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Adaptability in Law Enforcement

Towards a conceptual framework of adaptive behaviour

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Abstract

Adaptability is an area of concern in many fields including organizations, business, decision-making, teaching and society. To this point, however, very little is known about adaptability as a behavioural construct. Empirical data on adaptive thinking is sparse and the literature base is largely conceptual. The aim of the study therefore is twofold, first to come up with a conceptual framework about adaptability (including the concepts of cognitive flexibility and goal orientation), second, to examine the possibility to elicit and measure behavioural adaption in a controlled experiment. The first goal was reached through scientific literature research. For the second aim, participants ($N = 78$) were asked to take the role of an undercover agent and were given some background information on the missions they had to complete. Critically, during the missions participants faced an unexpected encounter, requiring the agent to adjust their behaviour in order to complete the mission objective. Adaptive behaviour was measured as behavioural, cognitive and emotional adjustment made as a response to the situational change. Results indicated an initial success in eliciting and measuring adaptive behaviour. Moreover, in the course of investigations, cognitive flexibility and goal orientation appeared to be valuable to expand the present paradigm.

Keywords: adaptability, resilience, naturalistic decision-making, cognitive flexibility, goal-orientation

Introduction

The world is changing faster than at any time in human history and is likely to change even faster. The ongoing advancements of globalization and dynamic technological environments place the modern society in swift changes (Santili, Marcionetti, Rochat, Rossier & Nota, 2017). People nowadays find themselves having to develop skills that differ substantially from the skills required in 20th century occupations. The idea of Darwin's work 'On the Origin of the Species' which describes that the species that are most adaptable will survive changing situations is still relevant (Claeys, 2000). In nature, organisms must be able to adapt to the circumstances of their environment to survive. Referred to the human species nowadays this could be mirrored in actively and continually adapt to the accelerating pace of change (e.g. adjust one's mindset and behaviour).

People's lives are characterized by frequent uncertainty, novelty and unexpected events across their lifespan. Being able to adapt to changes in society is one thing all people face, but people also have to deal with changing situations in personal development, including major life events such as beginning school, adjusting to peers or marriage as well as more ordinary events that occur on a daily basis (Martin, Nejad, Colmar & Liem, 2012). Despite the need to adapt to changing situations in personal development, adaptability is also relevant for professional development. The world of work is much less predictable, and people face greater challenges in adapting to changing tasks and demands. Being able to adapt therefore seems to be a critical ingredient to succeed in light of new changing situations. This recognition has fuelled growing interest in adaptability. To this point, however, very little is known about adaptability as a behavioural construct. Empirical data on

adaptive thinking is sparse and the literature base is largely conceptual (Ward et al., 2018).

Adaptability is an area of concern in many fields including organizations, business, decision-making, teaching and society (Ward, Gore, Hutton, Conway & Hoffman, 2018). Although adaptability has been studied in various contexts, there is very little known about the behavioural construct. There do not exist any evidence-based examinations, evaluations or training tools on adaptive behaviour (Ward et al., 2018). The concept of adaptability is not entirely clear; few attempts have been made to study adaptability as a competence, the acquisition, its assessment or its cultivation. The aim of this study therefore is twofold: first, the possibility to elicit and measure behavioural adaption will be examined; second, this study should serve as an attempt to conceptualize adaptive behaviour on an empirical basis (based on literature research). To narrow down the topic, the present study will limit itself to adaptability in the law enforcement context; an example of a work environment that is prone to uncertainty and change, and therefore high in need for adaptive employees.

Adaptability in a law enforcement context

As the world has become more dynamic and unpredictable, the need for adaptive behaviour is of increasing importance in safety and security contexts. For the military, it is important, for example, to be creative in making strategic plans during unpredictable missions, or to be able to adapt to other cultures in foreign countries during missions, as well as to physically adapt to extreme situations (Mun, Van der Hulst, Oprins, Jetten, Van den Bosch & Schraagen, 2016). In a policing context, there is a high demand for an adaptive workforce, since the nature of police work continuously alters. That is, officers today work within complex task and decision-making environments that require them to have an understanding of not only basic

police operations but also a range of different anti-crime strategies, policing technologies, evidence-based policing or predictive analytics (Huey, Kalyal & Peladeau, 2017). Also the types of crime change according to requirements and possibilities of time. Looking at the crime trends in the past century, it can be seen that the nature of crime is changing, crimes nowadays concern less the familiar household crimes but rather new types of crime involving cybercrime and terrorism (Friedman, Grawert & Culen, 2017). The rise of concerns about terrorism and organized crime has lead to a shift from reactive to proactive policing (Kruisbergen, de Jong & Kleemans, 2011). This shift is accompanied by the use of increasingly invasive investigative techniques, such as electronic surveillance or phone tapping. As a consequence, police officers constantly have to adapt to new forensic techniques and changes in legislation or judicial decision-making.

Moreover, they have to deal with different kinds of people who can be anywhere imaginable on a very broad emotional spectrum. Hence, they are faced with numerous personalities and a wide array of emotional responses, to which they have to react appropriately in respect of attending to the right social cues (Alison, Alison, Noone, Elntib & Christiansen, 2013). Police officers are often faced with situations that can lead to undesirable consequence, at extreme even death (Harris, Eccles, Freeman & Ward, 2017). Thus, policemen carry out a lot of responsibility and have to make crucial decisions in extremely stressful conditions. In addition, the public has a high expectation of police performance in handling such critical incidents (Au, Wong, Leung & Chiu, 2018). It is therefore absolutely essential for a police officer to be able to deal with and adapt to such situations.

However, although adaptability is recognized as an essential skill for police and military officers (Klein et al., 2015), it is remarkable that there do not exist any

evidence-based examinations, evaluations or training tools on adaptive behaviour. The concept of adaptability is not entirely clear; few attempts have been made to study adaptability as a competence, the acquisition, its assessment or its cultivation (Ward et al., 2018). In the context of law enforcement, this is rather astonishing considering that the modern society calls for police officers equipped with the ability to adjust tactics to achieve objectives. This study, therefore, should serve as an attempt to single out and examine adaptive behaviour by defining adaptability and distinguishing it from other related constructs and creating an experimental paradigm.

Adaptability

The etymology of the word adaptability can be traced to the early 14th century, derived from the Latin ‘adapto’ which means to fit or to adjust. Current definitions of adaptability have changed slightly, ‘to adjust fittingly’ or ‘to make suitable to new requirements’ (Schmidt, Eguchi, Austin & Gibb, 2010). The Cambridge English dictionary (n.d) defines adaptability as ‘an ability to change in order to suit different conditions’.

A review of the scientific literature reveals that there is not a widely accepted definition of adaptability. In natural science, the definition of adaptability is disputed, it broadly refers to ‘the development of genetic or behavioural characteristics which enable organisms or systems to cope with environmental changes in order to survive and reproduce’ (Smit & Wandel, 2006, p. 283).

In the psychological domain, adaptability is considered ‘the capacity to make appropriate responses to changed or changing situations; the ability to modify or adjust one’s behaviour in meeting different circumstances and different people’ (Van den Bos, 2015, p.18). More cognitive-based models have quite recently supplemented such behavioural definitions of adaptability. For instance, Martin and colleagues

(2012) define adaptability as the cognitive, behavioural and affective adjustment to change. Hereby, the *cognitive component* is defined as the evaluation of a new situation and the capacity to adjust one's thinking to deal with changing, new and uncertain demands. In terms of *behaviour*, the ability to attempt new behaviours or adjust existing behaviours to successfully deal with new situations is what is referred to. The *affective component* refers to the emotional response that is recognized as being important for an individual's motivation or willingness of managing changes (Martin, Nejad, Colmar & Liem, 2012). In other words, adaptability involves a change in behaviour, an expectation that this behavioural change is appropriate for the specific situation and based on that a reactive response to change. Cognitive models like these emphasize that psychological processes facilitate behaviour, and that these processes are key to understanding the observed behaviour. Hence, in order to properly examine and measure adaptability, it is important to unbundle related constructs. In the case of adaptability, the most related constructs would be resilience, buoyancy and coping (Martin et al., 2012).

