



The Analysis of Nonverbal Communication: The Dangers of Pseudoscience in Security and Justice Contexts

[Análisis de la comunicación no verbal: los peligros de la pseudociencia en entornos de seguridad y justicia]

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Abstract

For security and justice professionals (e.g., police officers, lawyers, judges), the thousands of peer-reviewed articles on nonverbal communication represent important sources of knowledge. However, despite the scope of the scientific work carried out on this subject, professionals can turn to programs, methods, and approaches that fail to reflect the state of science. The objective of this article is to examine (i) concepts of nonverbal communication conveyed by these programs, methods, and approaches, but also (ii) the consequences of their use (e.g., on the life or liberty of individuals). To achieve this objective, we describe the scope of scientific research on nonverbal communication. A program (SPOT; Screening of Passengers by Observation Techniques), a method (the BAI; Behavior Analysis Interview) and an approach (synergology) that each run counter to the state of science are examined. Finally, we outline five hypotheses to explain why some organizations in the fields of security and justice are turning to pseudoscience and pseudoscientific techniques. We conclude the article by inviting these organizations to work with the international community of scholars who have scientific expertise in nonverbal communication and lie (and truth) detection to implement evidence-based practices.

Resumen

Para los profesionales de la seguridad y la justicia (policías, abogados, jueces), los miles de artículos revisados por pares sobre comunicación no verbal representan fuentes importantes de conocimiento. Sin embargo, a pesar del alcance del trabajo científico realizado sobre este tema, los profesionales pueden recurrir a programas, métodos y enfoques que no reflejan el estado real de la ciencia. El objetivo de este artículo es examinar (i) los conceptos de comunicación no verbal transmitidos por estos programas, métodos y enfoques, pero también (ii) las consecuencias de su uso (por ejemplo, sobre la vida o la libertad de las personas). Para lograr estos objetivos, describimos el alcance de la investigación científica sobre la comunicación no verbal. Se examina un programa (SPOT: Evaluación de pasajeros mediante técnicas de observación), un método (BAI: Entrevista de análisis de conducta) y un enfoque (sinergología) que contradicen el estado de la ciencia. Finalmente, presentamos cinco hipótesis para explicar por qué algunas organizaciones en los campos de la seguridad y la justicia están recurriendo a la pseudociencia y a las técnicas pseudocientíficas. Concluimos el artículo invitando a estas organizaciones a trabajar con la comunidad académica internacional especializada en la investigación sobre comunicación no verbal y detección de mentiras (y verdad) para implementar prácticas basadas en la evidencia.

Palabras clave

Pseudociencia, Comunicación no verbal, SPOT, Entrevista de análisis de conducta, Sinergología.

Keywords

Pseudoscience, Nonverbal communication, SPOT, Behavior analysis interview, Synergology.

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Introduction

Nonverbal communication generally refers to any communication made other than by words (Knapp, Hall, & Horgan, 2014; Patterson, 2011). For example, a person's physical and vocal characteristics transmit information. Nonverbal behaviors (e.g., facial expressions, gestures) and interpersonal distances also play an important role in face-to-face interactions (Burgoon, Guerrero, & Floyd, 2010; Moore, Hickson, & Stacks, 2014). The volume, the range, and the complexity of scientific research on nonverbal communication may be seen from comprehensive handbooks on the topic published in recent years (Hall & Knapp, 2013; Manusov & Patterson, 2006; Matsumoto, Hwang, & Frank, 2016).

For security and justice professionals (e.g., police officers, lawyers, judges), the thousands of peer-reviewed articles on nonverbal communication represent important sources of knowledge, including on the detection of lies or mal-intent (Granhag & Strömwall, 2004; Granhag, Vrij, & Verschuere, 2015; Vrij, 2008). Lying, however, cannot be detected at a glance as is often stated on the Internet. The belief that gaze avoidance allows lie detection is a widespread misconception (The Global Deception Research Team, 2006). Like the unrealistic expectations of the public toward forensic science (Chin & Workewych, 2016), nonverbal communication has suffered from its popularity in television series (e.g., *Lie to Me*) and other popular media (Levine, Serota, & Shulman, 2010; Vrij, Granhag, & Porter, 2010). In fact, scholars who have scientific expertise in lie (and truth) detection agree that there are no nonverbal behaviors that are present in all liars and are absent in all people who tell the truth. There are no nonverbal behaviors that are indicative of deception, such as Pinocchio's nose (DePaulo et al., 2003; Vrij, 2008). In addition, when facial expressions and gestures are documented as having a link to lying, this link is typically weak (DePaulo et al., 2003; Vrij et al., 2017) and often moderated by situational variables (Sporer & Schwandt, 2006, 2007). In other words, although not a silver bullet, the analysis of an individual's nonverbal behaviors can be based on knowledge published in peer-reviewed scientific journals. In fact, research conducted by the international community of scholars who have scientific expertise in nonverbal communication can inform understanding of a wide range of human behaviors (Burgoon et al., 2010; Knapp et al., 2014; Moore et al., 2014; Patterson, 2011).

Despite the wealth of peer-reviewed knowledge on nonverbal communication, security and justice professionals can readily find widely disseminated programs, methods, and approaches that fail to reflect the state of science and promote pseudoscientific claims. The objective of this article is to examine (i) concepts of nonverbal communication conveyed by these programs, methods, and approaches, but also (ii) the consequences of their use. To achieve this objective, we will describe the scope of scientific research on nonverbal communication. Subsequently, we will examine a program aimed at identifying aviation security threats through monitoring the nonverbal behaviors and appearance of passengers at U.S. airports (SPOT; Screening of Passengers by Observation Techniques), an interview method used by many police forces (the BAI; Behavior Analysis Interview) and an approach to "read gestures" taught to security and justice professionals, including in France and Quebec (synergology). Finally, we will outline five hypotheses to explain why some organizations in the fields of security and justice are turning to pseudoscience and pseudoscientific techniques. We will conclude the article by inviting these organizations to work with the international community of scholars who have scientific expertise in nonverbal communication and lie (and truth) detection to implement evidence-based practices.

The Scope of Scientific Research on Nonverbal Communication

Many of the issues facing security and justice professionals involve the concealment and falsification of information (e.g., Garrido, Masip, & Herrero, 2004; Mann, Garcia-Rada, Houser, & Ariely, 2014; Vrij, Mann, Jundi, Hillman, & Hope, 2014). When it comes to developing better professional practices to address these

issues, the analysis of nonverbal communication may, on the face of it, seem foolproof. Indeed, it is not uncommon to read or hear that facial expressions and gestures can be used to detect lies, and that they would be more valid in this regard than words. Security and justice professionals would therefore have at their fingertips, for a few thousand, or even a few hundred dollars, programs, methods, and approaches to know what the other person thinks but does not say.

