Modernizing Decision-Making: A Comparison of Algorithmic Decision Support Systems in Child Protective Service Agencies in Germany and Australia

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Abstract

The thesis examines the understudied topic of Algorithmic Decision Support Systems in Child Protective Services (CPS). This is of societal and scientific relevance as algorithmic decision-making tools are expected to facilitate the work in many different high-risk sectors. Therefore, this thesis addresses the following research question: *"How are Algorithmic Decision Support Systems used in the sector of Child Protective Services and what are potential advantages and risks?"*. For this purpose, a systematic literature review is conducted based on secondary data from Germany and Australia.

The posed theoretical framework predicts that CPS, Algorithmic decision-making tools bring structure and consistency to child care decisions, provide high-quality outcomes and relieve pressure from the practitioners. Findings of the analysis indicate that algorithmic decision tools for CPS in Germany and Australia do not live up to expectations and potential. Caseworkers often feel obstructed in their work, and the systems do not support decision-making or consistency. Still, the tools offer advantages such as fast communication with police or healthcare organizations and access to other databases. This thesis concludes that Algorithmic Decision Support Systems for CPS need further development and input from practitioners to identify the areas of child welfare work that an algorithm can best support.

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1. Introduction

Child Protective Services (CPS) is a vital actor tasked with protecting those who cannot protect themselves – children under the age of 18 suffering from abuse and neglect in their current place of care. In recent years, the number of children receiving CPS care has risen despite the demographic change, and a shortage of CPS caseworkers is reported in Australia and Germany (Bücken et al., 2020; Delibasic et al., 2018). Many CPS practitioners handle an increasingly high workload because of the shortage of workers and more families needing care (Ronan et al., 2009). Handling more cases is connected to high stress, negative impacts on the practitioners' mental health, and can potentially even lead to burnout (Boberg & von Castell, 2018; Delibasic et al., 2018). Therefore, caseworkers demand that measures are taken to relieve the pressure caused by their tasks. German Child Protective Service workers lobby only to work a maximum of 35 cases per person to give proper attention to the children and their environment. However, many social workers state a case count of up to 50 families. Some practitioners note 100 cases in their care. The large caseload often does not give them more than one hour every six months to visit each family they observe (Boberg & von Castell, 2018). The limited time to inspect a child's living conditions leads to often unreported and undetected grave child abuse or neglect cases. The media repeatedly uncover these cases after the children have suffered abuse through their legal guardians. Australian and German Child Protective Services alike demand more staff and better preventive measures to provide the children and families with the best support possible to avoid such tragic events from happening (Delibasic et al., 2018; ZDF, 2020).

Measures for prevention and workload reduction usually involve structuring and standardizing the case files and the practitioners' approach. These standardized measures are mainly digitized questionnaires or online filing systems (Ackermann, 2020). Other modern measures are Algorithmic Decision Support Systems for child welfare agencies. Such tools are already being used in other high-risk fields, like healthcare or criminal justice, to facilitate human decision-making (Busuioc, 2020). In Australia, the systems have already been used in CPS since the mid-2000s. However, studies indicate a dislike by the caseworkers of the algorithmic tools. Often, data is entered incorrectly, falsified, or not digitized (Gillingham, 2011, 2020). In the German child welfare agencies, the "Jugendämter", algorithmic decision systems are still experimental and infrequently used. Researchers advise being cautious with the recommendation the tools produce (Ackermann, 2020; Schneider & Seelmeyer, 2018). In Germany, risk assessment and the following decision about a child in care are mainly made with questionnaires. They do not help to decrease the paperwork and alleviate risk assessments (Ackermann, 2020).

Introducing Algorithmic Decision Support Systems into Child Protective Services creates a field of tension for the practitioners. Caseworkers need discretion for the individual circumstances in the high-risk field. This need for discretion meets the urge for standardization with systems that could facilitate and speed up decision-making. However, the tools are seemingly untransparent and not used appropriately by CPS staff (Dahmen, 2021).

Understanding the reasons for the failure or success of algorithmic decision tools can help develop and enhance the systems to be more effective, efficient, and accepted by the practitioners. When an algorithmic support tool is helpful for the agencies, it can potentially decrease paperwork and support complex risk assessments. Thus, the social workers will have more time available to spend with the children and their families. Additionally, the correct use of Algorithmic Decision Support Systems can potentially identify cases where a child is in immediate danger and prevent grave child abuse or maltreatment cases. Therefore, investigating how such systems are used in different countries and identifying potential risks and benefits for the field of CPS will contribute to the existing state of knowledge and impact society.

A literature review is conducted to research the Algorithmic Decision Support Systems and their risks and benefits. The review is based on research and scientific articles about algorithmic tools in Child Protective Services in Germany and Australia. The literature available is used to highlight the current state of knowledge, critically assess the use of the systems and eventually make recommendations for future development. The following research question is posed: *"How are Algorithmic Decision Support Systems used in the sector of Child Protective Services and what are potential advantages and risks?"*. Furthermore, for the comparison, the sub-question *"To what extent do design and use of Algorithmic Decision Support Systems in Child Protective Services differ in Australia and Germany?"* is asked. Lastly, it needs to be considered *"How should Algorithmic Decision Support Systems be designed to ensure better usability and effectiveness for Child Protective Services?"*.

In the course of this paper, the theoretical framework used to evaluate and compare Child Protective Service and Algorithmic Decision Support Systems will be laid out. The methodology regarding research design, data collection, and analysis will be stated. The current state of algorithmic tools in German and Australian child welfare agencies will be summarized, analyzed based on the theoretical framework, and compared. A discussion is presented, giving recommendations for future use and development. Finally, a conclusion is drawn to answer the research question.

2. Theoretical Framework

In this section, Child Protective Services in Australia and Germany and their tasks will be explained. After, algorithmic decision-making will be defined. Then, the benefits and risks of algorithmic decision-making for high-stake, non-routine fields will be stated. In the end, it will be connected to Child Protective Services, and the theoretical framework will be presented.

2.1 Child Protective Services

Child Protective Services have a task that can be described with the German term "Schutzauftrag" (Eng. "protection mandate"), which means ensuring the safety and wellbeing of children under the age of 18 (von Boetticher, 2012, p. 483). CPS in Australia and Germany are mainly state-run agencies that fulfill activities like preventing endangerment situations or taking action when such situations have occurred.

In each German or Australian state, the organizations can decide how they will address their tasks in child protection as long as national guidelines are followed (Aner & Hammerschmidt, 2018; Mendes & Moslehuddin, 2004).

Generally, the agencies are committed to securing the rights of children and adolescents against their parents, legal guardians, or third parties (von Boetticher, 2012). Within this realm, CPS has different functions. Firstly, the agencies are tasked with providing the infrastructure for children and families to receive the support and care they need (AIHW, 2019). Secondly, CPS has to ensure that children or families receive the best possible care plan for each case. At best, this is developed together with the caseworker, child, and guardians. If a family is in the care of CPS, regular check-ins and evaluations of the situation and environment by the social worker are required (AIHW, 2019; Aner & Hammerschmidt, 2018). When a family or custodian is unfit to take care of a child, CPS has to take more drastic measures to ensure the child's wellbeing. Such measures can include the temporary or permanent withdrawal of legal guardianship and the placement of the child into foster care (von Boetticher, 2012).

