

From Child Protection to Paradigm Protection—The Genesis, Development, and Defense of a Scientific Paradigm

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A scientific paradigm typically embraces research norms and values, such as truth-seeking, critical thinking, disinterestedness, and good scientific practice. These values should prevent a paradigm from introducing defective assumptions. But sometimes, scientists who are also physicians develop clinical norms that are in conflict with the scientific enterprise. As an example of such a conflict, we have analyzed the genesis and development of the shaken baby syndrome (SBS) paradigm. The point of departure of the analysis is a recently conducted systematic literature review, which concluded that there is very low scientific evidence for the basic assumption held by Child Protection Teams: when certain signs are present (and no other “acceptable” explanations are provided) the infant has been violently shaken. We suggest that such teams have developed more value-based than scientific-based criteria when classifying SBS cases. Further, we suggest that the teams are victims of “groupthink,” aggravating the difficulties in considering critics’ questioning the criteria established by the teams.

Keywords: *child protection teams, circular reasoning, groupthink, shaken baby syndrome, value-based criteria*

I. INTRODUCTION

In 1971, the pediatric neurosurgeon Norman Guthkelch (1971) presented the hypothesis that shaking an infant in a whiplash-like manner might bring about a certain type of intracranial bleeding—subdural hematoma. Later, the hypothesis was extended to include retinal hemorrhages and encephalopathy—these three signs were referred to as the “triad.” The triad hypothesis was adopted rather promptly and eventually developed into a reverse and certain implication: if the triad is present, the infant must have been violently shaken, resulting in shaken baby syndrome (SBS) (Box 1).

In 2012, Guthkelch expressed disappointment that his 1971 hypothesis had been extended and misused, and he stated that the abductively derived implication was based on poor evidence. He also complained that the claim that if the triad is present the infant must have been violently shaken had been used to prosecute and convict suspected but potentially innocent parents and guardians (Guthkelch, 2012). Despite this, the claim seems to have become generally accepted among concerned physicians. The results from a recent study show that 88% of American physicians who frequently encounter suspected child abuse cases considered the SBS diagnosis to be valid if the triad was present (Narang et al., 2016).

Many studies on SBS have been published in the past 40 years, including several systematic literature reviews (Lynøe et al., 2017a). Accordingly, the proponents of the “SBS hypothesis” seem to have good reason to assume that their claim (i.e., that if the triad is present and no other “acceptable” explanation is provided, the infant must have been violently shaken) is based on strong and robust evidence (Ludvigsson, 2015; Strouse, 2016).

Box 1. The terminology used

The term “shaken baby syndrome” (SBS) signifies a constellation of symptoms and signs, viz. subdural hematoma, retinal hemorrhages, and encephalopathy, often referred to as “the triad” as caused by violent shaking.

The term is, however, problematic, as it includes *both* the medical findings and the alleged, but scientifically unproven, injurious mechanism—and even the intent behind this mechanism.

Hence, we ought to differ between *the injurious mechanism* (traumatic shaking) and *the medical findings* (the symptoms and signs, “the triad”). Intent is not, for obvious reasons, for the medical community to decide. In this article, however, we have chosen to use the term “shaken baby syndrome” when characterizing the associated paradigm as well as its acronym SBS.

However, the statement of Guthkelch (2012) has received support from others, who have directly or indirectly questioned the SBS hypothesis. Recently, a systematic literature review regarding SBS (Lynøe et al., 2017a) concluded that only 2 of 30 relevant papers (retrieved from 3,773 publications) met the criteria for “moderate risk of bias,” and not one single study met the criteria for “low risk of bias.” Of the present systematic review, two conclusions were inferred: (1) there is *insufficient (or very low) scientific evidence* on which to assess the diagnostic accuracy of the triad in identifying traumatic shaking, and (2) there is *limited (or low) scientific evidence* that the triad and, therefore, its components can be associated with traumatic shaking. As a consequence of these findings, it is not possible to estimate the incidence or prevalence of SBS.