Unfortunately, dubious concepts regarding nonverbal communication are widely disseminated, particularly on the Internet and in books aimed at the general public, as well as at seminars and conferences (such as "the body language never lies"). The use of such concepts can have negative and perhaps even disastrous consequences (Denault, 2015; Kozinski, 2015; Lilienfeld & Landfield, 2008). For example, security and justice professionals who are not familiar with the "peer-review" process can be misled into believing that these dubious concepts are scientific and give them a totally unjustified authority (Jupe & Denault, 2018). As we will demonstrate, the reliance on such concepts is fundamentally misguided, because decisions of security and justice professionals could be distorted and harm the life or liberty of individuals.

Although the detection of lies or mal-intent may be of interest to these professionals, it represents only a small part of the scientific research being conducted on nonverbal communication. As Plusquellec and Denault (2018) pointed out, the influence of culture, age, and mental illness on nonverbal communication, as well as the recognition of facial expressions and interpersonal sensitivity, are just some of the subjects receiving attention from a community of researchers from all over the world. Nonverbal communication is not a subject of scientific research in which psychology alone is concerned. For example, psychiatry, criminology, communication, linguistics, biology, sociology, anthropology, computer science, and ethology also focus on nonverbal communication. Regardless of the discipline, the affiliation of researchers, and their fields of research, the knowledge they develop is of great value because the process of critical appraisal of knowledge (the publication process), which is a central building block in establishing confidence in the results of a research project, remains the same. Let us examine briefly just how this process unfolds.

When completing a research project, the researcher generally prepares a manuscript describing the reasons and theoretical rationale for the study, as well as all the steps preceding its conclusions, including the methodology, data collection, and analyses. All these details will eventually allow the international scientific community to scrutinize the research project to provide support or criticism of the results in full knowledge of the facts (e.g., in the light of other research on the subject). All these details will also provide other researchers the opportunity to replicate the study and compare the results (Asendorpf et al., 2013; Jupe & Denault, 2018; Shipman, 2014; Ware, 2008). The manuscript is then submitted to the editor of a scientific journal who sends it to experts on the subject for a first critical evaluation. This is the "peer-review" process. Manuscripts are commonly reviewed double-blind, meaning that the names of the reviewers are not known to the researcher and the name of the researcher is not known to the reviewers. The reviewers provide feedback to the editor. Following the reviewers' feedback and his/her own evaluation of the manuscript, the editor informs the researcher that the manuscript is accepted as it is, with either minor or major revisions, or that it is rejected (sometimes with the possibility to revise and resubmit the manuscript after significant improvements) (Denault & Dunbar, 2017; Jupe & Denault, 2018). Some scientific journals in psychology have a rejection rate of up to 90% (American Psychological Association, 2017). Since the 1960s, approximately 30,000 peer-reviewed articles on nonverbal communication have been published (Plusquellec & Denault, 2018).

Pseudoscience in the Security and Justice Community

Despite the extent of scientific research on nonverbal communication (Burgoon et al., 2010; Knapp et al., 2014; Moore et al., 2014; Patterson, 2011), security and justice professionals in some jurisdictions have turned to programs, methods, and approaches that fail to reflect the state of science. The consequences of the misuses of nonverbal communication are important enough to question the responsibility of organizations in the fields of security and justice that have used either SPOT, the BAI, or synergology.

SPOT

Standing for Screening of Passengers by Observation Techniques, SPOT is a program aimed at identifying aviation security threats through monitoring the nonverbal behaviors and appearance of passengers. This program was implemented at numerous U.S. airports by the Transportation Security Administration (TSA) of the U.S. Department of Homeland Security (DHS) following the September 11, 2001 attacks. Based on Israeli methods for attempting to detect suspicious behaviors, SPOT was implemented in 2006 and 2007 at 42 TSA-regulated airports after being tested in 2003 and 2004 "to understand the potential of the program, not to validate its success" (U.S. Government Accountability Office, 2010, p. 25). In 2010, nearly 3,000 Behavior Detection Officers (hereinafter referred to as BDOs) were deployed at 161 of the 457 airports regulated by the TSA. SPOT had an annual cost of approximately \$212 million (U.S. Government Accountability Office, 2010).

According to the TSA, SPOT was based on several sources, namely learning tools from federal agencies, comments from law enforcement officers (e.g., Federal Bureau of Investigation, Drug Enforcement Agency), and the work of researchers, including Paul Ekman, who attempted to defend it before a committee of the U.S. Congress in 2011 (Committee on Science, Space, and Technology, 2011). However, at the time of the implementation of SPOT, the validity of identifying aviation security threats through monitoring the nonverbal behaviors and appearance of passengers was unknown. The effectiveness of

identifying aviation security threats using SPOT versus random questioning (i.e., questioning passengers at random rather than on the basis of behavioral indicators) was also unknown. According to the TSA, SPOT was implemented because it was low cost, was easy to set up, and provided an additional security measure for risks that were not covered by other measures ([U.S. Government Accountability Office, 2010](#)).

For the identification of aviation security threats, SPOT employed the BDOs. These individuals were recruited from TSA employees who had performed passenger and baggage screening. They received four days of classroom and three days of field training and took an exam. The BDOs were required, among other things, to memorize the list of indicators to identify potential terrorists (e.g., avoiding eye contact, looking down, wearing clothing inappropriate for the location, having a pale face due to recent beard shaving, emitting a strong body odor, covering the mouth with the hand when speaking; [The Intercept, 2015](#); [U.S. Government Accountability Office, 2010](#)). At airports, the BDOs' job was to observe waiting passengers (about 30 seconds per passenger). An exchange with a passenger could be initiated during this observation procedure. Following the exchange, if the passenger exceeded a certain score (from the list of 94 behavioral indicators), BDOs could conduct a pat-down and a search of his/her luggage. They could then invite the passenger to continue his/her journey or contact the law enforcement officers who then had the option to arrest the passenger. In addition, when the passenger was not arrested, the TSA could still refuse to allow him/her to board the aircraft. Finally, the BDOs were to enter information about their intervention into a database ([U.S. Government Accountability Office, 2010, 2013, 2017](#)).