Furthermore, child protection agencies have to assure the quality of any foster home or other parties with custodianships like child care institutions through routine evaluations (von Boetticher, 2012). Interventions of CPS can only happen on a legal basis. Therefore, social workers must cooperate with law enforcement, courts, and educational institutions to ensure the safety of children in urgent situations (AIHW, 2019; von Boetticher, 2012). Additionally, child welfare workers have the responsibility of safeguarding the wellbeing of minors and ensuring an environment that is as stable as possible. The main aim is to provide permanency in a placement. If adequate, the reunification of a family is attempted (AIHW, 2019).

However, making decisions regarding risk evaluation is very complex. Social workers carry an extensive workload with too little time for thorough evaluations. The lack of information gathered about specific family circumstances can cause human errors and wrong decisions (Boberg & von Castell, 2018; Ronan et al., 2009). Nevertheless, deciding what is best for a child and family must be evaluated individually for each case. Hence, it requires the expertise and discretion of the caseworkers (Aner & Hammerschmidt, 2018). This field of tension often presents difficulties for social workers as they attempt to help as many children as possible with the most suitable solutions. Yet, personal preferences or biases can distort the perception and judgment of welfare practitioners (Gillingham et al., 2017). Biases can lead to much harsher treatment than necessary and personal attachment to a child might cause decisions led by emotions. Child Protective Services use specific tools to standardize the evaluation process and document the decision process steps to avoid unsuitable recommendations. The systems used vary in Germany and Australia. They can be anything from questionnaires and digital filing and interaction systems to computerized Algorithmic Decision Support Systems and risk assessment tools (Ackermann, 2020; Gillingham, 2011).

One difference between Child Protective Services in Australia and Germany is that tasks are divided between governmental and non-governmental organizations in Australia. However, the duties and their execution in the two agencies differ only marginally (AIHW, 2019). Government-run child welfare agencies do the initial investigation, intake, and supervision. After the first decisions, children are sometimes referred to the care of non-governmental agencies that help plan and supervise the next steps of the family care plan (AIHW, 2019). The non-governmental services mainly provide "advice, education and support" in less acute cases (AIHW, 2019, p. 7).

2.2 Algorithmic Decision-Making

With the advancing digitalization, algorithms are frequently used to support human decision-making processes. Madalina Busuioc describes algorithmic decision-making as "the use of algorithms as an aid or as a substitute to human analysis, to make or inform (and improve the quality of) decisions or actions" (2020, p. 4). Algorithmic decision-making can take place in different ways. An algorithm is "any set of rules [...] implemented in sequence to reach a particular outcome" and it can be computer-based or analog (Busuioc, 2020, p. 4). Computerized algorithms can be anything from entirely autonomous (human-out-of-the-loop) or guided by human operators with the ability to intervene in the process and revise the outcome (human-in-the-loop) (de Laat, 2018).

Algorithms as Decision Support Systems are seen to be more rational, objective, and faster than human decision-makers (Busuioc, 2020). Without incorporating factors like human emotions or subjectivity about a topic, algorithmic decisions are expected to be superior and more adequate than human decisions (Bader & Kaiser, 2019). Furthermore, the systems have access to a significant amount of information from different databases. Hence, many algorithms can improve their decision-making processes over time. Improvements can be made by frequent updates or machine learning based on artificial intelligence (de Laat, 2018). By having access to a large amount of new information added over time, the algorithms can develop new statistics with the data. The more information available, the better the statistics and, thus, the algorithm's decision-making (Bader & Kaiser, 2019). Consequently, using algorithmic tools frequently supplied with new data will lead to more accurate and consistent outcomes (Bader & Kaiser, 2019). Results of the tools can also be used to justify the choices of human decision-makers (Busuioc, 2020).

Even though algorithmic decision tools translate complex calculations and statistics into an outcome, a recommendation or decision for action that humans can easily understand, they also have disadvantages (Bader & Kaiser, 2019). The calculation process highlights one main concern about algorithmic decision-making. It can be unclear how the algorithms have reached a decision for the developers and users of the systems. As they evolve with the amount of data available and processed, the procedures within the algorithms become more complex and less traceable to humans. Another difficulty with this so-

called black box design is that human operators can manipulate the outcomes when the input needed to achieve them is known. Manipulation can cause further problems with the decision-making of an algorithm (Busuioc, 2020).

Usually, when a decision is made, someone has to be responsible and held accountable for adverse consequences. By taking out human involvement as much as possible in algorithmic decision-making, accountability and responsibility are at risk (Busuioc, 2020). In addition, algorithms lack certain qualities of humans that are especially important in high-risk fields. For example, humans can look at the context and rely on intuition and expertise. This is not possible for an algorithm that uses statistics and calculations. Furthermore, algorithms do not see an individual behind the subject of their decisions, which often leads to human mistrust against algorithmic advice (Bader & Kaiser, 2019).

Algorithmic decisions are perceived to be objective and rational. As a result, some operators develop an over-reliance on the tools, known as automation bias (Busuioc, 2020). However, it has been discovered that algorithms are not always completely unbiased, as previously stated. Sometimes the databases an algorithm accesses contain historically biased information, or the programmers have unconsciously incorporated their own biases (de Laat, 2018). These biases, often difficult to detect because of the black box design, can lead to misconstrued and erroneous outcomes with potentially alarming consequences (Busuioc, 2020).

Especially in high-risk fields with non-routine decision-making, incorporating all the available information about the context and using human decision-making qualities are crucial (Bader & Kaiser, 2019). Therefore, it is advised to employ a human-in-the-loop decision system for risky public sector decision-making like Child Protective Services (Busuioc, 2020; de Laat, 2018). In the end, when a human operator is confronted with an algorithmic recommendation with an "opaque decision logic", it can cause the operator to reflect on their decision logic, and they possibly re-evaluate personal outcome choices (Bader & Kaiser, 2019, p. 666).

