SHOTPROS end user summary of scientific deliverable 3.2 "A Conceptual Human Factors Model of *Decision-Making and Acting* under Stress and in High-Risk Situation"

Here you find a hands-on summary of the definitions from SHOTPROS deliverable paper 3.2. The full version of the Horizon2020 3.2 deliverable was primarily composed by SHOTPROS partner Vrije Universiteit Amsterdam and is also publicly available for download at https://shotpros.eu/elements-structure-of-wps/.

A conceptual model on DMA (decision making and acting) builds the basis of the SHOTPROS research and consequently of the SHOTPROS Virtual Reality (VR) solution.

Being a first responder in high-risk situations never faced before, creates a high level of stress. To be prepared to deal with these stress levels in real life, it is important for police officers to receive suitable scenario-based trainings. This model elaborates the impact of stress on DMA and consequently how a police officer can train to enhance his DMA in real life. Another deliverable within the SHOTPROS project will focus on the definition how an ideal training framework considering the here described model should be set-up. In course of the project, on base of this deliverable (D3.3) a fact sheet will also be published.
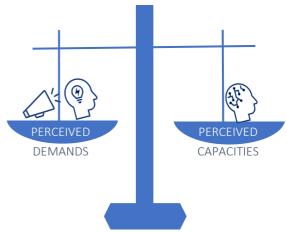
1.1 What is stressful in the SHOTPROS context?

Stress is the response to a perceived **discrepancy** between **demands** of an event and **capacities** to deal with these demands. This discrepancy threatens physical or mental well-being and control is uncertain. The occurrence of stress is related to **personal**, **contextual**, **organizational**, and **societal human factors**, as these factors determine the (perceived) demands of a situation, the (perceived) capacities to deal with the demands, and the appraisal of discrepancies between demands and capacities as stressful for well-being and under limited or no control.

*This means, the occurrence of stress is something **highly individual** and so is the way of dealing with it.*

We need to look at the balance between the perceived **demands** and perceived **capacities**:

Sometimes there is a **full balance**, or the perceived capacities even outweigh the perceived demands. Then the situation is **not**

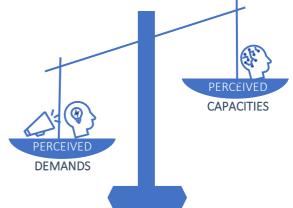PERCEIVED DEMANDS

PERCEIVED CAPACITIES

perceived as **stressful**. This means I have enough capacities to deal with the perceived demands of a situation.

But if the there is an **imbalance** between my perceived capacities and the perceived demands, the situation might be perceived as stressful. In this situation I feel that I do not have enough capacities to deal with the demands of the situation. This could still be positive and perceived as challenging. For SHOTPROS we are interested in stress in a negative and **threat**-related way.

*Consequently, stressful in the SHOTPROS context means an event that is **appraised** as **threatening** to my well-being and the police officer perceives **limitations in control** or ability to cope with it.*

Stress is the emotional response of a police officer to a stressful event.

1.2 Attentional processes

During the DMA we see 2 types of attentional processes: Goal directed processes vs. stimulus driven processes.

We either behave in a way that gets us closer to the **goal** where we concentrate on the **task relevant** information to achieve the goal, **or** our attentional processes are kind of **hijacked by the task-irrelevant stimuli** of the environment as a result of which we no longer perceive task-relevant issues optimally.

If a police officer **is stressed**, we often see a **shift** from the goal directed processes **to** the **more stimulus driven** processes. If we do not mitigate the stress response it may end up fully stimulus driven. Typically, you need a balance for making the right decisions and act accordingly – you need the goal directed attention and some stimulus driven influence to do a task like for example handcuffing: You have to keep in mind what you learned, what are the next steps, check the position of the suspect's hand and check if anything threatening is in the environment – all at the same time.

You must be able to perceive and process the **task-relevant aspects** to perform the tasks well.

1.3 Decision Making AND Acting

Typically, both were studied separately – Decision making in the cognitive domain and acting in the movement sciences. But the body has a brain, and the brain has a body and so the two were brought together from a scientific view. DMA is not a sequence but most of the time happens **together**.

> *Action is always a package of decision making **AND** acting together.*

To study this package, the concepts of motor heuristics and embodied choices are very useful. **Motor heuristics** are simple rules of thumb that enable police officers to **choose** between **behavioral options** to satisfy the demands of a situation.

> *These simple rules of thumb let me choose **appropriate behavior** for this situation.*

Embodied choices are similar and represent also rules of thumb that are useful when police officers have to decide quickly what to do and how (DMA) and **rely on cognitive AND sensory motor** input. This also means a first responder takes into account his bodily state while deciding and acting. For example, if you know you have an injured leg, you probably act more de-escalating as you are bodily aware of your physical limitations.

You only select from what is available for you. If you have a large box in your hand and want to pass through a door, you intuitively try to open the door for example with your elbow – you do not start thinking about it, you just do it like this.

> *This implies that decision-making and acting should be **trained**, evaluated/debriefed, and researched as **integrated**, emergent actions.*

1.4 Training

We can train people to invest **extra mental effort to enforce goal directed processes**, to inhibit stimulus driven processes and to reduce stress. If this is done the right way, a person can retain or restore the balance to goal directed processing and thereby keep a proper decision making and acting with proper results.