In 2010, the U.S. Government Accountability Office (GAO), an organization with a similar role to the Office of the Auditor General of Canada, recommended that the TSA bring together independent experts to validate the scientific basis of SPOT ([U.S. Government Accountability Office, 2010](#)). Three years later, the GAO recommended that the U.S. Congress consider the absence of scientific evidence on the effectiveness of identifying aviation security threats through the nonverbal behaviors of passengers in its SPOT funding decisions ([U.S. Government Accountability Office, 2013](#)). Finally, in 2017, the GAO published a report according to which 175 out of the 178 (98%) sources cited by the TSA were not relevant for determining the validity of SPOT. Indeed, of the 178 sources cited, only 20 were research articles reporting data and methods. Of the remaining 158 sources, 21 were literature reviews that did not report adequate information, and 137 were opinion papers or documents that provided irrelevant information for establishing the scientific basis of SPOT (e.g., newspaper articles, screenshots of medical websites). The 20 research articles were independently evaluated by two analysts: 5 articles did not meet generally accepted research standards and 12 did not validate the behavioral indicators for which they were cited by the TSA. One source justified seven of these indicators and two sources justified only one. In other words, the TSA did not have any evidentiary source to support the validity of 28 of the 36 indicators on the revised list used by the BDOs to identify aviation security threats². The GAO has therefore maintained its 2013 recommendations to limit SPOT funding ([U.S. Government Accountability Office, 2017](#)).

Following the 2017 report, as did the TSA in 2004 ([U.S. Government Accountability Office, 2010](#)), DHS attempted to defend SPOT, in some cases by using logical fallacies (e.g., overreliance on anecdotal evidence; [Gambrell, 2005](#); [Lilienfeld & Landfield, 2008](#)). For example, it was reported that a passenger identified by BDOs was carrying 4.4 kilograms of cocaine and that the techniques used to hide drugs could be used to hide explosives. In addition, the TSA replied that the BDOs had been reassigned as Transportation Security Officers required to perform behavioral analysis for a few hours a day to maintain their skills. However, given the lack of scientific evidence on the effectiveness of identifying aviation security threats through the nonverbal behaviors of passengers, the GAO expressed concern that behavior analysis was still being used ([U.S. Government Accountability Office, 2017](#)).

It should be noted that proponents of SPOT may claim that this program worked because a terrorist act such as that of September 11, 2001 has not occurred again. However, this is another logical fallacy. Although SPOT can deter some terrorists, just as dummy cameras can deter some thieves, this does not mean SPOT actually works. Furthermore, security and justice organizations should not use tragedies to justify dubious programs, methods, and approaches and avoid putting in place programs, methods, and approaches that actually work.

The use of logical fallacies to justify the importance of SPOT (a program estimated to have cost \$1.5 billion from 2007 to 2015; [Office of Inspector General, 2016](#)) seems at best questionable, especially since SPOT created "an unacceptable risk of racial and religious profiling" ([ACLU, 2017](#), p. 1). Indeed, rather than detecting terrorists, behavioral indicators have led BDOs to target immigrants. Moreover, "until late 2012, training materials for behavior detection officers focused exclusively on examples of Arab or Muslim terrorists" ([ACLU, 2017](#), p. 13; see also [Winter, 2015](#)).

Did SPOT offer a false sense of security? Possibly. Could the financial resources allocated to the TSA (e.g., taxpayers' money) have been invested in the development of new programs based on knowledge published in peer-reviewed scientific journals, as well as in programs that have already demonstrated their effectiveness? Certainly. For example, rather than being invested in behavior analysis programs of unknown effectiveness, taxpayers' money could be invested in local law enforcement, which is generally limited in personnel and financial resources, including the promotion of proactive policing and prosecution ([Bayley & Weisburd, 2009](#); [Howard, 2004](#); [LaFree & Freilich, 2018](#)).

The TSA, however, does not appear to have questioned its approach following the 2017 report of the U.S. Government Accountability Office. Indeed, the *Boston Globe* (2018) recently revealed the existence of Quiet Skies, a TSA surveillance program where travelers (who are not under investigation and not on a

terrorist watch list) are monitored by federal agents before they board an aircraft. This surveillance was partly based on behavioral indicators as dubious as those of SPOT (e.g., strong body odor, excessive perspiration, rapid eye blinking, hands that touch the face, recent beard shaving)³. Nevertheless, the effectiveness of using nonverbal behaviors for security controls at airports or to determine whether people are hiding an object is limited (Ormerod & Dando, 2015; Sweet, Meissner, & Atkinson, 2017). Moreover, observation of behavior alone reduces accuracy in judgments (Bond & DePaulo, 2006; Bond, Howard, Hutchison, & Masip, 2013; Reinhard, Sporer, & Scharmach, 2013; Reinhard, Sporer, Scharmach, & Marksteiner, 2011). In other words, current scientific knowledge on nonverbal communication suggests that security and justice professionals should not rely on the observation of behavioral indicators (or combinations of some of them) in face-to-face interactions to detect terrorists. Dubious concepts regarding nonverbal communication, however, continue to be used, not only by Transportation Security Officers, but also by professionals from other backgrounds.

The BAI

Standing for Behavior Analysis Interview, the BAI is the first step of the Reid technique, an interrogation technique in which more than 500,000 people have reportedly been trained (John E. Reid & Associates, n.d.b, n.d.c). Essentially, in this first step, an investigator conducts a non-accusatory interview with a suspect. Special attention is paid to the suspect's nonverbal behaviors when answering certain questions asked by the investigator (Snook, Eastwood, & Barron, 2014; Vrij, 2008). According to the creators of the Reid technique, this interview method is "designed to identify whether or not a person is telling the truth or withholding relevant information concerning a specific crime or act of wrongdoing" (John E. Reid & Associates, n.d.a). For example, the BAI claims that some nonverbal behaviors are linked with deception (e.g., closed and retreated posture, frozen and static, non-frontal alignment, to lean forward constantly) or truthfulness (e.g., open and relaxed posture, dynamic, frontal alignment, to lean forward occasionally) (Inbau, Reid, Buckley, & Jayne, 2013). At the end of the BAI, when the guilt of the suspect "in the opinion of the investigator, seems definite or reasonably certain" (Inbau et al., 2013, p. 185), the investigator proceeds to the second step of the Reid technique. The objective is then to obtain an incriminating statement through a psychologically coercive adversarial interrogation (Masip, Herrero, Garrido, & Barba, 2011; Snook et al., 2014; Vrij, 2008).