Resilience, Buoyancy and Coping

Resilience is derived from the Latin 'resilire', which means 'to bounce back'. Originally resilience has its roots in physics and material science, and can also be defined as flexibility, resistance or elasticity. In the psychological domain, resilience has been defined as the process of successful adjustment despite challenging or threatening circumstances (Howard & Johnson, 2000). Hence, resilience is a process of responding to change but focuses more specifically on addressing adversities and difficulties. It should be mentioned that these circumstantial adversities are characterized in acute and chronic terms, and thus have a major impact on essential processes (Martin et al., 2013). This means, resilience does not address minor,

insubstantial everyday challenges (see buoyancy). The associated principle of resilience is that of a tumbler toy, a toy figure that always bounces back and returns to its initial state (Fook, 2016). This principle illustrates the emphasis of the concept of resilience, which is the ability to withstand and survive disturbances in order to return to the baseline (Joseph, 2013).

Buoyancy is closely related with resilience, there is only one distinctive detail: buoyancy encompasses adjustments to less serious adversities and setbacks of daily life, whereas resilience involves adjusting to more accumulative and impactful adversities (Martin & Marsh, 2009). In other words, buoyancy is dealing with everyday challenges that could be considered as minor adversity (low-level nature).

Coping refers to cognitive and behavioural efforts to manage challenging demands that are perceived as difficult or beyond the individual's resources. Similar to resilience and buoyancy, coping involves a response to adversity. It is the mental toughness that helps people dealing with hassles when demands seem too difficult to handle (Martin et al., 2013).

As the definitions of adaptability, resilience, buoyancy and coping show, the constructs share the features of completing an objective in a changing situation. The difference seems to lie more in the type of situation. That is, resilience, buoyancy and coping are primarily aimed at getting through or getting by, whereas adaptability can apply on better dealing with changing situations that may actually be positive in nature (Wellensiek, 2011).

In practice, however, it may not be as simple as that, since it could be argued that combinations of flexible behaviour, for example being both resilient and adaptive is what will produce observable outputs. Consequently, researchers have developed inclusive 'macrocognitive' models illustrating relationships between situational

understanding and flexible execution. The first article explicitly addressing macrocognition, the way of describing cognitive functions as they naturally occur was published in 2000 (Klein, Klein & Klein, 2000). However, investigations into the nature of making decisions in natural setting began already in the 1980s. This line of research is what now has become known as Natural Decision Making (Klein, Wright, 2016).

Naturalistic Decision Making

Naturalistic Decision Making (NDM) attempts to study how individuals make decisions in real-world settings as opposed to controlled laboratory settings (Klein, 2008). NDM focuses on decision making in complex conditions, in the face of uncertainty, with vague goals, high stakes, dynamic and changing environments, time pressure and real-time reactions. One of the early works that led to the NDM approach was an attempt to analyse the decision making of firefighters since they are required to make decisions under conditions of uncertainty and time pressure in which the consequences are at high stakes. However, NDM approach originated in the early research on chess players. Investigations showed that grand masters differ from novice chess players in their quick judgments; the masters identified the most promising movements more rapidly, whereas novice players often failed to consider the best moves (Kahneman & Klein, 2009). The rapid decision of the expert players was explained by a perceptual skill in which complex patterns were recognized. Chase and Simon (1973) claimed that chess experts have acquired a repertoire of immediately recognizable patterns, which enables them to identify good moves without having to calculate all possible contingencies. Based on this assumption, intuition was defined as the 'recognition of patterns stored in memory' (Kahneman & Klein, 2009, p.516). The understanding of intuition is a central objective of NDM.

Researchers try to explain the concept by investigating the strategies of expert decision makers.

According to Ward and colleagues (2018) expertise is a continuous learning process that requires the ability to deal with change. However, it is important to mention that expertise and adaptability aren't interchangeable concepts, in order to adequately define and examine adaptive skill, it is therefore important to differentiate the concepts. To do so, first, the term expert needs to be defined. When one thinks of an expert, qualities such as experienced, skilled, talented and perhaps even gifted come to mind. Hoffman (1998) defined experts as individuals who have certain skills or sub-domain specializations. Still, there could be doubt when to consider an individual as an expert since there does not exist a golden standard for being an expert. Definitions are rather sketchy; hence, the great challenge is to generate an operational definition of expertise. Hoffman et al. 1993 argue that experts are very skilled at their familiar tasks, while disruption of these tasks can cause the expert's superior performance to decline markedly. Ward et al. (2018) conversely consider expertise best leveraged by examining challenging, non-routine cases where adaptive skill is paramount. According to their research, it could be argued that expertise requires a sufficient number of routine cases that might evoke the ability to adapt to new, non-routine cases. Opposed to the more traditional definitions that suggest expertise as highly domain specific with little evidence of transfer or adaption beyond tasks that require familiar reasoning strategies, Ward et al. (2018) in their study capture 'adaptive expertise'.

Adaptive expertise is a term coined by Hatano and Inagaki (1984/ 1986), their research focussed on differentiating routine from adaptive skill. *Routine task execution* was defined as being based on procedural skill or knowledge, whereas

routine expertise was considered as being outstanding in terms of accuracy, speed and performance. Still, routine expertise does not account for adapting to new problems.

Adaptive experts, in contrast, were described as being able to effectively perform procedural skills in combination with having a conceptual understanding of those procedures. Conceptual understanding was thereby considered the basis for being adaptive and flexible. The rationale is founded on the assumption that a strong conceptual understanding permits the development of a context-sensitive strategy. This context sensitivity enables experts to identify key decision points in specific situations, which allow immediate access to opportunities to deviate from the existing procedure when variations of this procedure might be appropriate.

Taken together, Hatano and Inagaki (1986) conceptualized that both types of expertise encompass the same extent of knowledge and therefore ability to perform flawlessly in familiar situations. The difference becomes evident once confronted with an unfamiliar situation, routine experts are likely to struggle with unexpected demands, whereas adaptive experts are likely to overcome such situations and quickly regain a high level of performance (Bohle, Stalmeijer, Königs, Segers & van Merriënboer, 2014). Research conducted by Spiro et al. (1991) claims that in general, experts' mental representations permit better adjustment to changes, which implies that experts are more adaptable than novices.

Cognitive flexibility theory

Although experts may perform better in unexpected situations than novices, even experts are prone to biases such as the 'reductive tendency'. Reductive tendency is considered as people's tendency to oversimplify, which can lead to significant misconceptions and incorrect inferences. This construct comes from research conducted under the rubric of cognitive flexibility theory. The roots of cognitive

flexibility can be traced to research conducted in a medical context (Feltovich, Hoffman, Woods & Roesler, 2004). Specifically, Feltovich and colleagues (2004) examined how people learn and perform in situations that are cognitively demanding. It has been found that students often deal with complexity by oversimplification, which can lead to imprecise application of knowledge and incorrect inferences about conditions, which are resistant to change and can inhibit future adaptation. In simple terms, oversimplification refers to the tendency to view situations as simpler than they are. Feltovich et al. (2004) argue that individuals tend to simplify and try to defend simple understandings when they are confronted with a more complex situation than expected. This can be explained by the fact, that humans are creatures of habits that prefer familiar courses of actions over new ones (Laureiro-Martinez & Brusoni, 2018). With this in mind, one could understand cognitive flexibility as the ability to recognize when to rely on habits versus when to explore new strategies. Therefore, cognitive flexibility could also be considered, as the plasticity required for adapting to new demands. In line with the definition proposed from Laureiro-Martinez & Brusoni (2018), Krems (1996) defined cognitive flexibility as the ability to recognize ineffective strategies of action and subsequently make appropriate change to adapt to the situation.