The question then arises as to how it is possible that several decades of research have resulted in such limited, insufficient, and biased evidence. Furthermore, why does the international scientific society believe the concept of SBS is based on strong and robust evidence? To answer these questions, we scrutinized the arguments provided in the recent systematic literature review and analyzed the genesis, development, and defense of the shaken baby paradigm.

II. THE RECENT SYSTEMATIC LITERATURE REVIEW

The recently published review concluded that the large majority of previous empirical studies suffer from a high risk of bias, mainly for two reasons: (1) there were methodological shortcomings regarding, for example, study design, and (2) the criteria used for classifying shaken baby cases were based on circular reasoning (Lynøe et al., 2017a).

Methodological Shortcomings

The focus of the systematic literature review was the relation between the triad and trauma without direct impact to the head or torso and included infants ≤ 12 months of age with someone having confessed to have shaken the infant or witnessed someone else doing so. Such cases were, if possible, compared to cases in which an infant or child had been exposed to other kinds of witnessed trauma (e.g., traffic accidents) also resulting in the triad (Lynøe et al., 2017a). The research question provided was *with what certainty can we claim that the presence of the triad was caused by violent shaking?*

Due to the nature of the issue, for obvious reasons it is impermissible to conduct randomized controlled trials. Accordingly, the studies on SBS are based on observational studies such as cohort and case control studies. Many of the reviewed studies were conducted as retrospective case control studies, with the common problem that the controls were not nearly comparable

to the study group regarding, for example, age. Such comparisons will result in observation bias and compromise the conclusions. Another methodological problem was that the criteria for classifying SBS cases were not explicitly defined or specified. In several studies, it was simply stated that a Child Protection Team (or “multidisciplinary team”) performed the classification, resulting in the subsequent issue of circularity (Lynøe et al., 2017a).

Circular Reasoning

As regards circular reasoning, the basic assumption of a Child Protection Team is that if the triad is present (and no alternative explanation considered “acceptable” is provided), the infant must have been violently shaken. A precondition for this assumption is that certain medical conditions (such as prematurity, coagulation disorders, infectious diseases, leukemia, and a number of other medical disorders) have been ruled out. But if the parent or guardian cannot provide an explanation that is considered “acceptable,” he or she is considered untruthful if denying shaking the baby violently (De Leeuw et al., 2013). This is also the case if there are signs of direct trauma (e.g., a subgaleal hematoma); the caretaker is expected to provide an “acceptable” explanation, for example, that the baby fell from a dressing table. But if this fall is said to have been from lower than a certain height (e.g., <1 m), the explanation is not considered “acceptable” and the parent or guardian is, by default, considered untruthful. Accordingly, such cases are classified as “shaken baby syndrome,” “abusive head trauma,” “inflicted head injury,” or similar. Moreover, if the parent or guardian can give no explanation or changes his or her story, the presence of the triad by default classifies the infant as having been violently shaken (Table 1). Sometimes, a parent or guardian admits to having shaken the infant but only *after* it became unconscious and/or stopped breathing, that is, as an act of resuscitation. Even though this kind of shaking might have been mild and temporally irrelevant to the infant’s illness, such cases are also classified as shaken baby cases. In several studies, the authors also included cases in which a parent

Table 1. The Child Protection Teams’ criteria for classification of shaken baby cases and controls depending on whether or not the parents or guardians are considered trustworthy

	Parents are trustworthy	Classified as
Lack of explanation	No	Shaken baby case
Explanation changed	No	Shaken baby case
Shaking, but after symptom	No	Shaken baby case
Deny, but convicted	No	Shaken baby case
Police induced confession	Yes	Shaken baby case
“Plea bargain”: confession	Yes	Shaken baby case
Accidental fall < 1 m	No	Shaken baby case
Accidental fall > 1 m	Yes	Control case

or guardian was convicted of having shaken an infant although he or she denied it (Adamsbaum et al., 2010). However, a verdict of guilt might be based on the testimony of an expert witness from a Child Protection Team. This once again underlines the important difference between the task of the Child Protection Team, namely, to protect the child from maltreatment, versus the task of the medical expert witness, which is to give impartial and well-founded information, based on scientifically robust evidence, to the judicial system.