In this second step, the investigator must state that there is no doubt in his/her mind that the suspect is guilty of the crime. The investigator then provides a moral excuse for the crime so that the suspect can "save face". In addition, the investigator will ensure, by various means, that the suspect cannot deny involvement (e.g., by interrupting the suspect). Finally, "to elicit an initial admission of guilt" (Inbau et al., 2013, p. 294), the investigator asks the suspect a question to which both possible answers are incriminating, for example, "Was the stolen money used to buy your drugs or to help your family?". Following the incriminating statement, the investigator requests details and proceeds to obtain a written statement (Inbau et al., 2013; Snook et al., 2014). Although it has many followers, especially in the United States, the Reid technique can lead to miscarriages of justice (e.g., Gudjonsson, 2014; St-Yves & Meissner, 2014).

The BAI is particularly alarming in its use of verbal and nonverbal behaviors in determining the suspect's guilt or innocence. For example, according to Inbau et al. (2013), "shifts in the chair that occur during or immediately following a significant statement, such as denial, often indicate fear of detection and should be associated with deception" (p. 134), and "generally speaking, a suspect who does not make direct eye contact is probably withholding information" (p. 135). However, even if these behaviors are "inconsistent with the existing research regarding the nonverbal behaviors of truthful and deceptive suspects" (Blair & Kooi, 2004, p. 82), they can add weight to the erroneous certainty of a person's guilt or innocence.

In addition, the specific study often presented as supporting the BAI foundations (Horvath, Jayne, & Buckley, 1994) suffers from fatal methodological shortcomings (e.g., small sample, no comparison group of untrained or lay evaluators; Kassin, 2015; Masip et al., 2011; Vrij, 2008). In fact, experimental research does not support the BAI effectiveness (Vrij, Mann, & Fisher, 2006). As Harrigan (2005) pointed out, the state of science is clear: "Unlike certain facial expressions, there are few, if any, body movements that have invariant meaning within or across cultures" (p. 139). Furthermore, research has shown that the BAI guilt or innocence indicators merely reflect common popular misbeliefs about behavioral correlates of guilt or innocence (Masip, Barba, & Herrero, 2012; Masip & Herrero, 2013; Masip et al., 2011). In short, although some other aspects of BAI may offer avenues for research, believing that a suspect's behavior following certain questions signals a suspect's guilt or innocence has little or no scientific basis (Masip & Herrero, 2013; Vrij & Fisher, 2016; Vrij et al., 2006; Vrij et al., 2017; see also Masip, 2017, for a recent review of scientific research on deception detection).

Of course, as for pseudoscience and pseudoscientific techniques, that is, bodies of information "that possess the superficial appearance of science but lack its substance" (Lilienfeld & Landfield, 2008, p. 1216), precautions are formulated regarding behavioral indicators. For example, Inbau et al. (2013) stated that the validity of behavioral indicators may be influenced by "the perceived seriousness of the offense, the mental and the physical condition of the subject, any underlying psychiatric or personality disorders, level of intelligence, degree of maturity, and the extent or absence of social responsibilities" (p. 152). This call to caution, however, is of no use. Investigators cannot know all the variables that may influence an individual's verbal and nonverbal behaviors. In addition, Inbau et al. (2013) do not explain how, in practice, all these factors actually influence all the behaviors that they link with deception or truthfulness. The same goes for precautions regarding specific behaviors. For example, regarding the lack of eye contact, Inbau et

[al. \(2013\)](#) stated that it may result from various factors, including the suspect's culture, as well as an inferiority complex and an emotional disorder. Worse still, in the case of the lack of eye contact, scientific research on nonverbal communication has even shown that it is not a valid sign of lying ([DePaulo et al., 2003](#); [Sporer & Schwandt, 2007](#)).

In many other contexts, the dubious meanings that the BAI assigns to verbal and nonverbal behaviors might, on the face of it, appear amusing. When used by security and justice professionals, however, they can lead both innocent and guilty persons to be subjected to a psychologically coercive adversarial interrogation and increase the risk of innocent people (especially juveniles and other vulnerable persons) making false confessions (e.g., [Horgan, Russano, Meissner, & Evans, 2012](#); [Kassin, 2015](#); [Kassin & Gudjonsson, 2004](#); [Kassin & Sukel, 1997](#); [Russano, Meissner, Narchet, & Kassin, 2005](#)). The questionable meanings that the BAI assigns to verbal and nonverbal behaviors are especially worrying because the ability of investigators to detect lies based on nonverbal behaviors is generally no better than chance ([Aamodt & Custer, 2006](#); [Bogaard, Meijer, Vrij, & Merckelbach, 2016](#); [Hauch, Sporer, Michael, & Meissner, 2016](#)). In addition, training in the Reid technique decreases the accuracy of these judgments, while, at the same time, increases investigators' confidence in their accuracy ([Kassin & Fong, 1999](#); [Mann, Vrij, & Bull, 2004](#); [Meissner & Kassin, 2002](#)). Despite all this, the creators of the Reid technique continue to "guarantee" that training in this technique allows to "increase your ability to eliminate the innocent, identify the guilty and motivate subject's [sic] to tell the truth" ([John E. Reid & Associates, n.d.c](#)). In addition to the BAI and SPOT, other programs, methods, and approaches promote pseudoscientific claims. Synergology, an approach to "read gestures" taught to French-speaking security and justice professionals, is one of them.

Synergology

According to its "official" website, synergology is a "scientific discipline of reading gestures" which is "anchored in a multidisciplinary field at the crossroads of neurosciences and communication sciences" ([Synergology, the Official Website, n.d.b, n.d.a](#), our translation). It purports to be "in this line of sciences which seek to better understand any body movement as an indicator of an unconscious mental process" ([Monnin, 2009](#), p. 35, our translation). More specifically, proponents of synergology purport that it uses "several revolutionary techniques and methods derived from the most recent discoveries in the field of behavioral sciences" ([Gagnon, n.d.b](#), our translation), and fills "the lack of a serious reference in nonverbal communication" ([Bunard, 2018](#), p. 47, our translation). In addition, proponents of synergology claim their approach was "founded to undo beliefs in popular communication" ([Institut Québécois de Synergologie, 2016](#), our translation). They also claim that its use is restricted by a "code of ethics" ([Association Européenne de Synergologie, n.d.](#)).