These definitions let assume cognitive flexibility being the same as adaptability, in fact, some researchers use the terms interchangeably. Reviewing scientific literature, it seems that the term flexibility is primarily used as ‘switching smoothly between different strategies’, whereas adaptability is considered as ‘selecting the most appropriate strategy’ (Verschaffel, Luwel, Torbeyns & Van Dooren, 2009, p. 337). Hence, the term flexibility puts its emphasis on the use of

multiple strategies, whereas adaptability focuses on making *appropriate strategic choices*.

Based on what has been said so far, the question arises what it means to be adaptive in one's strategic choices. Verschaffel et al. (2009) define an adaptive choice of a strategy as the conscious or unconscious selection and use of the most appropriate solution strategy on a given problem, in a particular situation, to a specific individual. This choice of strategy among others may then depend on the goal orientation of an individual.

Goal orientation

The concept of goal orientation emerged in the 1980s. Carol Dweck and colleagues (1986) conducted research with grade school children, who had to work on a set of problem-solving tasks that they were able to successfully solve and a set of problem-solving tasks that they were not able to solve. In their research, it was observed that there were two distinct response patterns: a portion of children exhibited *maladaptive response pattern*, whereas other children exhibited more *adaptive response pattern*.

The former ones were observed to have a loss of confidence in their ability and feelings of helplessness and distress, their problem-solving strategies became random and even counterproductive. The children who exhibited adaptive response pattern, on the contrary, appeared to enjoy the challenge and remained confident that they have the ability to solve the problems, their problem-solving strategies became more productive (VandeWalle, 2018).

Additional investigation revealed, that the children tended to approach activities with different underlying goals, *developing* ability and *demonstrating* ability. Based on that finding, Dweck (1986) proposed the concept of goal orientation and identified two basic goal orientations: *learning goal orientation* and *performance*

goal orientation. The former one refers to ‘a preference to develop one’s competence by acquiring new skills and mastering new situations’ whereas the latter one is considered ‘a preference to demonstrate and validate one’s competence by seeking favourable judgements and avoiding negative judgements from others’ (VandeWalle, 2018, p.163). To summarize, a *learning goal* focuses on effort as a means of achieving ability, surmounting obstacles or increase ability. *Performance goals*, in contrast, have its focus on issues of ability (e.g. confidence in ability; winning positive judgements of own abilities and avoiding negative ones).

Based on these findings research was conducted with adults, the main focus of investigations was if adults do have the same goal orientations as children. Moreover, an issue was to examine how these orientations impact behaviour and performance (preconditioned that adults have these orientations) (VandeWalle, 2018). Research findings showed that adults hold learning and performance goal orientations. Further, the influential processes of behaviour and performance were identified, prominent among the processes were: cognitive framing, self-management procedures and the pursuit of skill development.

Central to understanding how goal orientations influences behaviour and performance are findings that both goal orientations are associated with different cognitive frameworks for how situations are interpreted. More specifically, they are associated with different implicit theories about personal abilities such as intelligence. Learning goal orientation is associated with *incremental implicit theory*, stating that ability can be developed with effort. Performance goal orientation, in contrast, is associated with an *entity implicit theory*, viewing ability as a fixed attribute that is difficult to develop (Dweck, 1986).

Besides the different underlying theories learning and performance goals are also associated with different beliefs about the value of effort and causes of success. *Learning goal orientation* stresses the importance of effort for success. Effort hereby is viewed as a means for developing additional capabilities needed for future mastery. With a *performance goal orientation*, in contrast, exerting substantial efforts is viewed as ineffective, because ability is seen as an innate attribute that is difficult to change (VandeWalle, 2018). The connection between goal orientation and adaptability can be made in that different goal orientations lead to different ways of dealing with changing situations. As an example, assuming a performance goal oriented individual performs poorly, he or she would not see any need in putting more effort into the task or changing the task strategy since they view the outcome as a reflection of their (in) ability. In contrast, a learning goal orientated individual would tend to view poor performance as feedback to alter their strategy and put more effort into the modification of their strategy and the task itself.

Studying adaptability as a behavioural construct

To capture adaptive behaviour, a novel experimental set-up inspired by observations of police undercover training at the Los Angeles Police Department was developed (S. Oleszkiewicz, September 2018). In its most simple terms, this paradigm plays with three principle features: an objective, an expectation, and a potential violation of that expectation. More precise, the participants will take the role of an undercover agent who has to complete a mission objective (e.g., collect fingerprints from a student advisor at the university). The agent receives a brief case file providing some background information on the operation. However, during the mission the undercover agent will face an encounter that is inherently unexpected in the situation described, requiring the agent to adjust their behaviour in order to complete the

mission objective. Adaptability is then measured as behavioural, cognitive and emotional adjustments.

The introduced paradigm is a first attempt to capture adaptive behaviour in a controlled context. The main questions regarding this initial model are whether the experimental design meets the needed requirements to elicit adaptive behaviour. First, it will be examined whether the experimental set-up violates the participant's expectations (otherwise adaptive behaviour would not be required). Moreover, we aim to identify if the experimental paradigm elicits adaptive rather than resilient behaviour. Last, it will be investigated if there can be seen any change in adaptive behaviour in the course of the experiment. The main questions regarding the paradigm can be summarized as follows:

- Does the experimental set-up violate the participant's expectations?
- Does the experimental set-up elicit adaptive rather than resilient behaviour?
- Does the experimental set-up influence adaptive behaviour across the operations?

Method

To capture adaptive behaviour, a novel experimental set-up inspired by observations of police undercover training at the Los Angeles Police Department was developed (S. Oleszkiewicz, September 2018). This experimental set-up plays with three principle features: the participants have to complete a fixed task (*an objective*), they receive some background information about the situation they will be encounter (*an expectation*), however, in the course of the mission the agent will be confronted with unexpected challenges (*violation of the expectation*) that require the adjustment of their behaviour in order to still complete the mission objective.

The participants had to complete a total of three undercover operations (see Appendix I for the instructions). As mentioned before, each operation included a mission objective, an expectation and a violation of that expectation. The three operations were called 'Secret note operation', 'Tap water operation' and 'Fingerprint operation', described below.

The Secret note operation. Participants were asked to collect a secret note hidden in a book inside the office of a professor (mission objective). To collect the note the participants needed to borrow the book from a professor who is unbeknownst of the letter's existence. Participants were informed that the professor is likely to be nice towards them and willing to lend them the book (expectation). However, when the participants arrived at the office, the professor is out on a business trip and they encounter his assistant instead. The assistant is reluctant to lend the book simply because it is not hers (violation of expectation).

The Tap water operation. Participants were asked to collect a sample of tap water from the main distribution source located at the university reception (mission objective). Participants were informed that the receptionist might be unwilling to step away from her position to get them a glass of water (expectation). However, when the participants approached the receptionist, the receptionist cannot speak any language known to the participant (violation of expectation).

The Fingerprint operation. Participants were asked to collect the fingerprints of a student advisor at the university (mission objective). In order to collect the fingerprints, participants should let the advisor hold a paper with the participant's grades during a scheduled study consultation meeting (expectation). However, when the participants entered the office, the advisor is just about to leave to the airport and

informs the participants that a colleague is just about to arrive to consult them on their case (violation of expectation).

Experiment 1

Design

The current study has a repeated measures design (Operation 1, Operation 2, Operation 3) that was counter-balanced in Order A (Secret note – Tap water – Fingerprint) vs. Order B (Fingerprint – Tap water – Secret note).

Participants

Participants were recruited to take part in a study on being an undercover agent. The sample consisted of 37 individuals (89% students). Of the respondents 23 (62%) were male, 14 (38%) female. Participants' age ranged between 19 and 31 years ($M = 22.61$, $SD = 2.58$). Nationalities were distributed as follows: German (45%), Dutch (37%) and others (18%). After removing participants that did not complete the full study ($n = 4$), the final sample used in this study consisted of 33 participants. Participation was on a voluntary basis and all respondents were compensated with 5€ (university students also received 1 SONA credit). The study was approved by the ethical review board of the University of Twente.

