories that are not fully mastered. And since the ICI items are intended to reflect the different stages of the defence cascade model, coding these items during a brief screening (approximately 1 minute) would allow identification of the victim's behavioural and neurophysiological response following exposure to an acute event.

**Reliability and validity of the ICI tool**

The aim of this study was to provide the first evidence-based assessment of the reliability and validity of the ICI screening tool (table 1) compared with a traditional symptom-based tool (SB tool) composed of nouns of clinical categories (table 2).

**Method**

A sample of mental health professionals were contacted by post to complete one of two versions of a questionnaire form, including video clips. The inclusion criterion was to be a current volunteer in emergency medical and psychological services. Exclusion criteria were previous involvement in the design of the tools tested or in the experimental setting. Both forms included the same set of video clips describing a series of survivors' profiles. All volunteers registered in the databases of the services of the French Normandy and Morbihan regions were contacted by e-mail. They were randomly given a link to either the ICI tool or the SB tool to rate the same set of video clips. Of the 190 emails sent, 41 professionals (21.6%) responded to the survey. One participant's responses were excluded because the participant reported experiencing sound issues interfering with comprehension of the videos. Finally, 21 participants completed the questionnaire with the ICI tool and 19 participants completed the questionnaire with the SB tool. Data was collected using the Google Form™ application from 9 November to 16 December 2022.

**Triage Material**

Each questionnaire began with a presentation of the goals of the study and the tool items. First, the participants were given a practice run in which they viewed two video clips with correct answers and explanations. Next, they viewed and rated 10 clips shown in standardised order; after each screening, participants had to give a prioritisation score for the survivor profiles shown in the clips. These profiles were played by four actors following instructions written by the expert group, although they were given degrees of freedom in their interpretation. The actors intervene in simulation scenarios for paramedical and medical training. They also all work in a psychiatric hospital as healthcare assistant or nurse. Each video clip lasted about 1 minute. No time constraint was placed on participants to give their rating. Finally, questions were asked on the difficulty of the screening and prioritisation tasks (1= Very difficult, 2=Difficult, 3=Average, 4=Easy, 5=Very easy), and demographic information about the participants was collected; their anonymity was protected.

In addition to the ICI tool, an *ad-hoc* Symptom-Based screening tool (SB) was developed (Table 2). According to the expert group, it contains typical symptoms of PTSD and uses a terminology

commonly employed informally by volunteers during early psychological intervention. It will serve as a control condition in which behaviours are described as reflecting clinical categories. This document was judged by the expert group as adequate to screen all the video clips presented.

**Table 2:** The Symptom-Based screening tool (SB) designed for the study (control condition).

(in parentheses and italics, the French original version used in the study)

- In shock (*sidération*)
- Automatic action (*action automatique*)
- Verbal perseveration (*persévération verbale*)
- Disorientation (*désorientation*)
- Agitation/Disinhibition (*agitation/désinhibition*)
- Panic (panique)
- Adapted behaviour (*comportement adapté*)

The expert group also designed a triage scale to prioritise the victims. This scale included the following items: Priority 1: Immediate caring; Priority 2: Caring deferred a few hours; Priority 3: Proposal for a consultation postponed for 24/48 hours; Priority 4: Caring reduced to simple information giving. Four experts in the group tested the screening and prioritisation tasks using both forms in order to judge their feasibility and readability. Note that before this evaluation of the ICI tool, a first version was tested with 104 students in 1<sup>st</sup> year of nursing education, at the beginning of a class in a lecture hall. They rated the video clips used in the study and provided free comments. This pre-test led to the exclusion of some items (e.g., an item named “strange behaviour”) and the addition of others (e.g., “agitated”).

## Results

### Participants

A post-hoc analysis shows that the two groups of participants are globally homogeneous, except for the number of years of experience in an early psychological intervention unit (table 3). However, the difference is not significant (Mann-Whitney,  $W=253.5$ ,  $p=0.13$ ).

**Table 3:** Distribution of the Participants between the Two Experimental Groups.

	N	Age	Gender	Profession	Experience as volunteer in rescue unit
<i>ICI Form</i>	21	45.6 (7.1)	Female: 19 Male: 2	Healthcare executive: 2 Nurse: 13 Psychologist: 6 Psychiatrist: 0	Median class: [6-10 years]
<i>SB Form</i>	19	45.8 (12.1)	Female: 15 Male: 4	Healthcare executive: 1 Nurse: 15 Psychologist: 2 Psychiatrist: 1	Median class: [2-5 years]

### Inter-Rater Reliability of Screening Tools

In both groups, there is a moderate level of inter-rater agreement [17]. Results are comprised between [0.41 – 0.60] with Cohen’s

Kappa (ICI=0.56; SB=0.53) and Fleiss’ Kappa indexes (ICI=0.57, 95%CI=[0.55-0.58]; SB=0.53, 95%CI=[0.51-0.54]). However, the inter-rater agreement is significantly higher for the ICI tool than for the SB tool (Mann-Whitney:  $W=20088$ ,  $p<0.05$ ).

### Criterion Validity and Reliability of Prioritisation

Criterion validity is assessed through the level of similarity in the prioritisation task with both tools. In this regard, a moderate but significant correlation is noticed (Spearman’s  $Rho=0.45$ ,  $p<0.001$ ; Kendall’s  $Tau=0.42$ ,  $p<0.001$ ). Overall, prioritization is the same in the ICI group and the SB group. However, consistency in prioritisation inside both groups is low (ICI: overall Fleiss’ Kappa = 0.37; SB: overall Fleiss’ Kappa = 0.16).