To know what the other thinks "before the other has even accessed his own thoughts" ([Bunard, 2018](#), p. 20, our translation), proponents of synergology say they have accumulated thousands of videos in databases and linked meanings to different gestures ([Bunard, 2018](#); [Gagnon & Martineau, 2010](#); [Story, 2018](#)). According to the founder of synergology, each association "must be verified in at least 80% of the situations resulting from databases images. In the case of micro itching, it must be verified in at least 90% of cases" ([Turchet, 2009](#), p. 299, our translation; see also [Bunard, 2018](#); [Turchet, 2012](#)).

For example, hand movements are supposedly of the utmost importance because "looking at the hands, following them in all their movements on the face and body seems to be the best way to decipher the emotions and therefore the thoughts of our interlocutor" ([Turchet, 2009](#), p. 103, our translation). Among the hand movements, micro itching (i.e. "unconscious itching relieved by the tip of the finger or nail"; [Turchet, 2009](#), p. 311, our translation) supposedly occurs "always in embarrassing situations that provoke internal contradictions when we do not allow ourselves what we want, when we censor our words, our attitudes... therefore when we are uncomfortable" ([Turchet, 2009](#), p. 112, our translation). In other words, a micro itching supposedly emerges "when there are contradictions between what is said and what is thought" ([Gagnon & Martineau, 2010](#), p. 54, our translation; see also [Monnin, 2009](#)). Therefore, when a person scratches under the right nostril, it would mean that "I don't believe what the other person says" ([Turchet, 2009](#), p. 136, our translation) and when a person scratches under the left nostril, it would mean that "I don't say everything, or not exactly, what I think" ([Turchet, 2009](#), p. 136, our translation). When a person scratches on top of his/her nose on the right, that would indicate "something bothers me in what the other shows" ([Turchet, 2009](#), p. 138, our translation) and when he/she scratches on top of his/her nose on the left, that would indicate "there is something that disturbs my image" ([Turchet, 2009](#), p. 138, our translation). According to [Story \(2018\)](#), "there are about fifteen ways to touch your nose, with very different interpretations" (p. 32, our translation). In total, more than 50 different points on the face would have different meanings when scratched ([Turchet, 2009, 2012, 2017](#)). In addition, positions of the body on a chair and those of the head would also have different meanings (see [Denault & Jupe, 2017](#), for an evaluation of a "synergological" analysis).

For example, a sitting person could be in a position of withdrawal (backward), analysis (backward to the right), escape (backward to the left), stress and discourse control (right), reserve and emotional control (left), attack (forward to the right), flexibility (forward to the left), and interest (forward) ([Bunard, 2018](#); see also [Gagnon & Martineau, 2010](#); [Story, 2018](#)). Moreover, "if the head is strongly bent to the left, then we speak of submission or abandonment depending on the context. If the head is strongly bent to the right, we speak then of rigidity" ([Bunard, 2018](#), p. 100, our translation). In addition, when the head is turned to the right "we can assume that the relationship is good, that our interlocutor is confident, in a climate conducive to exchanges" ([Story, 2018](#), p. 65, our translation) and when it is turned to the left "we can assume that he

is more distant, that he analyses and classifies the information with his left brain and that as a result, he may, by nature or according to the context, be on the defensive or in search of performance" (Story, 2018, p. 65, our translation).

Proponents of synergology have also associated different gestures with particular contexts, including that of lying. According to Gagnon & Martineau (2010), "the gap between truth and lies is never completely masked and the body transmits it" (p. 44, our translation; see also Bunard, 2018). For example, Story (2018) claims that a liar "tends to make two-dimensional gestures, mechanical, disembodied, rather large" (p. 182, our translation), because "only a person who has really experienced a situation can reproduce it in three dimensions, with gestures sometimes very close to the body and of low amplitude" (Story, 2018, p. 182, our translation). Gagnon and Martineau (2010) purport that when a person pinches his/her nose while telling the customs officer that he/she has nothing to declare, "the customs officer being alert to the nonverbal, should ask for assistance in order to carry out necessary checks since this gesture is closely linked to the unspoken" (p. 57, our translation). However, according to Gagnon and Martineau (2010), one should not rely on a single gesture, but "when you see an inconsistency between the gesture and the word, be sure to identify the subject of the discussion, because it is probably (not exclusively) on this point that the person lies, exaggerates or hides something" (p. 42, our translation). Therefore, synergology would "save time, open up new avenues for consideration and investigation by identifying authenticity more quickly" (Synergology, the Official Website, n.d.c, our translation).

Despite the seemingly scientific and ethical claims of proponents of synergology, their approach neglects the process of critical appraisal of scientific research on nonverbal communication (Burgoon et al., 2010; Denault & Jupe, 2017; Harrigan, Rosenthal, & Scherer, 2005). To our knowledge, since the "creation" of synergology in 1996 (Synergology, the Official Website, n.d.e), the meanings this approach claims to have associated with different gestures (e.g., micro itching) have not been the subject of peer-reviewed articles. They "look like rabbits you would pull out of hats: you can't see where they come from, and they magically appear" (Lardellier, 2008, p. 12, our translation; see also Axelrad, 2012; Jarry, 2016, 2018; Lardellier, 2017). Furthermore, the effectiveness of seminars and conferences on synergology as well as the effectiveness of the 200-plus hours training to "become" a synergologist (at a cost of more than \$6000 CAD) is unknown, even though the founder of synergology stated that "our methods make it possible to detect 80% of lies in the test called 'guilty/innocent'" (Turchet, 2009, p. 322, our translation; see also Turchet, 2012).

To our knowledge, the founder of synergology has published only one peer-reviewed article in a scientific journal (Turchet, 2013), which did not validate the meanings associated by synergologists to different gestures or the effectiveness of synergology. In addition, this article was severely criticized, particularly because of methodological and analytical defects (e.g., inappropriate comparison, data selection, circular reasoning), and "casts serious doubt on the thousands of gestures to which synergologists give a meaning" (Rochat, Delmas, Denault, Elissalde, & Demarchi, 2018, p. 262, our translation; see also Denault, Larivée, Plouffe, & Plusquellec, 2015). In other words, synergology purports to be "founded to undo beliefs in popular communication" (Institut Québécois de Synergologie, 2016, our translation), but it replaces them with concepts that have not been the subject of peer-reviewed articles. Moreover, a "code of ethics" cannot make up for the lack of scientific evidence, especially because, to our knowledge, no decision against a synergologist has been made public. Such a "code of ethics" (as well as the attribution of license numbers to synergologists) seems to mimic that of professional governing bodies, which are provided by law. As a result, some organizations could believe that synergology has an official cachet that it does not have.