2.3 Algorithmic Decision-Making in Child Protective Services

When using Algorithmic Decision Support Systems in Child Protective Services, technology meets the vulnerability of a high-risk field led by discretion. Algorithmic tools are meant to reduce the stress of high-risk decision-making, which is solely based on an individual's instinct (Gillingham & Graham, 2017). Additionally, considering the incorporation of algorithmic advice into the human-made decision can potentially introduce more objectivity, help avoid blind spots or detect abuse patterns, and further increase the effectiveness and efficiency of Child Protective Services (Gillingham, 2019; Gillingham & Graham, 2017). It can lead caseworkers to re-assess their own decision and evaluate recommendations from a new angle, as previously mentioned (Bader & Kaiser, 2019). Based on these aspects of algorithmic decision-making, it can be said that not only CPS workers could potentially benefit from tools that facilitate their task as risk assessment might become more consistent (Gillingham, 2019). Also, the

children in care could receive the most appropriate help for their individual needs. Incidents of child endangerment could decrease when algorithms and human discretion are used together (Busuioc, 2020). Algorithmic tools are made to provide the most accurate current and future risk assessment possible and prevent children from being abused by calculating risk factors. However, it is not clear if characteristics of abuse and maltreatment can be codified into mere categories that the algorithms used for their statistical evaluations (Gillingham & Graham, 2017). Child maltreatment can have different forms that do not always fit into designated categories, and other factors need to be considered. Also, the accountability and transparency of algorithmic decision tools are risk factors. Not knowing how a decision is made by the tool makes it difficult to trace the process (Gillingham & Graham, 2017). Comprehending why a decision was made is necessary for Child Protective Services. Additionally, if child welfare agencies rely on algorithmic outcomes without evaluating them sufficiently, holding someone accountable for negative consequences becomes difficult (de Laat, 2018). Finally, the decreased ability to use discretion in the cases might also cause advice unsuitable for a specific situation, as contextual aspects are fundamental in child welfare (Bader & Kaiser, 2019).

In the following, it will be looked at different factors from the theoretical-analytical framework to analyze the current state of knowledge about Algorithmic Decision Support Systems in Australia and Germany. In *Figure 1,* the functions of algorithmic decision tools as stated in *Section 2.2* and the tasks of Child Protective Services from *Section 2.1* are displayed. The application parameters for algorithms are laid out to indicate how algorithmic tools could positively influence the tasks of CPS. Additionally, the general risks and benefits of Algorithmic Decision Support Systems as described in *Section 2.2* are presented. Finally, how algorithmic decision support could be practically implemented to assist Child Protection workers has been indicated as stated in *Section 2.3.* In the analysis, this framework will be used to identify which advantages or disadvantages Algorithmic Decision Support Systems have in practice in German and Australian Child Protection agencies. The practical use stated in the framework is compared to the actual use of the tools to establish how algorithmic systems need to be developed to work most efficiently and effectively for Child Protection Services.
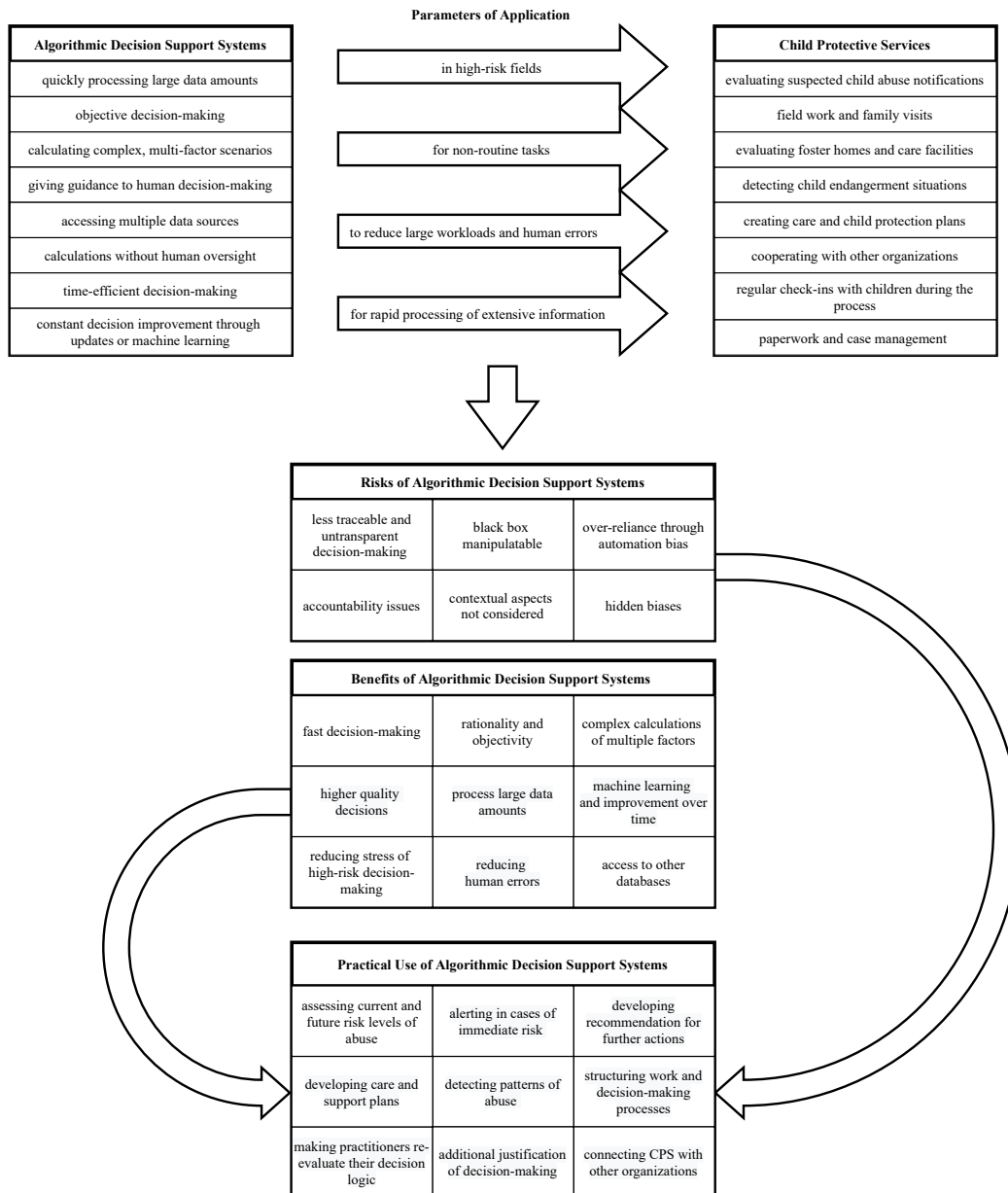
Parameters of Application

Algorithmic Decision Support Systems		Child Protective Services
quickly processing large data amounts	in high-risk fields	evaluating suspected child abuse notifications
objective decision-making		field work and family visits
calculating complex, multi-factor scenarios	for non-routine tasks	evaluating foster homes and care facilities
giving guidance to human decision-making		detecting child endangerment situations
accessing multiple data sources	to reduce large workloads and human errors	creating care and child protection plans
calculations without human oversight		cooperating with other organizations
time-efficient decision-making	for rapid processing of extensive information	regular check-ins with children during the process
constant decision improvement through updates or machine learning		paperwork and case management

Risks of Algorithmic Decision Support Systems

less traceable and untransparent decision-making	black box manipulatable	over-reliance through automation bias
accountability issues	contextual aspects not considered	hidden biases

Benefits of Algorithmic Decision Support Systems

fast decision-making	rationality and objectivity	complex calculations of multiple factors
higher quality decisions	process large data amounts	machine learning and improvement over time
reducing stress of high-risk decision-making	reducing human errors	access to other databases

Practical Use of Algorithmic Decision Support Systems

assessing current and future risk levels of abuse	alerting in cases of immediate risk	developing recommendation for further actions
developing care and support plans	detecting patterns of abuse	structuring work and decision-making processes
making practitioners re-evaluate their decision logic	additional justification of decision-making	connecting CPS with other organizations

Figure 1. Theoretical-analytical framework for evaluating Algorithmic Decision Support Systems in the context of Child Protective Services.