A parent or guardian might lie to protect him or herself from prosecution. But, he or she might also be truthful when unable to provide an “acceptable” alternative explanation. Perhaps nothing has happened, or a minor fall resulted in the triad (Gardner, 2007). For instance, increased head size associated with benign external hydrocephalus with or without minor trauma seems to be associated with an increased risk of subdural hematoma (Ghosh and Ghosh, 2011). Subdural hematoma and retinal hemorrhages are also associated with regular and complicated vaginal deliveries (Hughes et al., 2006; Looney et al., 2007; Rooks et al., 2008; Kelly et al., 2014). On average, approximately 40% of regular deliveries might bring about subdural hematoma and retinal hemorrhages without clinical symptoms. But in a few cases, a subdural hematoma might develop into a hygroma and rebleed, which in turn might result in clinical symptoms such as sudden unconsciousness or ceased breathing (Hymel, Jenny, and Block, 2002; Gabaeff, 2013).

Hence, the Child Protection Teams have developed the criteria for classification of shaken baby cases versus controls. The criteria are based on the assumption that a parent or guardian is untruthful when denying having shaken the baby; consequently, if the triad is present, the baby has by default been violently shaken. However, from the very beginning, researchers who have conducted observational studies to explore whether the triad actually implies that the baby has been shaken have adopted the classification and criteria of the Child Protection Team. Hence, a classification that presupposes that an infant with the triad has been violently shaken results in circular reasoning. Or, in other words, what is investigated is already assumed to be true: if the triad is present, the baby must have been violently shaken. This kind of circular reasoning can be minimized, albeit not completely avoided, if study cases include only witnessed or confessed shaken babies with detailed information on the shaking event, information that must not presuppose as true what is to be demonstrated, that is, that the baby has been violently shaken. Study cases could, of course, also include cases of *undoubtedly proven* shaking, based on video documentation of the incident (Table 1).

Using the above-mentioned circularity criteria for classification is likely to result in inadequate comparisons. The allegedly shaken baby group might include cases in which no shaking has taken place, and the control group might include shaken infants. Obviously, such studies are inconclusive, and

in the literature review were accordingly classified as having a high risk of bias (Lynøe et al., 2017a). Also, considering the methodological shortcomings, only two studies (Adamsbaum et al., 2010; Vinchon et al., 2010) were classified as having a *moderate* risk of bias, and none as having a *low* risk of bias. However, these two studies also had debatable comparison groups and other methodological shortcomings.

False Confessions

Contrary to most studies, the two with a moderate risk of bias included caretakers who had confessed to shaking an infant, and in one of the studies some of the shaken baby cases included detailed information about what the parent or guardian had actually confessed to doing. But generally, in most of the assessed studies there was no information as to what the parent or guardian had confessed to or the circumstances under which the confession had been obtained. Was the confession the result of a so-called “plea bargain”? A plea bargain procedure entails that the defendant is offered a milder crime classification in exchange for a confession, and thereby does not run the risk of a much longer sentence (Gertner et al., 2015). In such a case, the defendant has a strong incentive to confess, whether guilty or not, resulting in a risk of false confession. In a US-based study, the share of plea bargain-based confessions was estimated to be 13 of 29 cases (Esernio-Jensen, Taj, and Kodsí, 2011).

The risk of false confession might also occur in cases in which both parents are prosecuted of having shaken the infant. An interrogating officer might indicate that if one of the parents confesses, the other will be released and be able to retain custody of the infant (and any siblings); otherwise, the child(ren) will be taken to a foster home. This strategy is a part of the so-called Reid technique, in which the point of departure is that the suspect is guilty and is told so by the police (Kassin et al., 2010). In such cases, the police and prosecutor are confident that the suspect is guilty as they have been informed by an expert from, for example, a Child Protection Team that because there is no alternative “acceptable” explanation, the infant must have been violently shaken. In this manner, even false confessions may contain detailed (but confabulated) information about what happened.