Procedure

Upon arrival, participants had to confirm that they agree with the informed consent. Then the procedure was designed as follows. Participants received the instructions for their first mission and were given approximately five minutes to prepare. They were then escorted to the door of the room in which they had to perform their mission. Time was measured from the moment when participants knocked on the door and started their mission. After the completion of an operation, the participants were escorted back to fill out a between-operation questionnaire. When the questionnaire

was completed, participants received the instructions for their next mission. For operations 2 and 3 the exact same procedure was followed. However, after the conclusion of the third operation, the participants received an additional final questionnaire. By completing the final questionnaire the experiment was over.

Interactions during the missions. Research assistants were used as role-players who interacted with the participants during each mission. The participants met a new role player for each mission. To keep high control, standardized protocols for the role-play were developed (see Appendix II). There was one rule for all missions, the assistants had to wait for three prompts, and on the forth they had to give in. (i.e., consent to the participant's request). However, if participants wanted to give up or accept a rejection, research assistants immediately had to turn to the final concession phrase, thus they had to give in.

Materials

Between operations questionnaire. Immediately after each operation the participants filled in the adaptability questionnaire (Martin et al., 2012, Collie & Martin, 2016) and rated their perceived ability to adjust their behaviour, thinking and feeling. The adaptability scale contains six questions about cognitive/behavioural adjustment (e.g. *I was able to think through a number of possible options to assist me when the new situation arose*) and three questions about emotional adjustments (e.g. *I was able to minimize frustration or irritation so that I could deal with it best*) (see Appendix IV). Participants were asked to indicate to what extents they agree with each statement using a 7-point scale, with 1 meaning strongly agree and 7 meaning strongly disagree.

After having filled in the adaptability scale, the participants rated the situation they encountered on seven distinct descriptors. Three descriptors examined if the

change called for adaptive behaviour, three descriptors examined if the change would call for resilient behaviour, and one descriptor examined if the situational change was considered challenging. Participants were asked to rate to what extent they would describe the situation on a 7-point rating scale, with 1 meaning not at all and 7 meaning very. The instruction stated: '*Please describe to what extent you would describe the situation you just encountered with words such as (e.g. a challenge) (1 – Not at all; 7 – Very)*'. The descriptors and corresponding situations are listed in Table 1.

Table 1

Descriptors and corresponding situations

Descriptor	Situation
<i>Situational change</i>	a challenge (a situation that tests your abilities or is seen as difficult)
<i>Adaptive behaviour</i>	a change (a new or different situation) a novelty (an original or unusual situation) an uncertainty (an unsure or unknown situation)
<i>Resilient behaviour</i>	a threat (a situation likely to cause damage or danger) an adversity (a difficult or unpleasant situation) a confrontation (a hostile or argumentative situation)

Final questionnaire. After all operations had been completed, the participants answered four questions regarding demographics (age, gender, nationality and affiliation). Moreover, participants were asked to rate their motivation to participate in the study, how unexpected each operation was and if they had anticipated each situational change. All question were answered on a 7-point rating scale, with 1 meaning not at all and 7 meaning very. Next, they again had to fill in the adaptability

scale, but this time the participants were asked to consider the perspective of an average person. This measure was included since individuals tend to deviate positively from an objective view of themselves.

Results Experiment 1

As a first step, the data was screened for outliers. Participants that did not complete the full study were removed and recorded as missing values ($n = 4$). Further, the motivation of the participants to take part in the study was checked. A mean above 5 was considered as high. Participants were very motivated to complete their objective during the three operations ($M = 5.58$, $SD = 0.97$) and they took on the operations ($M = 5.85$, $SD = 0.87$), as well as their roles as special agents ($M = 5.61$, $SD = 1.10$) in a serious manner.

Next, it was tested, whether the operations violated the participant's expectations. The first operation was perceived as very unexpected ($M = 5.30$, $SD = 1.65$), as well as the second operation ($M = 5.36$, $SD = 1.59$), the third operation was unexpected ($M = 4.42$, $SD = 1.50$).

Adaptive behaviour versus resilient behaviour

To answer the question if the experimental set-up elicited adaptive rather than resilient behaviour, first, the validity of the measurement was tested. In order to measure the perception of the situation the participants were encountered, seven items were used: change, novelty, threat, adversity, confrontation and challenge (see Table 1). To determine the number of constructs, and validate the measurement, a separate factor analysis for each operation was conducted. The order of the missions was not included in these analyses since it was not relevant.

Factor analysis 1. Seven items were factor analysed using a principal components analysis with direct oblimin rotation. The analysis yielded three factors,

factor one was labelled adaptive behaviour, due to the loadings on: change, uncertainty and novelty. The second factor derived from the analysis was labelled resilient behaviour, this label was used due to the high loadings on: adversity and threat. Moreover, there was a third factor explained by challenge, change and confrontation.

Table 2

Factor loadings principal component analysis with oblimin rotation Experiment 1 – Operation 1

	Factor 1 <i>Adaptive behaviour</i>	Factor 2 <i>Resilient behaviour</i>	Factor 3
<i>Change</i>	.502		.519
<i>Novelty</i>	.598		
<i>Uncertainty</i>	.798		
<i>Threat</i>		.823	
<i>Adversity</i>		.811	
<i>Confrontation</i>			-.764
<i>Challenge</i>			.732

Note. Factor loadings < .4 are suppressed

Factor analysis 2. The second factor analysis of operation two revealed two factors. Six items (change, uncertainty, threat, adversity, confrontation and challenge) were factor analysed using a principal components analysis with direct oblimin rotation. The factor analysis yielded two factors, factor one was labelled adaptive behaviour due to the loadings on: change, uncertainty and challenge. The second factor was labelled resilient behaviour due to the loadings on: adversity, threat and confrontation. However, confrontation loads on both factors.

Table 3

Factor loadings principal component analysis with oblimin rotation Experiment 1 - Operation 2

	Factor 1 <i>Adaptive behaviour</i>	Factor 2 <i>Resilient behaviour</i>
<i>Change</i>	.872	
<i>Novelty</i>	*	*
<i>Uncertainty</i>	.648	
<i>Threat</i>		.769
<i>Adversity</i>		.813
<i>Confrontation</i>	-.428	.587
<i>Challenge</i>	.756	

Note. Factor loadings < .4 are suppressed. *missing value

Factor analysis 3. The third factor analysis of the third operation yielded two factors. The first factor was labelled adaptive behaviour, due to the loadings on: change, uncertainty, novelty and challenge. Novelty loads on both factors, however, more on factor one than on factor two. The second factor was labelled resilient behaviour, due to the loadings on: adversity, confrontation and threat.

Table 4

Factor loadings principal component analysis with oblimin rotation Experiment 1- Operation 3

	Factor 1 <i>Adaptive behaviour</i>	Factor 2 <i>Resilient behaviour</i>
<i>Change</i>	.733	
<i>Novelty</i>	.591	-.454
<i>Uncertainty</i>	.739	
<i>Threat</i>		.626
<i>Adversity</i>		.814
<i>Confrontation</i>		.628

<i>Challenge</i>	.765
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Note. Factor loadings < .4 are suppressed

Overall, the factor analyses indicated, that the items represent distinct constructs.

The main factors (adaptive behaviour and resilient behaviour) seem to be valid across the three mission operations. However, the third construct ‘situational change’ cannot be measured adequately by one item (challenge).

Reliability. As a next step, the reliability of a scale out of the above-mentioned items was tested. The adaptive behaviour scale contains 3 items, change, novelty and uncertainty. Cronbach's alpha of the items was moderately reliable ($\alpha = .620$). The resilient behaviour scale consisting of the 3 items: threat, adversity and confrontation was found to be reliable ($\alpha = .728$).