3. Methodology

In this section, the research design of the systematic literature review will be explained. Furthermore, the methodology for the collection and analysis of data will be illustrated.

3.1 Research Design

To answer the research question and sub-questions, a systematic literature review was chosen. A description of Child Protective Services in Australia and Germany and their tasks were given. The difficulties faced by caseworkers were identified. The meaning of algorithmic decision-making and the perceived advantages and disadvantages of algorithmic tools were laid out. The framework of Child Protective Service and algorithmic decision-making is used to analyze the collected data. For the review,

existing research articles and studies about algorithmic use in CPS agencies in Germany and Australia will be collected, summarized, and evaluated regarding the potential benefits and risks of the Algorithmic Decision Support Systems. Findings will be compared. Based on the analysis and evaluation, the findings will be discussed, and recommendations regarding the use and development of the tools will be made.

Automated Decision-Making in other high-risk fields has already been researched extensively. However, the information for algorithm use in CPS is relatively scarce as they are not commonly used in many countries. Therefore, collecting existing information about how algorithms are used in child welfare in a country with more experience, like Australia, and comparing this to a country where algorithms are relatively new and not standard for CPS, like Germany, will help understand the differences in use. Australia and Germany were chosen as both CPS systems are tasked with the same duties. The structure is similar, and CPS are primarily state-run organizations in both countries. Australian child welfare organizations have been using algorithmic tools since the mid-2000s, and research about it has been conducted. In Germany, algorithmic decision support is more experimental and used to standardize work processes. Other countries, like the United States, use algorithmic decision support in child welfare organizations more extensively. However, comparing a country with more than 300 million inhabitants in 50 states to Australia with 25 million inhabitants would not be feasible in the scope of this paper (Data Commons, 2021a, 2021b). Child Protective Services in each American state or even county can create individual guidelines (CWIG, 2018). The different systems complicate the comparison of algorithmic support tool use with other countries. Thus, comparing Germany and Australia with child welfare agencies that work similarly will produce relevant insides. Investigating the use of the available tools and which opinions caseworkers have can improve the development process of Algorithmic Decision Support Systems.

3.2 Data Collection and Analysis

As the starting point of this systematic literature review, different databases were searched to find relevant literature. Databases include Google Scholar, Web of Science, Scopus, and the FindTU page of the University of Twente online library, which is connected to every online literature database the University can access.

For the search, different keywords were used. *Table 1* in the Appendix displays the keywords. In addition to the listed search term, multiple combinations of them for the countries were used. Further, a backward citation search was conducted. Articles cited in papers that were particularly interesting and informative to the topic were searched. Thus, the research of Philip Gillingham was chosen as he studied algorithmic tools in CPS since the mid-2000s and provided extensive insight. Other search terms were included to look for specific information about algorithmic systems, their risks and benefits, and the working methods of child welfare agencies in Germany and Australia.

The articles and studies used for the comparison were chosen based on the information they provided about Algorithmic Decision Support Systems in Germany and Australia. Papers that only researched or referred to digitalized questionnaires without algorithmic support were excluded from the review. This was mainly the case for literature investigating systems used in German Child Protective Services. Other research was excluded as no information about the practical use of algorithmic decision tools was presented. Studies that were included provide details about the use of algorithms in different countries and further refer to practitioners' opinions and handling of the systems.

4. Data Summary

In the following section, data collected about the use of Algorithmic Decision Support Systems and risk assessment tools in Child Protective Services in Australia and Germany are summarized. In addition, the current state of knowledge about the use, advantages, and disadvantages of Algorithmic Decision Support Systems is laid out.

4.1. Data Summary – Australia

Child Protective Services in Australia are provided by governmental and non-governmental organizations, as stated in *Section 3.1*. Therefore, this section contains information about the systems and opinions of practitioners in both types of organizations. Philip Gillingham, an Australian social worker and child welfare researcher, has conducted a multitude of studies about decision support and risk assessment tools in Child Protective Services. His research mainly focuses on the State of Queensland but is not limited to it.

There are varying Algorithmic Decision Support Systems and risk assessment tools used in Australian CPS agencies. However, these systems have similar functions and are meant to assist caseworkers in almost identical ways. The tools used are different Structured Decision-Making tools developed by the Children's Research Center in Wisconsin that were adjusted appropriately for the Australian jurisdictions (Gillingham et al., 2017). These systems include the "Child Protection Guide" and "the Screening tool, the Response Priority tool, the Safety Assessment tool and the Family Risk Evaluation tool (FRET)" (Gillingham et al., 2017; Gillingham & Humphreys, 2010, p. 2602). In Australian child welfare agencies, Algorithmic Decision Support Systems are mandatory (Gillingham, 2011).

The Child Protection Guide is an online application that supports practitioners in making choices about a child's care situation. By filling in questions about a child's circumstances, it is attempted to assess the endangerment level quickly. The application is meant to structure the initial referral process so families can receive fast support afterward (Queensland Government, 2021). Questions are asked about the child, the family situation, the suspected form of risk or abuse, and additional contextual aspects. After filling in the questionnaire, the system will produce an outcome. It indicates a need for further

investigation or no need for investigation. A case can be forwarded based on the recommendation, and further assessment will take place to evaluate which actions need to be taken by the Australian CPS to protect a child (Queensland Government, 2021). It is emphasized that the Child Protection Guide is meant "to complement rather than replace an individual professional's critical thinking" and, thus, allows the Australian practitioners to use discretion and consider contextual aspects when making decisions (Queensland Government, 2021).

The Screening, Response Priority, Safety Assessment, and Family Risk Evaluation tools are used collectively and provide advice beyond the referral process. The Screening tool fulfills the same task as the Child Protection Guide and analyzes the input data to see whether a child's situation needs further examination (Gillingham & Humphreys, 2010). The Response Priority tool assesses a case file to identify how fast action needs to be taken. The Risk Assessment tool calculates if a child is in immediate danger and needs to be removed from the parents' care or if other care options should be considered (Gillingham & Humphreys, 2010). FRET examines how much support a family needs to work on the issues that have been detected.

Further, the level of current and potential future risk is estimated (Queensland Government, 2013). Like the Child Protection Guide, by using the Family Risk Evaluation tool, it is assumed that practitioners' subjectivity and personal bias can be eliminated from the risk assessment process (Queensland Government, 2013, 2021). Nevertheless, if a caseworker believes an outcome is inaccurate, manual changes of the risk scores can be made either with the justification of discretion or by citing policies (Queensland Government, 2013). The assessments of the tools are based on actuarial data from Australia that has been added to their databases. The recommendations become more exact by inserting additional information, and better advice can be provided (Gillingham, 2009; Gillingham et al., 2017).