III. THE GENESIS OF THE GENERAL ASSUMPTION AND THE CRITERIA

The present state of evidence regarding SBS is obviously not impressive. But, why has the collective of concerned pediatricians and other concerned scientists accepted and endorsed such biased criteria for the classification of shaken baby cases? In the next section, the reasonableness of three explanations is discussed. One concerns the social psychological theory of “groupthink” and another the philosophy of scientific paradigms. Third,

characteristics and traits on an individual level, such as conformity and a lack of critical attitude and/or moral courage among editors and reviewers of scientific journals, may have contributed.

Groupthink

Although the social psychological theory of groupthink was introduced in 1971 (Janis, 1971), it was not until 2010 that it was applied in a context relevant to this study: an examination of manifestations in family courts, particularly in the context of child abuse cases (Breger, 2010). Groupthink might occur when members of a “cohesive in-group are striving for unanimity overriding their motivation to realistically appraise alternate causes of actions” (Janis, 1971). It is stressed that it is the context—for example, facing difficult moral dilemmas—rather than the character of the single members of the group that facilitates groupthink. A long education or training does not offer immunity to groupthink. Symptoms of groupthink include (1) a strong sense by the group members of being on the morally right side; (2) proclivity for using stereotypes and hostility in relation to outside groups; and (3) pressure to conform (Breger, 2010). Groupthink is not displayed solely in a single case in the courtroom; if a group, for example, a multidisciplinary team, is repeatedly used by the court, groupthink might also permeate decision-making by the same group in future cases. Groupthink is also described to appear if the group members regard themselves as belonging to an exclusive club or elite group (Breger, 2010).

In this context, the hypothetical explanation is that the Child Protection Teams are victims of groupthink. Such teams are sometimes composed of members from different medical specialties, but predominately contain pediatricians, radiologists, social workers, police, and sometimes prosecutors. A team faces difficult moral dilemmas and has a strong moral sense of protecting children from maltreatment and abuse. Within the framework of such a morality, the criteria with which they identify child abuse might come to be oriented to prove guilt, rather than being medically or scientifically motivated. Accordingly, the task is not primarily to classify shaken baby cases correctly, but rather to protect the child from future risk of abuse, even if it involves a risk of convicting an innocent parent or guardian. If someone questions a team’s decisions, its members may react in a hostile manner: “So you want child abusers walking free?” As no one wants to be suspected of such a thing, the members of the group are protected from outside criticism. The suggestion that the criteria for the classification of shaken baby cases have been more penally oriented than scientifically motivated might also explain the finding that the incidence of homicide among infants increased sharply after 1980 (until 2005) from a stable incidence during the period 1940–1979. The explanation for this, suggested by the authors, was that the classification of homicides and accidents was influenced by value-based

rather than scientific considerations (Riggs and Hobbs, 2011). Groupthink among Child Protection Teams might not only have influenced their classification of study cases and controls; in practice, the consequence is that *false positive* cases are concealed and might appear as if they were *true positives*. Since, for example, a *positive predictive value* depends on the number of *false positive cases* (true positives/true positives + false positives), hiding false-positive cases as if they were true positives might bring about an extremely (and unreasonably) high *positive predictive value* (Table 2; Lynøe et al., 2017b). This course of action might be a plausible response as to how groupthink among Child Protection Teams also allows them to manage uncertainty in a situation in which failure to identify and prosecute child abuse is not an acceptable alternative.

Even though the groupthink hypothesis may explain the genesis of the criteria *within* a Child Protection Team, this does not explain how the international scientific society has endorsed the provided criteria for classifying shaken baby cases. Why have editors and reviewers of international scientific journals and groups that approve funding, as well as research ethics committees, all accepted such biased criteria?