Adaptive versus resilient behaviour. Finally, to answer the question if the experimental set-up elicited adaptive rather than resilient behaviour, a paired sample t-test was conducted. Adaptive behaviour score ($M = 3,73$, $SD = .46$) was statistically significant higher than resilient behaviour score ($M = 2,43$, $SD = .60$), $t(32) = 9,30$, $p < .001$. Hence, the experimental set-up elicited adaptive rather than resilient behaviour.

Influence on adaptive behaviour

In order to answer the question whether the experimental set-up influenced adaptive behaviour, an already validated Adaptability Scale (Martin et al., 2012, Collie & Martin, 2016) was used. The reliability was tested separately for each mission.

Cronbach's alpha was found highly reliable for the Secret note mission ($\alpha = .921$), the Tap water mission ($\alpha = .75$), as well as for the Fingerprint mission ($\alpha = .890$).

To explore whether the experimental set-up influenced adaptive behaviour across the operations a repeated measures ANOVA with the counterbalanced

operation order (A, B) as the between-subject factor and the Adaptability Scale scores for each operation as within factor was conducted. The within factor showed no statistically significant main effect [Wilks' Lambda = 0.859, $F(2,52) = 2.468$, $p = .102$], the interaction between operation and order also showed no statistically significant effect, [Wilks' Lambda = 0.867, $F(2,62) = 2.115$, $p = 0.138$]. Indicating no differences (increases or decreases) in adaptive behaviour across the operations and between the orders.

Moreover, a repeated measures ANOVA with mission as within factor was conducted. No statistically significant difference was found between the missions [Wilks' Lambda = .889, $F(2,64) = 1.944$, $p = 0.16$].

Last, to test whether there was a difference in the Adaptability Scale for the participants themselves and how they rated the Adaptability Scale from the perspective of an average person, a paired sample t-test was conducted. There was a statistically significant difference between their own rating ($M = 1.36$, $SD = .31$) and the rating for another person ($M = 3.30$, $SD = .75$), $p = <.001$, $t(32) = -16.34$.

Experiment 2

Participants

A total of 41 university students were recruited to take part in a study on being an undercover agent via SONA (Radboud Research Participation System) for students from the University of Twente. Of the respondents, 22 (54 %) were female and 19 (46 %) male. Participants' age was ranged from 19 to 29 years ($M = 21.93$, $SD = 2.16$). Nationalities were distributed as follows: German (59%), Dutch (15%) and others (26%). Participation was on a voluntary basis and all respondents were compensated

by 5€ and one SONA credit. The ethical review board at the University of Twente approved the study.

Materials

This experiment used the same materials and procedure as experiments 1. The only difference from Experiment 1 was a modification to the design. For the last operation participants were provided with a correct indication. The participant's expectation of the mission to complete was not violated (Table 5). That is, for Order A, the participants were given correct background information about the Fingerprint mission (i.e., that the study advisor was on the way to leave the country). In addition, for Order B, the participants were given correct background information about the Secret note mission (i.e. that explained that the professor was away on a business trip).

Table 5

The order and background descriptions of the missions

Expectation	Experiment 2	
	Order A	Order B
Incorrect	Secret Note	Fingerprints
Incorrect	Tap Water	Tap Water
Correct	Fingerprints	Secret Note

Results Experiment 2

For this experiment, the same analyses as in Experiment 1 were conducted.

Participants were very motivated to complete their objective during the three operations ($M = 6.15$, $SD = 0.85$). They also took on the operations ($M = 5.71$, $SD = 1.06$) and their roles as special agents ($M = 5.76$, $SD = 1.04$) in a serious manner.

The first operation was perceived as very unexpected ($M = 5.41$, $SD = 1.82$), as well as the second operation ($M = 5.59$, $SD = 1.449$), the third operation was less unexpected ($M = 3.37$, $SD = 1.61$).

To answer the question whether the experimental set-up elicits adaptive rather than resilient behaviour, the validity of the measurement was tested. Again, three separate factor analyses were conducted to check whether the seven items indeed represent distinct constructs.

Factor analysis 1. The first factor analysis of operation one yielded three factors. Seven items (change, novelty, uncertainty, threat, adversity, confrontation and challenge) were factor analysed using a principal components analysis with direct oblimin rotation. See Table 6 for the factor loadings.

Table 6

Factor loadings principal component analysis with oblimin rotation in Experiment 2 - Operation 1

	Factor 1	Factor 2	Factor 3
<i>Change</i>	.849		
<i>Novelty</i>	.614	-.450	.463
<i>Uncertainty</i>	.515		.602
<i>Threat</i>		.737	
<i>Adversity</i>	.659		-.512
<i>Confrontation</i>		.748	
<i>Challenge</i>	.586		-.519

Note. Factor loadings < .4 are suppressed

Factor analysis 2. The second factor analysis of operation two indicated two factors. All items load on Factor 1. The other factor is explained by change, novelty, threat and confrontation.

Table 7

Factor loadings principal component analysis with oblimin rotation in Experiment 2-Operation 2

	Factor 1	Factor 2
<i>Change</i>	.510	.676
<i>Novelty</i>	.685	.551
<i>Uncertainty</i>	.757	
<i>Threat</i>	.594	-.484
<i>Adversity</i>	.824	
<i>Confrontation</i>	.649	-.521
<i>Challenge</i>	.517	

Note. Factor loadings < .4 are suppressed

Factor analysis 3. The third factor analysis of operation three yielded two factors. All items load on factor 1. Factor 2 is explained by change, threat and confrontation.

Table 8

Factor loadings principal component analysis with oblimin rotation in Experiment 2-Operation 3

	Factor 1	Factor 2
<i>Change</i>	.763	-.431
<i>Novelty</i>	.776	
<i>Uncertainty</i>	.727	
<i>Threat</i>	.648	.537
<i>Adversity</i>	.751	
<i>Confrontation</i>	.426	.752
<i>Challenge</i>	.723	

Note. Factor loadings < .4 are suppressed

Overall, there can be seen a recurring theme, that is, that change, novelty and uncertainty (meant to measure adaptive behaviour) always load on the same factor. While the items threat and confrontation (meant to measure resilient behaviour) load on a separate factor.

Reliability. As a next step, the reliability of a scale out of the above-mentioned items was tested. The adaptive behaviour scale contains 3 items, change, novelty and uncertainty. Cronbach's alpha of the items was found to be reliable ($\alpha = .792$). The resilient behaviour scale consisting of the 2 items: threat and confrontation was found highly reliable ($\alpha = .804$).

Adaptive versus resilient behaviour. Finally, to answer the question if the experimental set-up elicited adaptive rather than resilient behaviour, a paired sample t-test was conducted. Adaptive behaviour score ($M = 5,05$, $SD = .91$) was statistically significant higher than resilient behaviour score ($M = 2,90$, $SD = 1.23$), $t(40) = -10,45$, $p < .001$. Hence, the experimental set-up elicited adaptive rather than resilient behaviour.

Influence on adaptive behaviour

In order to check whether the experimental set-up influenced adaptive behaviour, an already validated Adaptability Scale (Martin et al., 2012, Collie & Martin, 2016) was used. Three separate reliability tests were conducted for each mission. Cronbach's alpha was found highly reliable for the Secret note mission ($\alpha = .884$), the Tap water mission ($\alpha = .940$), as well as for the Fingerprint mission ($\alpha = .920$).

Next, a repeated measures ANOVA with the counterbalanced operation order (A, B) as the between-subject factor and the Adaptability Scale scores for each operation as within factor was conducted. The within factor showed no statistically significant main effect [Wilks' Lambda = 0.952, $F(2,78) = 0.948$, $p = .397$],

indicating no difference across the operations. Furthermore, no significant difference was found between the orders [$F(1,39) = 0.011, p = .917$]. However, there was a significant interaction effect [Wilks' Lambda = 0.78, $F(2,78) = 5.353, p = .009$], indicating a difference between Order A and Order B across the different operations. On average, during the Fingerprint mission participants perceived their ability to adapt the lowest (see Table 9). Indicating, participants in Order A (Secret note – Tap water – Fingerprint) became less adaptive in the course of the missions, whereas participants in Order B (Fingerprint – Tap water – Secret note) became more adaptive.