Table 4 shows the inter-rater agreement for each priority level. We note that the inter-rater agreement in the ICI group is moderate for Priority 1 (Fleiss’ Kappa = 0.47) and becomes substantial for Priority 4 (Fleiss’ Kappa = 0.62), whereas the inter-agreement is always low in the SB tool group.

**Table 4:** Inter-Rater Reliability Index Regarding Victim Prioritisation Depending on the Priority Level.

ICI Form	ICI Form		SB Form	
	Fleiss’Kappa	95% CI	Fleiss’Kappa	95% CI
Overall	0.37	[0.34-0.40]	0.16	[0.13-0.19]
Priority 1	0.47	[0.43-0.51]	0.19	[0.14-0.23]
Priority 2	0.11	[0.06-0.15]	0.02	[-0.03-0.07]
Priority 3	0.01	[-0.03-0.06]	0.00	[-0.05-0.05]
Priority 4	0.62	[0.58-0.67]	0.36	[0.31-0.41]

### Face validity

Whereas the SB tool is judged as *moderately easy* to use (median=3, min-max =[2-4]), the ICI tool is mainly judged as *easy* to use (median=4, min-max =[3-5]). This difference is statistically significant (Mann-Whitney:  $W=275$ ,  $p<0.03$ ). There is no significant difference between the two groups regarding the judgment of the difficulty to prioritise the survivors (Mann-Whitney:  $W=230$ ,  $p=0.39$ ). This task is mostly judged as *moderately easy* (median=3 and min-max =[1-4] for both groups).

### Construct validity

Based on the most representative items of each tool for each video clip, it is possible to assess the degree of conformity between the two tools. Table 5 shows that the attributes imputed with the SB tool generally correspond to those given with the ICI tool. This correlation is less evident for victims 07 and 02. SB screening classifies victim 07 as showing “agitation/disinhibition”, whereas the ICI screening tool focuses on her “opposition”, an attribute that appears particularly salient in the video recording. Victim 02 is mainly evaluated as showing “agitation/disinhibition” with the SB tool, whereas she is evaluated as making “incoherent remarks, out of step with the situation” with the ICI tool. Post-hoc verification shows that the victim is genuinely physically agitated and disinhibited in her attitude with the rescuer; in addition, her verbalisation content is particularly out of step with the situation.



**Table 5:** Main items rated by the participants in percentages (modal classes), with each form (n with SB=19, ICI=21). In parentheses, the range (i.e., number of items with at least one rating by one participant).

Victims	Modal class SB tool	Modal class ICI tool
Victim 01	In shock: 85.7% (4)	Frozen: 100% (2)
Victim 08	In shock: 85.7% (3)	Frozen: 52.4%, Speaking very little: 52.4% (5)
Victim 03	Panic: 71.4% (6)	Distraught/panicked: 85.7% (5)
Victim 06	Panic: 85.7% (5)	Distraught/panicked: 100% (5)
Victim 04	Automatic: 81.0% (6)	Incoherent: 95.2% (4)
Victim 05	Automatic: 57.1%, Perseveration: 57.1% (4)	Incoherent: 52.4% (6)
Victim 09	Automatic: 81.0% (4)	Incoherent: 90.5% (6)
Victim 10	Adapted: 85.7% (2)	None of the previous items (100%) (1)
Victim 07	Agitation/disinhibition: 85.7% (4)	Opposition: 95.2% (5)
Victim 02	Agitation/disinhibition: 85.7% (6)	Incoherent: 100% (6)

## Discussion

Though the degree of consistency between participants remains moderate with both tools, the new ICI form based on behavioural cues appears to be a more reliable screening tool than a symptom-based form as commonly used by professionals. Regarding the validity of the ICI tool, although the prioritisation of victims is similar with the two tools, the prioritisation with ICI shows a better inter-rater reliability, notably when participants decide a critical triage in extreme positions (P1 and P4). Moreover, even though this experiment involved rapid observation of the victims' behaviour without interacting with the individuals, the participants judge triage based on behavioural cues as easier than triage using the SB tool.

These findings also show that a syndromic approach to primary mental health triage based on category nouns may not be appropriate for primary triage, even when triage is carried out by clinicians. It is difficult to identify signs and symptoms that directly refer to diseases reliably during a brief interaction with survivors. It is worth recalling that clinical terms are based on abstract discrete classifications that may be disputed, even among experts [18,19].

On a superficial level, the two instruments tested in this study could be seen as quite similar, as they share some items. For example, "panic" (SB) vs. "distraught, panicked" (ICI), "agitation/disinhibition" (SB) vs. "agitated" (ICI), "in shock" (SB) vs. "frozen" (ICI) are lexically close. However, the expression of items by adjectives or verbs allows the screener to focus on the victim's behaviour rather than searching for abstract categories of symptoms. This aspect, coupled with the ability of these items to represent key neurophysiological responses to an adverse event, would constitute the contribution of the ICI to rapid and reliable screening for early psychological intervention following a mass casualty event.

Nevertheless, this study is a first evaluation of the value of a behavioural screening tool. A real evaluation of its construct

validity, notably regarding the Defence Cascade Model, would require a larger sample with a factorial analysis. In addition, a larger set of video clips would be needed to represent a wide range of potential behaviours observed in mass casualty survivors.

## Conclusion

This first version of a behaviour-based primary screening tool shows the possibility of screening survivors rapidly. Such an approach avoids the risk of triggering detailed verbalisations among survivors who feel the need to speak about what they have experienced or their antecedents. Furthermore, since this behavioural screening can be performed without having to collect speech content, it can be used with adults, foreign victims, or young children in shock.

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