Generally, the tools in Australia are designed to put more attention on particular matters in a child's life and help filter less relevant information. Therefore, practitioners have to fill in specific questions (Gillingham et al., 2017). As emphasized, the assessments created by the systems are supposed to be seen as guidelines for the caseworkers and support decisions by adding justifications or new insights (Gillingham & Graham, 2017). Further, the algorithmic tools promote more consistent child protection decisions in Australian CPS agencies (Gillingham, 2009). Additionally, algorithms support the caseworkers throughout the decision-making process of child care cases to make the CPS goal of providing permanent placements more easily achievable (Gillingham, 2011).

The used databases allow access to an abundance of information, an asset for Child Protective Services (Gillingham & Graham, 2017). When data are frequently added, it becomes possible to identify undetected patterns of child endangerment and, thus, develop new fields in child care that need specialization to create better solutions in specific situations. Pattern detection can even lead to policy changes in

Australia that recognize certain forms of abuse early or help prevent them (Gillingham & Graham, 2017).

Even if algorithmically produced recommendations or risk assessments do not coincide with the caseworkers' opinions, Gillingham has identified that more reflected decisions are being made. Practitioners are compelled to question the methods and reasoning used for their recommendation or assessment of risk when confronted with deviating advice from an algorithm (Gillingham, 2016).

Research results also indicate that without Algorithmic Decision Support Systems, practitioners often insert their personal biases and preferences into their decision-making. Evaluating information about a child and family can be done by using own assumptions. With the tools in place, the subjectivity of caseworkers is contained to a certain degree, providing more consistent outcomes in Australian Child Protection agencies (Gillingham et al., 2017). Especially for young, less experienced social workers risk assessment tools give a guideline on how to evaluate and approach child maltreatment situations as they have not yet developed professional judgment, Gillingham acknowledges in his research (Gillingham, 2011).

Even though Gillingham et al. state decision support tools for CPS agents are an "important part of their practice in making decisions about levels of risk to children", researchers and practitioners in Australia see certain risks in the use of the systems (Gillingham et al., 2017, p. 53). Some practitioners think that the risk assessments made by the tools are incorrect. Caseworkers often disagree with the high risk levels displayed by the tools. As it is not possible for practitioners to identify how the algorithm has come to a conclusion, they mistrust the outcomes because of this lack of transparency (Gillingham, 2009). Also, as CPS agents have learned how to manipulate the algorithmic output with their input data, risk assessment and advice can be skewed (Gillingham & Graham, 2017). Practitioners have caused the tools to produce higher risk levels so families can get access to services and support (Gillingham, 2009). Australian CPS workers have also claimed to manipulate the algorithms to match their supervisors' opinions (Gillingham, 2011). These manipulations of input data can cause advice to be generally inaccurate.

Many practitioners feel the tools are used to monitor their work by supervisors rather than as actual support. The feeling of not being trusted with their work causes further aversions against the algorithms (Gillingham, 2016). With different levels of experience, the social workers' opinions about algorithmic support tools change. As mentioned, younger Australian practitioners use the systems as guides. However, the less experienced agents often say it is challenging to apply the definitions and recommendations in real life. Their colleagues with more experience say dependency on the tools lessens with more working expertise (Gillingham, 2011). Child Protective Service workers with long years of experience feel hindered in their decision-making, as they rely on their intuition to decide child protection cases. The algorithmic tools interfere in the practitioners' decision-making process. Nevertheless, they acknowledge that algorithmic support can be a good starting point for young practitioners to gain expertise. Despite this, experienced practitioners assume that inexperienced colleagues can develop an

over-reliance on the tools, which "[impairs] the professional development" (Gillingham, 2011, p. 417). Especially in earlier years of Algorithmic Decision Support Systems, more experienced caseworkers refused to make use of the tools or only used them after having already made decisions (Gillingham, 2009).

Furthermore, social workers criticize that it is not possible to add information about the context or achievements of the family that have improved the endangerment situation (Gillingham, 2009). Therefore, practitioners feel restricted in using discretion and expertise when making recommendations about a child care situation (Gillingham, 2011). Additionally, Australian Child Protective Service agents do not believe that it is possible to fit child abuse scenarios into calculatable categories (Gillingham, 2020). It oversimplifies the situation's complexity and leads to de-individualization of the children's cases (Gillingham, 2011; Gillingham & Graham, 2017). The algorithms also mainly consider the parents' behavior in the risk assessment. The demeanor and actions of the children are usually not taken into account. Yet, an aggressive attitude or undiagnosed special needs of a child can be the reason why a family is referred to be investigated by CPS (Gillingham et al., 2017). Another aspect mentioned by CPS workers in Australia is that thoroughly answering the questions of the support and risk assessment tools is time-consuming. Additionally, standard casefiles still need to be kept. Social workers feel that extra paperwork will take time away that could be actively spent with the children and families (Gillingham, 2016).

The research of Gillingham concludes that practitioners do not receive adequate training to use the tools, and CPS workers would like to be more involved in developing the systems (Gillingham, 2011). Lastly, it is often emphasized that algorithmic decision support and risk assessment tools are most effectively used if practitioners combine the outcomes of the systems with their intuition, contextual aspects, and expertise (Gillingham, 2011, 2020).

4.2 Data Summary – Germany

The algorithmic tools used in German Child Protection Services are not based on machine learning but are digitized standardization tools and algorithms. However, as any "set of rules [...] implemented in sequence to reach a particular outcome" is classified as an algorithm, the German methods also belong to this category (Busuioc, 2020, p. 4). Risk assessment tools and decision-making systems vary in the German states. A standardized questionnaire is mandatory everywhere (Strobel et al., 2008). Lower-Saxony uses a digital filing system that allows fast access to police, court, and healthcare records connected to a child's case. Its filing system and search functions are similar to Wikipedia. However, the system does not produce risk assessments or decision support (Kröckel, 2015). Therefore, it will not be considered further. Hamburg uses a similar system with added decision support (Sozialbehörde Hamburg, 2021). In Berlin, CPS has state-wide software with an integrated decision support tool (Schroth, 2021).

The standardized "Kinderschutzbogen" (Eng. "child protection questionnaire") is a questionnaire developed in the early 2000s for child welfare agencies in each German state. It is used as an analog or digitized form (Strobel et al., 2008). The tool was created to contribute to more transparent and higher-quality decision-making to increase public trust in Child Protective Services (Dahmen, 2021). The practitioners document information about the child, family, living conditions, parenting abilities, and contextual aspects. The questionnaire structures the intake and evaluation process (Strobel et al., 2008). It is mandatory for Child Protective Services, and it is a way to document the practitioners' opinions and justify why childcare measures are chosen. However, the "Kinderschutzbogen" is not an Algorithmic Decision Support System and does not produce outcomes. Hence, it will not be discussed in the analysis. It was mentioned to indicate the current standard procedure used in German CPS to evaluate child protection cases.