Table 9

Means and SD of the Adaptability Scale across the missions

	Order A	Order B
	<i>M (SD)</i>	<i>M (SD)</i>
Secret note	2.68 (0.81)	2.47 (0.78)
Tap water	2.67 (1.16)	2.76 (1.09)
Fingerprint	3.12 (0.95)	3.32 (1.19)

Further, a repeated measures ANOVA with mission as within factor was conducted, there was a statistically significant difference between the missions [Wilks' Lambda = .788, $F(2,80) = 5.237, p = .01$]. Pairwise comparisons using multiple paired t-test with a Bonferroni correction showed a significant difference between the Secret note mission and the Fingerprint mission ($p = .007$). The Fingerprint mission scores were statistically significant higher ($M = 3.22, SD = .166$) than the Secret note scores ($M = 2.58, SD = .124$). Indicating, that the Fingerprint mission was more difficult than the Secret note mission.

Moreover, to check whether there was a difference in the Adaptability Scale scores for the participants themselves and how they rated the Adaptability Scale from the perspective of an average person, a paired sample t-test was conducted. There was a statistically significant difference between their own rating ($M = 2.84$, $SD = .68$) and the rating for another person ($M = 3.13$, $SD = .60$), $p = .02$, $t(40) = -2.42$.

Discussion

The goal of the study was twofold: first, to come up with a conceptual framework about adaptability; second, to examine the possibility to elicit and measure behavioural adaption. In essence, results showed an initial success in eliciting and measuring adaptability.

Experiment 1

As was shown in Experiment 1, participants were highly motivated to take part in the study, increasing the likelihood of attentive participation, which in turn could have a positive effect on the validity of the study. Moreover, they took on the operations and their roles as special agents in a serious manner, which also adds to the validity of the experimental set-up.

As desired, participants experienced a violation of their expectation. This was important as the operations were supposed to be unexpected, so that participants were required to adapt to a changing situation. The first two operations both had high mean scores, indicating the operations were successful in violating the participant's expectations. However, the third operation indicated a lower mean score. It could possibly be that participants had a learning effect during the course of the operations. Since the operations followed each other within a short time, participants already expected something unpredictable to happen.

Moreover, to be sure that adaptive rather than resilient behaviour was elicited, firstly factor analyses were conducted; results yielded two main factors, adaptive and resilient behaviour. Further analyses showed that the experimental set-up elicited adaptive behaviour rather than resilient behaviour, indicating an initial success in eliciting and measuring adaptive behaviour.

Furthermore, it was investigated if there can be identified any change in adaptive behaviour across the missions or between the order. Results indicated no difference in the participant's ability to adapt their behaviour. There was not found any difference across the missions nor between Order A (Secret note – Tap water – Fingerprint) and Order B (Fingerprint – Tap water – Secret note). In other words, adaptive behaviour did not show to improve in the course of the experiment.

Last, it was examined how participants scored the Adaptability Scale from the perspective of an average person. This measure was included since individuals tend to deviate positively from an objective view of themselves. It was expected that participants would overestimate their abilities. Results indeed indicate a significant difference between the mean score of oneself and the mean score of an average person. Participants evaluated themselves as more adaptable than an average person.

Experiment 2

Experiment 2 showed similar results regarding the participant's motivation to take part in the study. Participants were highly motivated and took on the operations and their roles as special agents in a serious manner. There were also found similar pattern regarding participant's experienced violation of their expectation. The first two operations both had high mean scores; whereas the third operation indicated a lower mean score. However, in Experiment 2 participants in the third operation were provided with a correct indication, thus no violation of the expectation. That will

mean the third operation is not representative of a person's adaptive behaviour but rather their ability to successfully achieve a task in a more predictable situation.

Moreover, as in Experiment 1, Experiment 2 elicited adaptive rather than resilient behaviour. Factor analyses showed that the items used to measure adaptive behaviour (change, novelty, uncertainty) always load on one factor, while two out of three items (threat and confrontation) used to measure resilient behaviour always load on another factor. Therefore, further analyses were conducted without the third item (adversity) that was used to measure resilient behaviour. Results indicated, that Experiment 2 also elicited adaptive rather than resilient behaviour.

Further, it was tested, whether the experimental set-up influenced the ability to adapt across the operations. Results indicated no main effect across the operations, indicating adaptive behaviour was not influenced across the operations. However, between the Order (A, B) there was found an interaction effect, indicating that there was a difference between the orders. More precise, participants in Order A (Secret note – Tap water – Fingerprint) became less adaptive, whereas participants in Order B (Fingerprint – Tap water – Secret note) became more adaptive. A possible explanation for this interaction effect could be the reason that the Fingerprint mission was perceived as more difficult than the Secret note mission. As participants in Order A began with the Secret note mission followed by the Tap water and Fingerprint mission, this could explain the decline in adaptive behaviour in Order A. Contrary, participants in Order B began with the most difficult mission therefore improved during the operations.

Limitations

A possible explanation for the different results of Experiment 1 and 2 could be that different research assistants have implemented the experiments. The experiments

were built up at exactly the same way, except for one modification in Experiment 2. That is, for the last operation participants were provided with a correct indication. The participant's expectation of the mission to complete was not violated. However, results show different pattern on the same measures were this modification was not relevant. Hence, the experimental set-up seemed to be implemented differently. This could be affected by the fact, that different research assistants implemented the experiments. It seems that the different research teams performed the Experiments differently. To remedy this, in a following experiment, the implementation has to become more standardized.

Another possible explanation for the different results could be caused by individual differences of the participants. As mentioned earlier, individuals for example possess different goal orientations that lead to different strategies of handling a situation, or they differ in their cognitive flexibility. Therefore, it is suggested to include such possible predictive factors of adaptability in further investigations.

Moreover, the fact that the research assistants were students could have affected how participants perceived the scenarios. It seemed that participants sometimes did not get the situation right, for example during the Secret note operation (see Appendix I) participants did not immediately recognize, that the person they encounter was not the person they expected. Thus, the actors were not authentic enough which probably made important features less explicit.

Further, the location could have affected the authenticity of the experiments; the experiments were conducted in the Research Lab of the University of Twente, a setting very different from a typical undercover environment. However, as participants indicated that they took on the operations and their roles as special agents in a serious manner, this may only be a minor inconvenience. Nevertheless, it would

be advisable for further investigation to use other locations in order to provide more authenticity.

Another limitation is connected to the short duration of the experiments. The missions were relatively short and participants seemed taken by surprise, which to a certain extent was intended. However, the participants may have had insufficient time to adapt to the situation. The results of Experiment 2 let speculate, that this particular was the case during the Fingerprint mission. This mission was perceived as the most difficult to adapt. The scenario was built up in a way, that participants hardly get the chance to become familiar with the situation, limiting the quality of their adaption (see Appendix II). Participants entered the office and found the person from whom they had to collect a fingerprint in a hurry, irrespective of their expectation it was hard to adapt to this hectic situation.

Furthermore, if adaptability changed across the operations was measured by means of a self-report scale. It is known, that when evaluating the self relative to others, individuals demonstrate a wide range of self-serving biases (Hornsey, 2003). In particular, individuals are prone to biases such as the above-average effect, also known as superiority bias, described as a positive illusion relating to the self (Modic & Lea, 2013). More precise, individuals tend to overestimate their own abilities in relation to others. As the results of the comparison between the ratings on the Adaptability Scale about themselves and the ratings from the perspective of an average person show, participants tend to overestimate their own ability to adapt over the ability of an average person. Therefore, for further investigations, it would be desirable to use expanded, more objective measurements to examine adaptive behaviour.