In addition, although synergology neglects the process of critical appraisal of scientific research on nonverbal communication, the meanings this approach claims to have associated with different gestures have been widely disseminated, particularly on the Internet and in books for the general public (e.g., Gagnon & Martineau, 2010; Turchet, 2004, 2009). One of these books, for example, was written because, according to one of the authors, "these people [the armed forces] didn't want to wait until it was scientifically valid in ten years before they could use synergology" (Collignon, 2012, our translation). These meanings have also been disseminated at seminars and conferences, some of which were aimed at security and justice professionals. For example, the Bar of Quebec, the professional governing body of lawyers whose mission is to ensure the protection of the public, made two online training courses available until 2015. These training courses promoted concepts specific to synergology, which was presented as a discipline that is "based on a rigorous scientific approach" (Barreau du Québec, n.d.a, our translation).

For example, in the first training course (taken by 1,929 members of the Bar of Quebec; Lagacé, 2015), lawyers were taught that if a person "squeezes his/her lips, holds his/her right hand, recounts the past by looking to the right, scratches his/her neck back to the right, and makes low and limited movements" (Barreau du Québec, n.d.a, our translation), it would indicate lying. In the second training course taken by 1,083 lawyers (Lagacé, 2015), the concepts presented had no stronger scientific foundation. For example, "open hands, exposed palms that move freely as the person speaks, and soft wrists indicate open communication where nothing is hidden" (Barreau du Québec, n.d.b, our translation). However, the use of such behavioral indicators (or combinations of some of them) has no scientific foundation (Hartwig & Bond, 2011, 2014; Mann, Vrij, & Bull, 2002; see also Vrij, Hartwig, & Granhag, 2019, for a recent review of scientific research on nonverbal communication and deception detection).

In addition to the Bar of Quebec, proponents of synergology claim to have assisted, trained, or otherwise had as clients professionals in positions of trust or authority, including police officers and judges of Québec courts (e.g., Régie du logement du Québec, Commission des lésions professionnelles, Municipal Court of

the City of Montreal, Superior Court, Court of Quebec) (Denault, 2017; Denault et al., 2015). Furthermore, "official" training centers offer the 200-plus hours training to "become" a synergologist, notably in Belgium, France, Quebec, Spain, Switzerland, and the Netherlands (Institut Québécois de Synergologie, n.d.; Bunard, 2018; Synergology, the Official Website, n.d.d). In all these cases, the use of concepts specific to synergology by security and justice professionals can have very harmful effects. In Quebec courts, for example, if judges use concepts specific to synergology "having no more scientific basis than those used in medieval ordeals" (Denault, 2015, p. 9, our translation), the outcome of trials could be distorted, particularly when the evidence is limited to contradictory testimonies (e. g., at a sexual assault trial where the victim's and the accused's words are in opposition). Witnesses who tell the truth could be considered dishonest, and vice-versa.

In response to criticism, synergologists argue that questions should be asked to confirm or disprove a hypothesis after considering several behavioral indicators and other concepts specific to their approach (e.g., Bagoë, 2015; Gagnon, 2015; Gagnon & Martineau, 2010; Institut Québécois de Synergologie, 2018; Story, 2018; Turchet, 2010). This call to caution, however, is of no use if these behavioral indicators and concepts have not been subjected to peer-review and replication. Indeed, as with the Reid technique, training in synergology could increase the confidence of judges in their ability to detect lies, while in fact, the accuracy of their judgments could decrease. Confirmation bias, in contrast, could lead judges to ask questions to verify an erroneous hypothesis, to give more weight to the answers that corroborate it and less weight to the answers that contradict it (Porter & ten Brinke, 2009). In addition, also in response to criticism, other proponents of synergology argued that the current peer review system "offers an illusion of quality control of publications that reassures the less well-informed and enhances the image of researchers in the eyes of gullible people" (Loranger & Loranger, 2019, p. 79, our translation) and suggested that their approach is criticized because it is innovative (Denault, 2018; Jupe & Denault, 2018). Some proponents of synergology have also used other types of responses, including attacks on the morality and competence of the critics in an attempt to discredit their arguments without responding to the substance of those arguments (Denault, 2018; Denault et al., 2015; Walton, 1987)⁴.

In spite of all this, synergology is now entering a new field of application, that of identifying potential threats through the analysis of nonverbal behaviors and preventing terrorist acts. For example, a "specialized training in practical recognition and probable identification of malicious intentions of individuals or groups of individuals through the learning of known techniques of synergology and new safety concepts" (Cellule SCAN, n.d., our translation; see also Gagnon, 2018) is now available. Given that the effectiveness of synergology is dubious at best and the effectiveness of using nonverbal behaviors for security controls at airports or to determine whether people are hiding an object is limited (Ormerod & Dando, 2015; Sweet et al., 2017), this new field of application of synergology is highly questionable. Its use for preventing terrorist acts is of even more concern because the effectiveness of a \$1.5 billion program (the SPOT) whose goal was similar (the identification of potential threats through the analysis of nonverbal behaviors) remains doubtful despite years of scrutiny from the U.S. Government Accountability Office (2010, 2011, 2012, 2013, 2017).

Why Do Some Organizations Turn to Pseudoscience?

The reasons for irrational beliefs have been the subject of extensive scientific literature. People's critical thinking abilities, political, and religious ideologies, as well as cognitive skills and scientific knowledge are some of those reasons (Bensley & Lilienfeld, 2017; Bensley, Lilienfeld, & Powell, 2014; Boudry, Blancke, & Pigliucci, 2015; Bronstein, Pennycook, Bear, Rand, & Cannon, 2018; Gauchat, 2012; Majima, 2015; Nisbet, Cooper, & Garrett, 2015; Pennycook, Cheyne, Barr, Koehler, & Fugelsang, 2015; Pennycook & Rand, 2018; Shen & Gromet, 2015). But why do some organizations in the fields of security and justice turn to pseudoscience and pseudoscientific techniques? To an international scientific community that has published thousands of peer-reviewed articles on nonverbal communication, it may seem surprising that these organizations embrace programs, methods, and approaches that, on the surface, seem scientific but, in reality, are not. We offer five hypotheses as to why some organizations turn to pseudoscience.

The Problems to Solve

First, organizations in the fields of security and justice may be confronted with problems that these programs, methods, and approaches could apparently solve. For example, the importance and urgency of securing airports could partly explain why SPOT has been implemented at numerous U.S. airports. The desire to implement better professional practices could partly explain why the BAI is an interview method used by many police forces and why synergology has been taught to French-speaking security and justice professionals. The issues may also be exacerbated or mitigated by circumstances within or outside these organizations. For example, the attacks of September 11, 2001, likely increased the importance and urgency of securing airports.