The state of Hamburg works with a system called "JUS-IT", which uses the IBM software "Cúram" (Sozialbehörde Hamburg, 2021). The system was developed specifically for the social services sector with the input of welfare workers. It offers different features, so every social or child welfare agency can use Cúram to manage their work efficiently in their preferred way (IBM, 2017). IBM has developed the software as a possibility for "organizations to develop prevention and remediation strategies that may help protect children and facilitate permanency, while improving resource utilization" (IBM, 2017, p. 2). In addition, it offers quick access to data from other organizations, like the police, to better evaluate a child's family and living environment (IBM, 2017). In Hamburg, Cúram is used for intake, management of the cases, and as an accounting system (Sozialbehörde Hamburg, 2021).

Additionally, the software is meant to provide statistical data about child welfare for a national database. By the input of more information into the system, the recommendation process can be enhanced further (IBM, 2017). Cúram is supposed to help caseworkers evaluate the urgency of child care situations and help develop plans that are best suitable for a family and their circumstances (Stein, 2017). Always considered is the information from other service providers like family court or healthcare institutions, which is also linked to the case files in the system (IBM, 2017). Therefore, the software is used as a support tool to enhance the justifiability of a welfare agent's decision.

When a social worker is uncertain about the best approach to a specific situation a child is in, Cúram helps create recommendations based on the system's data and in combination with other assessment frameworks (IBM, 2017). This software is not based on machine learning, and the decision-making process is enhanced through updates. However, Cúram follows a strict logic, and questions of the system must be answered entirely before any advice can be made. This is time-consuming for the practitioners (Stein, 2017). Additionally, the caseworkers often feel like the tool is used more as supervision of their tasks rather than providing consistent, adequate support for child care situations. There has been a case where the system could not provide quick decision support, leading to the death of a child (Stein, 2017).

Child Protective Services in Berlin work with the software "SoPart®" (Schroth, 2021). Primarily, the software is a digital filing system used for more consistent case management and better outcome quality. It incorporates digitized versions of the standardized questionnaires and uses a tool for decision support in planning child protection measures. Like JUS-IT, information uploaded into the system is used to produce statistics on child abuse and risk scenarios to develop the output quality (GAUSS-LVS, 2015). A standard in child welfare agencies in Berlin is to work together with a colleague to oversee cases, examine decisions about child care decisions and offer help. Therefore, practitioners are responsible for checking their co-workers' digital files and algorithmic outcomes (Schroth, 2021). It is emphasized that the software is meant to support decision-making, and practitioners should not only rely on the system's recommendations. The care plans recommended by the system can be adjusted by the social workers if needed (GAUSS-LVS, 2015). Visiting a family and observing their daily life and living conditions is seen as one of the most crucial aspects of the assessment process in CPS. Therefore, the purpose of SoPart® is to support caseworkers so they can fulfill other tasks adequately (Schroth, 2021). Inexperienced social workers encounter an area of tension as they do not have developed enough professional judgment yet. They either look to more senior colleagues or the tool for guidance. However, more experienced practitioners state a dislike for the digitized support system. They feel restricted in making decisions with discretion and believe that the algorithms are not fit to evaluate children's individual circumstances (Schroth, 2021). Schroth, a young practitioner herself, says that "the main goal of child protection cannot be neglected" because practitioners are battling with standardization and trying to stay flexible in decision-making (2021, p. 51, translated by author).

Generally, decision support and risk assessment systems are not standard in German Child Protective Services. They are mainly used experimentally (Dahmen, 2021). German researchers investigating Algorithmic Decision Support Systems often refer to the findings of Philip Gillingham's research in Australian child welfare agencies (Ackermann, 2021; Büchner, 2017; Schneider & Seelmeyer, 2018). German researchers pose criticism against algorithmic decision support for CPS. It is commonly assumed that algorithmic decision tools will de-professionalize social workers. Through the interference of technology in the assessment process, welfare agents will rely less on their expertise and intuition and more on statistical calculations over time (Dahmen, 2021). Over-reliance seems to be an issue, especially for younger, less experienced practitioners. Opposite to the younger practitioners, German child protection workers from older generations struggle with the tools and have difficulties parting with the analog methods they have been accustomed to before (Ackermann, 2020).

Algorithmic Decision Support Systems are problematic for German researchers as algorithms attempt to fit complex social circumstances into calculatable categories and take away contextual discretion. Schneider and Seelmeyer emphasize that it is not yet possible to imitate discretion with the current state of technology. Only with more data input and use of the systems, algorithmic risk assessment can become a valuable tool for Child Protective Services in the future (Schneider & Seelmeyer, 2018). In

addition, it frequently occurs that algorithmic tools will produce inconsistent recommendations (Ackermann, 2021). A possible reason for inconsistent algorithmic advice is that tools are not frequently updated and, therefore, new data with new insights are not considered automatically in the system's calculations (Büchner, 2017).

However, Dahmen states that algorithmic systems in Germany can be additional legitimization for a social worker's decision in a child's assessment process (Dahmen, 2021). Further, the German tools are supervised by human operators during the decision-making process. Ackermann indicates in a paper that when an algorithm's outcome differs from the human-made decision, it can cause the practitioner to reconsider their advice. As a result, caseworkers are led to find more plausible and convincing ways for justifying their choice or change their opinion about child care measures after all. This causes more reflective recommendations and actions by caseworkers (Ackermann, 2021). Another advantage of digital tools and risk assessment systems in German CPS is the possibility to communicate sensitive data such as police or court files that can impact a CPS worker's decisions (Ackermann, 2020). Nevertheless, scientists investigating Algorithmic Decision Support Systems for German Child Protection Services agree that the tools have not been researched enough to fully understand their use and the positive or negative consequences (Ackermann, 2021; Dahmen, 2021).

5. Data Analysis

In this section, the data summarized in *Sections 4.1* and *4.2* are analyzed individually using the theoretical-analytical framework of *Figure 1*. In the end, a comparison about the knowledge, use, risks, and benefits of algorithmic decision tools in CPS in Germany and Australia is made. A summary of the literature used in the analyses, research objects, and findings will be displayed in the appendix in *Tables 2* and *3*.

5.1 Analysis – Australia

The Algorithmic Decision Support Systems in Australia provide recommendations for child care situations and risk assessment. As stated in the theory, the input information about a child is calculated without human oversight using multiple factors. Furthermore, risk scores or care advice are produced. Outcomes are created by using actuarial data in the systems, which are regularly updated to provide suitable recommendations. The Algorithmic Decision Support Systems follow the human-in-the-loop principle as outcomes are not automatically employed and can be revised by the practitioners.

The theory states fast data processing and structuring of the work process as a practical use benefit of algorithms. For example, in Australia, the online Child Protection Guide allows for a more structured initial referral process of a child abuse situation through the questionnaire. It quickly evaluates the inserted information to support a practitioner's decision for further action in the case.

The Screening, Response Priority, Safety Assessment, and Family Risk Evaluation tools assist the caseworkers in assessing the immediate and potential future risk for a child and provide advice for creating the best individual child protection plan. In addition, the tools analyze the casefiles and ask additional questions about family and environment for their final recommendation. These are also practical use benefits that can be found in the theory.