Paradigms and Paradigm Protection Strategies

A plausible explanation of the scientific community's acceptance of the general assumption can be extrapolated from the theory of scientific paradigms, according to which a scientific paradigm embraces certain basic assumptions about factual aspects and values. The general assumption about factual aspects in the present case is, again: if the triad is present and if no alternative explanation considered to be "acceptable" is provided, the infant has been violently shaken. So, according to the basic assumption, if the triad is present without an "acceptable" alternative explanation but doubts are raised as to whether it is the result of shaking, we are faced with an "anomaly"

Table 2. Relationship between the presence of the triad (yes/no) and the Child Protection Teams' classifications (as *gold standard*) of whether or not an infant has been violently shaken. The calculation of, for example, *positive predictive value* is based on the proportions of *true positive*/(*true positive* + *false positive*) cases. Reducing the number of *false positive* cases imply that the *positive predictive value* becomes higher; if the number of *false positive* is zero it becomes 100%. Similar reasoning might be applied regarding the *specificity* (*true negative*/*true negative* + *false positive*)

The triad is present	The infant has been violently shaken	
	Yes	No
Yes	<i>True positive</i>	<i>False positive</i>
No	<i>False negative</i>	<i>True negative</i>

Table 3. The general assumptions by the Child Protection Teams and the criteria applied by researchers in the classification of shaken baby cases, and how the classification functions as a paradigm protection and preserving procedure. The general assumption is that if the triad is present in an infant and there is no alternative explanation considered to be “acceptable,” the infant has been violently shaken

Accordingly:

- 1) If a parent or guardian provides no explanation as to why the infant displays the triad, this is, according to the shaken baby syndrome (SBS) paradigm, considered impossible and should scientifically be classified as an anomaly. According to the Child Protection Team, it is presupposed that the parent is not telling the truth unless confessing to shaking the baby and the case is classified as a shaken baby case. In this manner, the anomaly is eliminated, and the SBS paradigm is protected and accordingly preserved.
 - 2) If a parent or guardian confesses to shaking an infant with the triad as an act of resuscitation, this is, according to the SBS paradigm, considered impossible and should scientifically be classified as an anomaly. But according to the Child Protection Team, it is presupposed that the parent or the guardian is not telling the truth and the case is classified as a shaken baby case. Again, the anomaly is eliminated, and the SBS paradigm is protected and preserved.
 - 3) If external signs of impact are found and an alternative explanation considered to be “acceptable” is lacking (e.g., a fall <1 m), this should also be regarded, according to the SBS paradigm, as an anomaly. Again, the parent or guardian is assumed to not be telling the truth, and the case is classified as a shaken baby case. The anomaly is eliminated, and the SBS paradigm is protected and preserved.
 - 4) If a parent or guardian falsely confesses to having shaken an infant as the result of a “plea bargain” procedure (which may presuppose that an expert witness claims that there is no alternative “acceptable” explanation), this is also classified as a shaken baby case. The procedure might also function as a paradigm protection and preserving procedure.
 - 5) If a parent or guardian confesses to having shaken an infant after interrogation by use of the Reid technique, (which presupposes that an expert witness claims that there is no alternative “acceptable” explanation) this case is also classified as a shaken baby case. The procedure thus might also function as a paradigm protection and preserving procedure.
 - 6) If a parent or guardian changes his/her story about what happened, it is presupposed that the caretaker is not telling the truth, and such a case is also classified as a shaken baby case. Similarly, the procedure functions as a paradigm protection and preserving procedure.
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(Kuhn, 1979; Johansson and Lynøe, 2008). A scientific anomaly is a phenomenon that the theoretical framework of the paradigm cannot explain. So if, for instance, a parent or guardian denies having shaken an infant with the triad and maintains that the infant suddenly became unconscious, this story would be considered to have no explanation according to the paradigm, that is, a scientific anomaly. And because the paradigm is concerned with providing an explanation for the phenomenon in question, this becomes a problem. But in the context of SBS, it is not regarded as an anomaly; instead, the parent or guardian who claims that he or she has done nothing of the kind is considered untruthful, and a scientific anomaly need not arise (Table 3). Scientifically, the claim that the parent or guardian is untruthful might be regarded as an auxiliary hypothesis with the purpose of eliminating the anomaly and thereby protecting the paradigm from crises (Table 2).