It is important to emphasize that, unlike scientific knowledge, pseudoscientific claims offer immediate and easy solutions to complex challenges. They are thus particularly enticing. For example, the work of security and justice professionals could be facilitated by the use of highly accurate lie detectors during their daily face-to-face interactions. While science cannot offer such devices because they simply do not exist, pseudoscientific claims can be tailored to the needs of professionals and appear to be nearly infallible. Practitioners with limited knowledge of science and seeking a silver bullet might find these claims quite appealing. Thus, offering a "guarantee" that training in the Reid technique allows to "increase your ability to eliminate the innocent, identify the guilty and motivate subject's [sic] to tell the truth" (John E. Reid &

[Associates, n.d.c](#)) can have a highly persuasive effect on some police officers. Also, the fact that approaches are presented as truly scientific can increase their credibility. Thus, the assertion that synergology uses "several revolutionary techniques and methods derived from the most recent discoveries in the field of behavioral sciences" (Gagnon, n.d.b, our translation) could convince organizations of its validity.

The Lack of Scientific Knowledge

Second, the lack of specific or general scientific knowledge could partly explain why some organizations turn to pseudoscience and pseudoscientific techniques. For example, knowledge of the state of scientific research on nonverbal communication makes it easy to recognize the true nature of the indicators conveyed by SPOT, the BAI, and synergology. However, awareness and understanding of the process of critical appraisal of knowledge could overcome the lack of specific scientific knowledge. Indeed, when science is implicitly or explicitly invoked to legitimize programs, methods, and approaches, peer-reviewed articles that demonstrate their effectiveness should be requested and reviewed (to assess their relevance), regardless of the status of the individuals promoting those programs, methods, and approaches.

The following example illustrates the importance of this advice. In 2015, the founder of synergology (who was then pursuing a PhD in language sciences and who obtained it two years later; [Turchet, 2017](#)) sent a formal notice to a columnist requiring him to retract and apologize for criticizing him in a series of texts published in a French-language daily newspaper from Montreal. In this formal notice, which was also shared on social media by proponents of synergology, a number of references were cited, arguing that the columnist should have mentioned them. However, these references did not validate the meanings associated by synergologists to different gestures or the effectiveness of synergology. In fact, after reviewing the references, it became apparent that "there was no interest in considering them in order to determine whether synergology is a sham or not" ([Denault et al., 2015](#), p. 440, our translation). This episode is reminiscent of the 175 irrelevant sources cited by the TSA to legitimize SPOT ([U.S. Government Accountability Office, 2017](#)).

The Ignorance of the Importance of Science

Third, even if organizations in the fields of security and justice do not lack specific or general scientific knowledge, they might turn to pseudoscience because they ignore the importance of science to improve their professional practices. Indeed, the importance of knowledge published in peer-reviewed scientific journals comes not only from the first critical evaluation by researchers with scientific expertise in the subject, but also from the subsequent critical evaluation of members of the international scientific community. In other words, organizations essentially have two choices: (i) scientific knowledge that, though fallible, can be supported or criticized because everything is accessible to do so, or (ii) pseudoscientific claims which these organizations must largely trust blindly. Without knowing the merits of the knowledge published in peer-reviewed scientific journals, pseudoscience can appear much more enticing and reassuring by implementing marketing campaigns and using logical fallacies (e.g., calls for authority; [Shermer, 2002](#)).

For example, to flaunt the merits of synergology, the following statement was used: "Who are the synergologists? Who are the participants, the clients who use synergology? Doctors, neuropsychologists, psychologists, pharmacists, investigators, economic fraud experts, high security special agents, lawyers, social workers, caregivers, business leaders, directors, interviewers. Any other users? Judges, lawyers, public relations officers from various backgrounds and so on" ([Gagnon, 2015](#), our translation). However, as when the creators of the Reid technique state that more than 500,000 people were trained ([John E. Reid & Associates, n.d.b, n.d.c](#)), such a statement cannot make up for the lack of scientific evidence.

The Underestimation of the Dangers of Pseudoscience

Fourth, some organizations in the fields of security and justice have probably turned to pseudoscience because they underestimate the disadvantages (and overestimate the advantages) of using programs, methods, and approaches that, on the surface, seem scientific but, in reality, are not. Beyond the fact these organizations may overlook truly effective means because they pay attention to pseudoscientific claims, the use of dubious concepts regarding nonverbal communication can result in (i) failing to detect actual threats and misidentifying guilty individuals as innocent, (ii) misidentifying innocent individuals as guilty, and (iii) a loss of valuable time and money as well as reputational, legal, and social consequences.

Unless they have unlimited resources, it seems unwise for these organizations to invest time and money in learning and using concepts that have not been the subject of peer-reviewed articles. In addition, if some security and justice organizations are turning to pseudoscience, their reputation could be damaged, especially if it becomes public, and more so if people or other organizations (with whom they do business) assume that best professional practices are being used. The legal and social consequences are no less significant. When they turn to pseudoscience, these organizations are exposed to risks, such as when physicians omit to consult research findings in scientific journals and treat their patients with programs, methods, and approaches that have not been scientifically supported. In other words, when they are sued because their patients have suffered harm that could have been prevented by using evidence-based practices, physicians may find themselves in an unfortunate position ([Cohen & Eisenber, 2012](#); [Cohen & Kemper, 2005](#); [Foster, Schwartz, & DeRenzo, 2002](#)). First developed in medicine in the 1980s ([Thoma & Eaves, 2015](#)), evidence-based practices have since reached the field of psychosocial intervention ([Eyberg,](#)

[Nelson, & Boggs, 2008](#); [Okpych & Yu, 2014](#)) and gained growing popularity among security and justice professionals ([Lum & Koper, 2015](#); [Sherman, 2013](#)). Because their mission is to ensure the protection of the public, professional governing bodies (including those outside the health sector) should therefore ensure that their members rely on evidence-based practices.

The Accountability of Researchers

Finally, when organizations in the fields of security and justice have unrealistic expectations stemming from television series and other popular media, and turn to pseudoscience, part of the responsibility lies with the international scientific community ([Colwell, Miller, Miller, & Lyons, 2006](#); [Denault & Jupe, 2017](#)). Indeed, "the scientific process doesn't stop when results are published in a peer-reviewed journal. Wider communication is also involved, and that includes ensuring not only that information (including uncertainties) is understood, but also that misinformation and errors are corrected where necessary" ([Williamson, 2016](#), p. 171).