Towards a conceptual framework of adaptive behaviour

This study was a first attempt to capture adaptive behaviour in a controlled laboratory setting. The results of the two experiments clearly show that the measurement has to be expanded. First, since the items used to demonstrate a situational change were not clearly distinguishable, more items have to be included. Moreover, to achieve more accurate outcomes, the framework of adaptability has to be expanded, by for example possible predictive factors. Based on the findings of the introduction cognitive flexibility and goal orientation could be constructs valuable to include in further investigations. Both possibly could predict or generally influence adaptive behaviour. Cognitive flexibility is considered as the plasticity required for adapting to new demands (Laurero-Martinez & Brusoni, 2018). It is defined as a person's awareness that in any given situation there are alternative strategies of action available, as well as a person's willingness to be flexible (Martin & Rubin, 1995). In other words, cognitive flexibility is considered as the ability to recognize ineffective strategies of action and subsequently making appropriate changes to adapt to the situation. This could indicate, that cognitive flexibility is a prerequisite for recognizing the need for action in a changing situation and could therefore serve as a predictor of adaptive behaviour.

Goal orientation, another concept that could be valuable for further investigations is seen as an underlying factor that influences one's choice of strategy of action (VandeWalle, 2018). The concept of goal orientation stresses different approaches to deal with changing situations, a distinction is made between *learning goal orientation* and *performance goal orientation*. The former stresses the importance of effort for success, and is also considered as the preference to develop new skills to master new situations, the latter, in contrast, is associated with a fixed

view of one's ability that is difficult to develop, therefore, exerting substantial efforts for success is viewed as ineffective (Dweck, 1986). Since goal orientation is seen as a factor influencing one's choice of strategy in a new or changing situation it could also be of predictive value for adaptive behaviour. As an example, assuming a performance goal oriented individual performs poorly, he or she would not see any need in putting more effort into the task or changing the task strategy since they view the outcome as a reflection of their (in) ability. In contrast, a learning goal orientated individual would tend to view poor performance as feedback to alter their strategy and put more effort into the modification of their strategy and the task itself. This leads to the assumption that learning goal oriented individuals would be more adaptable than performance goal oriented individuals. Due to that, goal orientation could be a beneficial construct to further examine adaptive behaviour.

In sum, the constructs of cognitive flexibility and goal orientation could be helpful for a better understanding of the concept of adaptive behaviour. It therefore is suggested to further investigate the predictive value of both constructs regarding adaptability.

Conclusion

The present study was a first step towards a conceptualization of adaptability. The possibility to elicit and measure behavioural adaption was examined in a behavioural experiment. Results indicated an initial success to elicit adaptive behaviour in a controlled laboratory setting. However, to better examine the role of adaptability in goal achievement, more concepts and dependent variables have to be included. In the course of the investigation, cognitive flexibility and goal orientation appeared to be valuable for a further step towards a framework of adaptive behaviour. This research

lays the foundation for examining behavioural principles of adaptability. In general, more research is needed to measure adaptive success, specifically, the role of adaptability in achieving a goal.

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Appendix I

General Instructions

In the current study you will take the role of a special agent that will execute three undercover operations. Before each operation you will receive a brief case file. The case file will (1) explain the background and the purpose of the operation, and (2) state your mission objective. After each operation you will answer a short questionnaire.

Please note that the operational descriptions will be brief and direct. This means that you will only be informed on what you are expected to complete. No information will be provided for how to complete it. This will be left entirely up to you.

You will have about 5 minutes to prepare for each operation.

You have already been introduced to your “contact”. She will give you your case-files and you will bring her the items you obtain during the operations.

There will also be a research assistant that observes you during the operations. We ask you to do your best to ignore the observer. Her role is simply to rate your performance on similar measures to ones that you will be asked to answer yourself in the questionnaires.

When all three operations are completed you will fill in a post-operation questionnaire. When you have filled in this final questionnaire, the study is over.

Please note that as the operational scenarios are arranged you will have to play along with them. We thus request that you take your role as an agent in a serious manner. We also ask you to do your best to imagine the importance of completing your mission objectives.

Your alias during this study will be Kenny / Kim

The Secret Note Operation

Purpose There is information that a double agent has left a secret message to a foreign intelligence agency at the University. We need you to collect that message before it gets into the wrong hands.

Background information The message is written on a note placed in the book “Critical thinking about research” by the author Meltzoff. This book can be found in Professor Balthazar’s office. You need to visit the professor’s office, collect the note and bring the note to your contact.

The professor is known to be friendly to students who want to learn. Since you are going to ask to borrow a book on research methods it is likely that he will be nice to you.

Mission objective Collect a note hidden in a book in the office of Professor Balthazar.

Tools (None).

The Tap Water Operation

Purpose	There are indications that the tap water at Cubicus could be poisoned. We need you to secure a sample from the main water distribution in the building and bring it to your contact, so that the water can be properly tested.
Background information	<p>The main water distribution is in the closet in the reception. It is critical that a sample is secured from this closet without causing any panic or alarm at the University.</p> <p>The receptionist will likely be unwilling to step away from her position to get a glass of water. Rational arguments might work well.</p>
Mission objective	Collect a sample of tap water from the receptionist.
Tools	(Optional). A paper cup.

The Fingerprints Operation

The Purpose There is reason to believe that a student advisor at the University is committing fraud by working under a false identity. You need to collect this advisor's fingerprints so that they can be matched with the personal identity system.

Background information A meeting with the advisor, miss Helene, has been arranged. You are to consult her on what courses to take next semester. What courses you are planning to study and ask about is up to you – it is recommended that you stay as close to the truth as possible.

To collect the fingerprints, you need to make Helene hold a paper with your grades. If she holds the paper, the fingerprints will be collected.

Mission objective Collect the fingerprints of the student advisor Helene.

Tools (Mandatory). A paper with the agent's grades on it.

Appendix II

The Secret Note Operation

The participant will have the objective to *collect a secret note* hidden in a book inside the office of a professor at the University. To collect the note, the agent needs to borrow the book from a professor. However, when the participant arrive they will find that the professor is out on a “business trip” and that the professor’s assistant is instead in the office. This assistant will be reluctant to lend the book simply because it is not theirs to lend.

Standardized rules:

Wait for three prompts, on the fourth prompt you give in (or if the participant gives up/leaves, immediately turn to point four and give the book).

- 1) Well how about you come back tomorrow when Balthazar is back from his trip. It can’t be that urgent, can it.
- 2) Look, I am not in a position to lend out his books to strangers.
- 3) I’m sorry, I just can’t, I’m just not comfortable lending out his books.
- 4) I really shouldn’t lend his books to strangers, but okay – if you promise to go copy the pages you need and then come right back with it, okay?

The Tap Water Operation

The participant will have the objective to *collect a sample of tap water* from the receptionist, as there are indications that it might be poisoned and needs to be tested without causing any panic at the University. However, when the participant approaches the receptionist, they will find that it is “international employee day”, and the receptionist cannot speak their language (neither English, Dutch or German). Also, there will be free bottles of water at the reception desk.

Standardized rules:

Wait for three prompts, on the fourth prompt you give in (or if the participant gives up/leaves, immediately turn to point four, get their attention and fetch a glass of water).

1. Shake your head and bring your thumbs towards your shoulders (signaling “I don’t know what you’re saying”). Point to the note saying that it is international employee day and a sign saying you don’t speak Dutch, German or English.
2. Nod slowly (as if you’re thinking), and then come to a conclusion by nodding quicker and give an understanding smile. Then reach for a water bottle under the desk and give it to the participant.
3. Point to the water bottle and make a “drinking” motion. Then shake your head and signal “what is the problem, you have your water”.
4. Raise your finger and nod understandingly – then take the participants cup (or your own) and get the participant some tap water.

The Secret Note Operation

The participant will have the objective to *collect the fingerprints* of a student advisor at the university, as there is reason to believe that this advisor is committing fraud by working under a false identity. However, when the participants enter the office, they will find that the student advisor is on her way out of the office. She will inform them that she is in a hurry to go on a long vacation, and that a colleague is soon to arrive to assist them with their case.