Although a scientific paradigm is born, lives, and dies with its anomalies, anomalies might sometimes indicate that something is wrong with the prevailing paradigm and, eventually, become the embryo of a new paradigm. To defend and preserve the paradigm from excessive anomalies and the subsequent risk of crises or a scientific revolution, different paradigm-protecting strategies might be brought about. [Table 3](#) presents six examples that illustrate such paradigm-preserving strategies regarding SBS. As illustrated, the strategies might have dire consequences not only for facilitating scientific bias, but also for an innocent parent or guardian, for the child, and for the whole family.

What has been said above, however, cannot explain why the general assumption was adopted in the first place. Why?

A scientific paradigm typically embraces important research norms and values, such as truth-seeking, critical thinking, rationality, disinterestedness, and good scientific practice ([Johansson and Lynøe, 2008](#)). These values should prevent the paradigm from introducing defective assumptions, such as the one discussed here. But if the scientist is also a clinician with special duties (e.g., protecting children), he or she may not be able to separate the scientific values from those of the caring clinician; it might be difficult to ignore the clinicians' norms and values outside the scientific enterprise. When it comes to issues associated with child abuse, most pediatricians have a strong passion for child protection. This passion is also reflected and endorsed by pediatric academies and societies, making pediatric ethics special and perhaps elevated than that involving all other patients within the health care system. The special duties associated with pediatric ethics could also explain the discounting of events and phenomena that should otherwise be considered potential anomalies and thus a challenge to the clinical adequacy of the SBS paradigm. Hence, the scientific values of researchers in the present field may have been overruled by clinical norms and preferences associated with Child Protection Teams. These preferences might also explain the notion that the classification of shaken baby cases is ethically rather than scientifically motivated ([Riggs and Hobbs, 2011](#)).

To protect the prevailing paradigm from hostile or inconvenient questions and anomalies, the shaken baby paradigm developed successful protection strategies, enabling the paradigm to be preserved and survive for many decades.

Responsibility of the Individual

Editors and reviewers of international scientific journals, members of research ethics committees and funding bodies, etc., may of course have been the victims of the paradigm umbrella as well as of groupthink. But, as they all have the stated and explicit goal of critiquing scientific contributions before publication, they must be held responsible if they do not fulfil their main task. There is a vast body of literature on conformity, cronyism,

moral courage, whistle-blowing, and similar aspects in this context (Sodeke, 2016). Obviously, however, the critics have not been efficient enough in their efforts to object, argue, and convince their peers of their doubts, and conformers have failed in their task to apply a strictly scientific approach.

The individual pediatrician might understand his or her obligation to protect children from abuse. This, in turn, makes it necessary to defend the SBS paradigm—a task that has probably not always been easy and that demands courage as well. However, the lack of individual criticism is also understandable. For an individual scientist it might be rather problematic to criticize the paradigm. The reception and the aftermath of the Swedish systematic literature review (Lynøe et al., 2017a) illustrated that the discussion is not based solely on scientific arguments. In one of the many reactions, it was even suggested that the Swedish report was the result of a conspiracy (Narang and Greeley, 2017)!

IV. CONCLUSION

We suggest that the genesis and maintenance of biased criteria in determining whether a baby has been violently shaken is based on groupthink among Child Protection Teams and paradigm protective strategies in the scientific community, which have enabled the publication of biased studies for a period of more than 40 years. Insufficient efforts by critics have likely also contributed to this. These phenomena might have had a synergetic effect and resulted in criteria, which might have become more penally oriented than scientifically motivated.

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