In other words, the international scientific community must promote more open access to knowledge published in scientific journals by disseminating it to the general public, as well as to organizations in the fields of security and justice that wish to implement evidence-based practices ([Freckleton, 2016](#)). More broadly, academics should also promote the importance of science, explain the strengths (and limitations) of peer-reviewed knowledge, and seek to provide accessible and convenient (and scientifically supported) tools to meet the needs of professionals.

Conclusion

The objective of this article was to examine (i) concepts of nonverbal communication conveyed by programs, methods, and approaches that fail to reflect the state of science, but also (ii) the consequences of their use by security and justice professionals. To achieve this objective, we described the scope of scientific research on nonverbal communication and examined a program, a method, and an approach that each run counter to the state of science. Finally, we outlined five hypotheses to explain why some organizations in the fields of security and justice are turning to pseudoscience and pseudoscientific techniques. These organizations (and their employees) may be acting in good faith, perhaps believing they are using the best professional practices. Good faith, however, is not sufficient for good practice. For example, SPOT created "an unacceptable risk of racial and religious profiling" ([ACLU, 2017](#), p. 1), the BAI increases the risk of innocent people (especially juveniles and other vulnerable persons) making false confessions, and synergology could distort the outcome of trials and important decisions made by professionals in positions of trust or authority.

It should be noted that not all aspects of SPOT, the BAI, and synergology are incorrect. However, the use of some evidence published in scientific journals (embedded among a host of pseudoscientific claims) to legitimize programs, methods, and approaches that are not scientifically supported is a typical feature of pseudoscience. In other words, proponents of these programs, methods, and approaches can categorically reject the overwhelming weight of a vast literature that runs counter to their views, and select a few peer-reviewed articles that support them ([Blancke, Boudry, & Pigliucci, 2017](#); [Denault et al., 2015](#)). For example, synergologists mobilize knowledge from laboratory experiments, including on issues related to emotional expressions and investigative interviews (e.g., [Gagnon, n.d.a](#); [Story, 2018](#); [Turchet, 2009, 2012, 2013](#)), while the founder of synergology stated that "what we absolutely do not believe in within synergology is experiment, because body language is made in such a way that when we participate in an experiment, it does not work" ([Institut Européen de Synergologie, 2015](#), our translation; see also [Jarry, 2016](#)).

Although the dangers of pseudoscience in security and justice contexts are undeniable, security and justice organizations would be mistaken to reject anything that relates to nonverbal communication on the grounds that it is not always easy to distinguish scientific knowledge from pseudoscientific claims. In fact, the thousands of peer-reviewed articles on nonverbal communication are important sources of knowledge for security and justice professionals ([Burgoon et al., 2010](#); [Granhag & Strömwall, 2004](#); [Granhag et al., 2015](#); [Knapp et al., 2014](#); [Moore et al., 2014](#); [Patterson, 2011](#); [Vrij, 2008](#)). In addition, the usefulness of an individual's nonverbal behaviors goes far beyond the detection of lies or mal-intent.

For example, in recent years, the field of study of thin slices of expressive behavior (e.g., using videos of a few seconds without sound; [Weisbuch & Ambady, 2011](#)) has developed in an attempt to understand experiential knowledge that results from intuition and that has a considerable impact on rapid judgments. This field of study has also developed in an attempt to increase the ability to accurately observe and interpret nonverbal behaviors, including judging an individual's personality or propensity to psychopathology ([Borkenau, Mauer, Riemann, Spinath, & Angleitner, 2004](#); [Carney, Colvin, & Hall, 2007](#); [Fowler, Lilienfeld, & Patrick, 2009](#); [Oltmanns, Friedman, Fiedler, & Turkheimer, 2004](#); [Stillman, Maner, & Baumeister, 2010](#)). In addition, the usefulness of nonverbal communication in creating a trust relationship between a police officer and a suspect to gather information ([Abbe & Brandon, 2013](#); [St-Yves, 2006](#); [Tickle-Degnen & Rosenthal, 2009](#)) and the automated recognition of facial expressions ([Mast, Gatica-Perez, Fraundorfer, Nguyen, & Choudhury, 2015](#)) are merely some of the many issues on which peer-reviewed knowledge could benefit security and justice professionals.

Although some security and justice organizations are still turning to pseudoscience, others have already moved past programs, methods, and approaches that fail to reflect the state of science. In a number of organizations, researchers are already working closely with security and justice professionals to implement

evidence-based practices (e.g., Centre for Research and Evidence on Security Threats, United Kingdom; High-Value Detainee Interrogation Group, United States). Therefore, we hope that our article will inspire all organizations, regardless of the importance they currently attach to scientific research, to reflect more on the dangers of pseudoscience and the importance of science in security and justice contexts. In addition, we hope it will encourage security and justice organizations to start or continue working with the international community of scholars who have scientific expertise in nonverbal communication and lie (and truth) detection to develop evidence-based practices. We also hope that researchers will see our article as an invitation to increase opportunities to disseminate their scientific work, promote the scientific method, and engage with security and justice professionals to limit the use of pseudoscience.

Notes

¹ This article is a translation of the French article "L'analyse de la communication non verbale: Les dangers de la pseudoscience en contextes de sécurité et de justice" published herein with the authorization of the French journal *Revue Internationale de Criminologie et de Police Technique et Scientifique*. The initial manuscript of the French article was drafted by Vincent Denault with the help of Pierrick Plusquellec, Louise Marie Jupe, Michel St-Yves, and Norah Dunbar. The other authors read and commented the initial manuscript and subsequent versions. All authors approved the final version.

² The U.S. Government Accountability Office (2017) reported that the TSA revised the list of 94 behavioral indicators in 2014: "According to TSA, most of the 94 behavioral indicators were combined, condensed, or updated for incorporation into a revised list and a small subset were eliminated" (p. 3).

³ It should be noted that following the report of the *Boston Globe*, the TSA curtailed the program: "Agency officials told the Globe that air marshals no longer document the minor movements and behavior of these travelers" (Winter & Abelson, 2018).

⁴ For example, after having himself completed the 200-plus hours training to "become" a synergologist, the first author severed his links with synergology, transitioned to science by pursuing a master's degree in law and a doctorate in communication, and published academic texts rigorously criticizing the use of synergology in the justice system (e.g., Denault, 2015; Denault et al., 2015). He was then the target of ad hominem attacks, including insults and disapproving comments on social media (Denault, 2018).

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