Standardized rules:

Wait for three prompts, on the fourth prompt you give in (or if the participant gives up/leaves, immediately turn to point four, take their paper, look it over quickly and say that your colleague will be able to better assist the participant than you).

- 1) Ah, you must be Kenny/Kim! I'm really sorry I didn't have time to tell you. I am in a real hurry to leave for a long vacation. But don't worry, I've arranged so my colleague will meet you here in 2 minutes! Okay! Bye, bye!
- 2) I really don't have the time for this, my taxi is waiting outside, and I can't miss my flight.
- 3) Listen, I can't miss my flight. Nina is on her way, I think I hear her around the corner.
- 4) Just give me your paper (hold and scan it quickly). This is Nina's expertise, she'll help you better than I can. Goodbye!

Appendix III

Observer Protocols

*1. The participant has the objective to **collect a secret note** hidden in a book inside the office of a professor at the University. To collect the note, the agent needs to borrow the book from a professor.*

Were arguments adjusted based on the confederate's responses?

1	2	3	4	5	6	7
Used the same argument for all responses						Adjusted their argument with each response

Was behaviour adjusted based on the confederate's responses?

1	2	3	4	5	6	7
Used the same behaviour for all responses						Adjusted their behaviour with each response

How effortlessly (fluently, smoothly) did the participant adjust to the situation?

1	2	3	4	5	6	7
Not effortlessly at all						Very effortlessly

How emotionally intense was the situation?

1	2	3	4	5	6	7
Not intense at all						Very intense

How frustrated did the participant seem?

1	2	3	4	5	6	7
Not frustrated at all						Very frustrated

2. *The participant has the objective to **collect a sample of tap water** from the receptionist, as there are indications that it might be poisoned and needs to be tested without causing any panic at the University.*

Were arguments adjusted based on the confederate's responses?

1	2	3	4	5	6	7
Used the same argument for all responses						Adjusted their argument with each response

Was behavior adjusted based on the confederate's responses?

1	2	3	4	5	6	7
Used the same behavior for all responses						Adjusted their behavior with each response

How effortlessly (fluently, smoothly) did the participant adjust to the situation?

1	2	3	4	5	6	7
Not effortlessly at all						Very effortlessly

How emotionally intense was the situation?

1	2	3	4	5	6	7
Not intense						Very

at all

intense

How frustrated did the participant seem?

1

2

3

4

5

6

7

Not frustrated
at allVery
frustrated

3. The participant has the objective to **collect the fingerprints** of a student advisor at the university. To collect the fingerprint, the advisor needs to hold a paper they have brought.

Were arguments adjusted based on the confederate's responses?

1

2

3

4

5

6

7

Used the
same
argument for
all responsesAdjusted
their
argument
with each
response

Was behavior adjusted based on the confederate's responses?

1

2

3

4

5

6

7

Used the
same
behavior for
all responsesAdjusted
their behavior
with each
response

How effortlessly (fluently, smoothly) did the participant adjust to the situation?

1

2

3

4

5

6

7

Not
effortlessly
at allVery
effortlessly

How emotionally intense was the situation?

1 2 3 4 5 6 7

Not intense
at all

Very
intense

How frustrated did the participant seem?

1 2 3 4 5 6 7

Not frustrated
at all

Very
frustrated

Appendix IV

In between operations questionnaire (x3)

We would like you to answer some questions with regards to your decision-making during the last operation (1 – Strongly disagree; 7 – Strongly agree).

1. During the **secret note /tap-water /fingerprints operation** I was able to think through a number of possible options to assist me when the new situation arose.
2. During the **secret note /tap-water /fingerprints operation**, I was able to revise the way I was thinking (when the new situation arose) which helped me through it.
3. I was able to adjust my thinking or expectations during the **secret note /tap-water /fingerprints operation** to assist me in the new situation when it was necessary.
4. During the **secret note /tap-water /fingerprints operation**, I was able to seek out new information or useful resources to effectively deal with the new situation.
5. In the uncertain situations during the **secret note /tap-water /fingerprints operation**, I was able to develop new ways of going about things (e.g. a different way of doing something or finding information) to help me through.
6. To assist me in the new situation during the **secret note /tap-water /fingerprints operation**, I was able to change the way I wanted to do things when it was necessary.
7. During the **secret note /tap-water /fingerprints operation**, I was able to reduce negative emotions (e.g., social anxiety, feeling awkward) to help me deal with the uncertain situation.
8. When uncertainty arose during the **secret note /tap-water /fingerprints operation**, I was able to minimize frustration or irritation so that I could deal with it best.
9. To help me through the new situations during the **secret note /tap-water /fingerprints operation**, I was able to draw on positive feeling and emotions (e.g., enjoyment, satisfaction).

Appendix V

Post Operation Questionnaire

We would like you to answer some questions about your experiences during the undercover operations. Please answer the questions as honestly and accurately as you can.

Age: _____
Gender: _____
Nationality: _____
Affiliation: Student / employee / other

(1 – Strongly disagree; 7 – Strongly agree)

- When I started an operation, I had no idea how to behave in order to complete my objective.
- During an operation, I found it difficult to figure out how to behave in order to complete my objective.
- When I succeeded with an operational objective, I was still not sure how my behavior contributed to the success.

(1 – Not at all; 7 – Very)

- How motivated were you to complete your objectives during the operations?
- How easy/difficult was it for you to take your role seriously?
- How easy/difficult was it for you to take the operations seriously?

- How unexpected was **the first operation**?
- Were you able to correctly predict what would happen during the first operation?
- Did you have experiences from your life that helped you perform during the first operation?

- How unexpected was **the second operation**?
- Were you able to correctly predict what would happen during the second operation?
- Did your experience of the first operation influence your behavior during the second operation?
- Did your experience of the first operation improve your performance during the second operation?

- How unexpected was **the third operation**?
- Were you able to correctly predict what would happen during the third operation?

- Did your experience of the first and second operation influence your behavior during the third operation?
- Did your experience of the first and second operations improve your performance during the third operation?
- Do you perceive that your experiences during the three operations would help you achieve your objective in **similar operations in the future**?
- Do you perceive that your experiences during the three operations would help you feel better prepared when being involved **in similar operation in the future**?

Here we would like you to answer 9 questions from the perspective of an average person (who has not participated in this study) (1 – Strongly disagree; 7 – Strongly agree).

1. The average person would be able to think through a number of possible options to assist them in a new situation.
2. The average person would be able to revise the way they think about a new situation to help them through it.
3. The average person would be able to adjust their thinking or expectations to assist them in a new situation if necessary.
4. The average person would be able to seek out new information, helpful advice, or useful resources to effectively deal with new situations.
5. In uncertain situations, the average person would be able to develop new ways of going about things (e.g. a different way of asking questions or finding information) to help them through.
6. To assist them in a new situation at, the average person would be able to change the way they do things if necessary.
7. The average person would be able to reduce negative emotions (e.g., fear) to help them deal with uncertain situations.
8. When uncertainty arises, the average person would be able to minimize frustration or irritation so they can deal with it best.
9. To help them through new situations, the average person would be able to draw on positive feeling and emotions (e.g., enjoyment, satisfaction).

We would now like you to explain if you used any strategies or tactics during the operations.

Operation 1: Please describe any strategies or tactics that you used during the first operation

Tick box if no deliberate behavior was used

☐

Do you think this strategy/tactic would be effective in completing a similar objective in a similar situation?

1 2 3 4 5 6 7

Not effective
at all

Very
effective

Operation 2: Please describe any strategies or tactics that you used during the second operation

Tick box if no deliberate behavior was used

☐

Do you think this strategy/tactic would be effective in completing a similar objective in a similar situation?

1 2 3 4 5 6 7

Not effective
at all

Very
effective

Operation 3: Please describe any strategies or tactics that you used during the final operation

Tick box if no deliberate behavior was used

Do you think this strategy/tactic would be effective in completing a similar objective in a similar situation?

1

2

3

4

5

6

7

Not effective
at all

Very effective