Additional advantages, also stated in the theory, could be found for the algorithmic tools in Australian CPS agencies. As mentioned, the Australian systems are meant to support caseworkers by structuring their work processes. According to the theory, structuring can contribute to more consistent outcomes that are better in quality. The tools used in Australia are advertised to bring more consistency into CPS processes. In addition, the theory states that large amounts of data can be processed, and essential information is filtered. This is linked to a possible detection of abuse patterns. In practice, processing information and discovering patterns alleviate the caseworkers' workload. Furthermore, abuse pattern recognition allows for policy changes as preventive measures in Australia.

Another theoretical benefit is that multiple factors of child maltreatment are considered in the calculations. In the case of the Australian algorithms, the casefiles and questionnaires about the children are scanned for information, and recommendations are produced. The advice provided by the algorithmic tools can guide younger practitioners as they do not have much professional expertise. The theory states that guidance for decision-making in a high-risk field can reduce the stress associated with the decision and, thus, eliminate human errors.

Theory suggests that subjectivity and bias are taken out of the risk assessment and decision process through statistical calculation. The algorithmic support used in Australia is promoted by being more objective than human decision-makers as well as allowing discretion, like open-ended questions or override options to add the practitioners' professional judgment. The theory indicates that diverging outcomes of algorithms and humans often make the practitioners feel compelled to re-evaluate their decision logic. In practice, Gillingham has stated that practitioners produce more reflected child care decisions when they scrutinize their decision logic. Further, theory and practice acknowledge that advice from algorithmic tools can justify a practitioner's decision for a specific measure.

Lastly, a significant theoretical benefit of algorithmic support tools is the connection to various other databases. In practice, CPS are provided with additional information. Increasing the speed of the decision-making, and therefore faster support can be distributed to a child in an endangerment situation.

Risks of Algorithmic Decision Support Systems found in the theory were also identified in practice. The theory states that algorithms can remove biases from decision-making. However, the possibility of hidden biases cannot be excluded. Even though the Australian systems are promoted to be objective, their black box design makes it unclear if the data used to develop the algorithms contain biases in actuality. Another theoretical disadvantage of the algorithms is that they can be manipulated. As Australian practitioners often believe the results of the risk assessments are incorrect, they have learned to manipulate

the tools to receive the output that supports their judgment. As suggested in *Section 4.1*, this manipulation is also done due to the pressure of supervisors. To coincide with the superior's opinion, practitioners add inaccurate data to produce the desired outcome. The manipulation of input data can have far-reaching consequences for the recommendations of algorithmic support tools. The information added to the system is used to develop and improve future advice. If the reported data are inaccurate, outcomes will be skewed, and recommendations become invalid. Additionally, through algorithmic decision support, undetected patterns of abuse should be uncovered, which becomes impossible in practice with fabricated and falsified data.

The theory states that the tools were created to provide more consistent decision-making and alleviate the caseworkers' workload. As aforementioned, the Australian tools are promoted with the promise of providing more consistency for CPS. However, the manipulation does not make the outcomes more consistent as practitioners make their own judgments. Further, caseworkers develop a dislike against the tools because they supervise their work rather than support it. Having to use the support tools makes caseworkers feel like they are not trusted with their work anymore. Gillingham's research has found evidence that social workers will only use the tools after having already made a decision. Thus, they can use their expertise but still fill out the mandatory forms of the algorithmic tools. Nevertheless, this was not the intended use of the support systems.

Another flaw of algorithmic decision support mentioned in the theory is that contextual aspects are not considered. Even if the algorithms practically allow open-ended questions, practitioners have mentioned that this cannot replace human decision abilities like discretion. Additionally, they feel the questions in the questionnaires do not consider the necessary subjects or are only focused on the current behavior of the parents. By not asking about the children's behavior or progress that has been made, the algorithm does not account for important aspects in actual child care scenarios. Contextual aspects are essential for CPS workers in their decision process. Practitioners have criticized that the decision support tools were not developed with the input of social workers. Hence, questions caseworkers would include in their evaluation process are not considered in the algorithms' calculations. This makes it evident that the practical use of algorithms is not as beneficial as stated in the theoretical framework.

Algorithms take multiple factors from different categories into consideration for their complex calculations. Nevertheless, the theory also acknowledges that categorizations might not fit a child's case. In practice, child protection workers state that abuse looks different in every case, and therefore it is difficult to assign pre-made categories to a maltreatment situation. Furthermore, categorizations can also oversimplify children's abuse situations. Practitioners indicate that it can lead to a de-individualization of a child if the child is simply seen as part of a category without acknowledging circumstances that make the case different.

Moreover, the theory acknowledges over-reliance caused by automation bias as a risk factor, especially for younger practitioners. The Australian research indicates that new caseworkers use the tools for

guidance, which often hinders professional judgment development. More experienced CPS workers fear young colleagues will be unable to apply theoretical knowledge in actual child maltreatment situations.

Specific aspects found in practice were not stated in the theory about algorithmic decision support. Especially young caseworkers have noted that the definitions and advice from the systems cannot always be applied in an actual child maltreatment situation. Child care scenarios are more complex than the algorithms acknowledge (Gillingham, 2011, p. 415).

Additionally, sufficiently filling out the questions of the algorithmic tools is time-consuming for the caseworkers. Predictions can only be made with greater accuracy when the questionnaires are completed. However, this additional filing work obstructs practitioners from necessary visits to families' homes or care facilities (Gillingham, 2016, p. 331). Hence, in the Australian context, the algorithmic tools do not alleviate the workload as promised in the theory. This can also be attributed to the lack of training on using the tools correctly and efficiently.

All in all, the algorithmic tools were instated as measures to create higher quality child care decisions and alleviate the practitioners' stress and workload. Nevertheless, the algorithms often seem like an obstruction rather than support. Algorithmic Decision Support Systems are promoted to facilitate CPS with their tasks and alleviate their workload. The theory about algorithmic decision-making states hypothetical benefits that cannot be found in practice.

5.2 Analysis – Germany

The systems used in German Child Protective Services use actuarial data. Practitioners using JUS-IT by IBM in Hamburg and SoPart® in Berlin add information into the system and receive recommendations as output. The data put into the systems are later used to improve decision-making. Neither system works with machine learning but updates the information used for the evaluation process. The theory states that updates can enhance the quality of the recommendations.

JUS-IT allows CPS access to other organizations' information for faster communication with police, health care, or courts in urgent child abuse situations, and timely help can be provided. This has been acknowledged in the theory as a practical use benefit. Further, a practical advantage is the possibility of the algorithms to provide recommendations and create child care plans. JUST-IT creates strategies for preventing child maltreatment and support or care plans for individual children with the input data. This system supports the practitioners in the decision process by providing recommendations for further action.

Additionally, the advice produced by the tool can be used as justification for a specific measure that has been chosen. According to the theory, using the algorithmic outcomes to justify child care measures is a benefit for CPS. JUS-IT has been developed with social workers. Therefore, it can be expected that

relevant questions are incorporated into the system. Another advantage of algorithmic support identified in the theory is the structuring of work processes and the production of high-quality outcomes. In practice, JUS-IT is used for the intake and management of child care cases. Financial resources can be handled, and consistency and better outcomes are promised.