> *So, the aim of scenario-based VR trainings is not to prepare a first responder for every situation, but to **empower** a first responder in focusing on task-relevant aspects in **any stressful situation**.*

For SHOTPROS, this model forms the basis of scenario-based VR training – the human factors help to create **realistic** VR-training where the **different** situations and **variations** are provided. They provoke a different perception of stress for the trainees and the trainee can **train to**

remain goal-directed attention under stress to decide and act adequate regarding the situation.

> *The more often a police **officer trains this decision making and acting under stress**, the **better** he can focus on task-relevant issues **in real-life and decide and act appropriately**.*

1.4.1 What is the consequence of training in the VR?

If trainings are **individualizable** for each trainee or team, the VR training will increase quality of DMA, which will lead to better and more correct decisions in real life.

Therefore, the **VR** must be **variable** and at the same time give the trainer an insight into the **physiological stress level** of a trainee. In VR you can **manipulate** the **sensory** (e.g.: noise) and the **cognitive** (e.g.: dispatcher information) **input** and this by just a few clicks. For SHOTPROS we need to test different stress cues to find out what "for the majority of police officers" is stressful and then, this kind of environment can be trained in the VR and **manipulated individually** as the perception of whether a situation is stressful or not remains individual for each trainee.

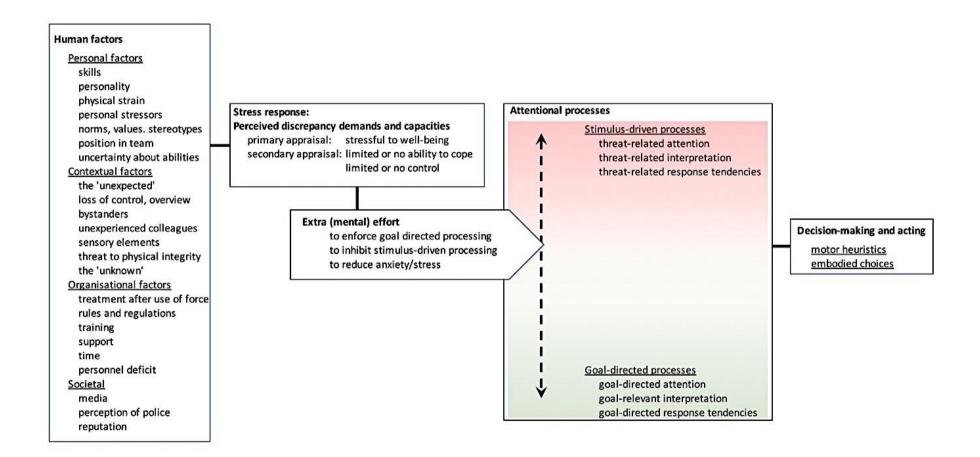The aim is to train skills to stay goal directed.

> *The trainee needs to **practice** how to **suppress irrelevant stimuli** despite the stress.*

Without these trainings a first responder will feel more overwhelmed and will not be able to focus on the **task-relevant input**. VR training may not make first responders feel less stressed, but it can **help them to choose correctly what to do and how to do it**, despite the stress. They can learn to **retain or restore the balance** of goal directed and stimuli driven processes.

In VR only **contextual human** factors can be displayed in the scenario and then be **manipulated** by clicking the SHOTPROS "Live-editor" to introduce different stress cues. But at the same time the **trainer needs to take the other factors into consideration when setting up the training** and needs to know for example the level of the trainee etc. to set the right objectives to really train the decision making and acting under stress (more on that will follow in D 3.3). Organisational factors and the general societal factors influence the training, but cannot be manipulated within the VR – but they play a role: For example, if filming bystanders are introduced as a stress cue this influences the trainee because he is thinking about the societal factors and therefore perceives the situation as stressful, which in the end probably lowers his ability to deal with it and finally let him make "wrong" decisions and unsuccessful actions.

Figure 1: Conceptual Human Factors Model of Police Officer's Decision-making and Acting in Stressful, High-Risk Situation

Human factors

<u>Personal factors</u>
  skills
  personality
  physical strain
  personal stressors
  norms, values. stereotypes
  position in team
  uncertainty about abilities
<u>Contextual factors</u>
  the 'unexpected'
  loss of control, overview
  bystanders
  unexperienced colleagues
  sensory elements
  threat to physical integrity
  the 'unknown'
<u>Organisational factors</u>
  treatment after use of force
  rules and regulations
  training
  support
  time
  personnel deficit
<u>Societal</u>
  media
  perception of police
  reputation

Stress response:
Perceived discrepancy demands and capacities
  primary appraisal: stressful to well-being
  secondary appraisal: limited or no ability to cope
                       limited or no control

Extra (mental) effort
  to enforce goal directed processing
  to inhibit stimulus-driven processing
  to reduce anxiety/stress

Attentional processes

<u>Stimulus-driven processes</u>
  threat-related attention
  threat-related interpretation
  threat-related response tendencies

<u>Goal-directed processes</u>
  goal-directed attention
  goal-relevant interpretation
  goal-directed response tendencies

Decision-making and acting
  <u>motor heuristics</u>
  <u>embodied choices</u>