Disadvantages of JUS-IT have been identified. In theory, the algorithmic support tools are meant to provide consistent decision-making. However, in the case of JUS-IT, consistency is not given. In Hamburg, the tool could not prevent a severe child endangerment case, and a child died while the case was reviewed. Furthermore, caseworkers have mentioned that they feel the tools are used for additional supervision of their tasks. They feel not trusted to do their work instead of receiving decision support from the algorithmic system. The theory states that tools make the decision process more time-effective, which is not the case in practice. JUS-IT is time-consuming as every question needs to be answered by the practitioner before a recommendation can be made. Thus, JUS-IT does not alleviate the workload for CPS but instead increases it.

SoPart® is focused on digital filing and providing consistency for the case management by structuring CPS processes. Structure and consistency are advantages mentioned in the theory. The use of the tool promises child care decisions that are more suitable for individual children. It is possible to adjust the recommendation given by the system as the caseworkers see fit. Besides the filing option, risk assessment and planning tools are integrated to help the CPS agents with their decision-making in suspected child maltreatment situations. This is again a practical use benefit acknowledged in the theoretical framework. The tool can be seen as guiding decision-making, especially for younger practitioners. Making it mandatory for a co-worker to check case files and outcomes, errors or misjudgments of the practitioners or tool try to be prevented.

Nevertheless, the theory indicates that algorithmic tools do not consider the context in their calculations. In Berlin, more senior child welfare agents dislike working with the system because contextual factors cannot be included. Consistent with the theory, practitioners also believe the categorizations of the support systems are unfit to describe individual abuse situations.

Generally, the algorithmic tools employed in German Child Protective Services provide advantages that have also been identified in the theory. Additional justification for CPS decisions through algorithmic advice is a theoretical benefit and has also been acknowledged in the research by German scientists. The theory states that the systems follow a rational logic. Therefore, their objectivity can lead to more reflected decision-making of the practitioners. In practice, when conflicting outcomes occur, caseworkers are confronted with a need to re-evaluate their recommendation for a child care situation. According to the theory, fast access to police, court or healthcare records creates better communication between the organizations and can contribute to faster action-taking when children need urgent support. The

possibility of connecting to other organizations' databases is also a significant advantage of the German Algorithmic Decision Support Systems.

However, most opinions in Germany are skeptical about Algorithmic Decision Support Systems. According to the theory, automation bias can be a risk connected to algorithmic decision tools. In Germany, practitioners have voiced the fear of de-professionalization in case of an over-reliance on the systems' output. Another disadvantage in the theory is the problem of categorizing. The maltreatment categories from the tools create an issue for the German CPS workers because it has been found that child abuse cannot be generalized and categorized.

Furthermore, the theory assumes that recommendations of algorithms are higher in quality. Nevertheless, in practice, algorithmic advice frequently appears to be wrong. For instance, in Germany, the algorithmic recommendations often do not coincide with the caseworkers' professional assessment of a child abuse case. Wrong advice can be due to the infrequent updates of the risk assessment and support systems that have been noted for Germany. The theory acknowledges that frequent updates are needed to process the newest information and detect abuse patterns.

One aspect the theory did not consider is that mainly older practitioners will have an aversion to algorithmic decision support. This is because they are less experienced with technology and, hence, have difficulties adjusting to the new tools and operating them correctly.

Lastly, the systems employed in Germany are mainly digital filing systems with some added risk assessment or evaluation tools. They are meant to structure the decision-making process in CPS to allow for better quality child care outcomes. However, they do not offer much decision support in reality. The algorithms and databases used are not yet developed far enough. As a result, Algorithmic Decision Support Systems in Germany currently present difficulties for CPS workers. It can be said that the promised theoretical benefits of the tools are overshadowed by flaws and risks that have been found in practice.

5.3 Comparison

Child Protective Services is a high-risk field in every country. Decisions are made judging the wellbeing and suspected endangerment of a child. These decisions are non-routine since every child and situation is different. Algorithmic Decision Support Systems for Australian and German CPS promise to be valuable assets. The algorithmic tools are employed to alleviate the caseworkers' workload by offering decision support and quickly processing large amounts of information. Neither country makes use of machine learning tools. Instead, they use algorithmic systems with updates that provide new, actuarial data. These updates happen less frequently for the German CPS tools.

German Child Protective Services work with less developed algorithms with few technical trades in common with the Australian tools. The German systems mainly provide digital casefiles and structure

of the work process. Decision support and risk assessment are added features, not the primary focus of the systems. The tools in Australia are also used to structure the process. However, the primary purpose is decision support and risk evaluation in child maltreatment situations.

Further, the algorithmic systems are mandatory in Australian CPS, whereas in Germany, only the "Kinderschutzbogen" is compulsory. The theory states that biases will be removed from the decision-making process. However, the theory has also acknowledged that hidden biases exist and hard to detect due to the black box design. In Australia, researchers assume the existence of hidden biases. For German CPS, there is no information about potential unknown biases in the tools. Yet, it cannot be excluded that the systems contain some bias. Whereas the JUS-IT software in Hamburg has been developed with the input of child welfare workers, the Australian tools were not developed with practitioners. Therefore, questions relevant to caseworkers are often not incorporated in Australia.

However, there are many similarities in the use of and opinions about algorithmic support tools in German and Australian Child Protective Services. Firstly, all algorithmic tools used are human-in-the-loop. They can produce recommendations without much human interference in the calculations, but the decisions are not automatically implemented, and practitioners can override them with discretion. Overall, higher quality and more consistent child protection decisions are promised. The outcomes produced by the risk assessment and decision support tools offer additional justification for CPS measures. The employed algorithmic systems analyze casefiles and additional data in their calculations and are connected to the databases of other organizations like police and courts. It has been stated for both countries that diverging outcomes by the algorithmic tools cause more reflective decision-making in caseworkers. Further, the support systems can guide the decision process of young practitioners and help develop an understanding of their tasks. At the same time, more experienced practitioners voice a dislike against the tools and believe an over-reliance can cause the de-professionalization of CPS workers.

Additionally, caseworkers have noted that the tools' outcomes are incorrect. Therefore, in Australia, they have developed ways to manipulate the input the receive the desired output in both countries. As mentioned, this leads to skewed data and difficulties detecting actual abuse patterns. In Australia, practitioners often feel obligated to coincide with their superiors' opinions. Thus, they manipulate the input data. Generally, manipulations are done because CPS agents in both countries do not believe that child maltreatment can be defined in specific categories. Caseworkers' discretion and judgment are needed for adequate child protection measures. Therefore, the tools fail to bring more consistency into the risk assessment and decision-making processes of Child Protective Services, even if the tools are promoted with the promise of delivering more consistent outcomes. This is because practitioners do not use the systems as they were intended to be used. Another aspect found in both countries is that caseworkers do not feel trusted to make child care decisions. They have mentioned that supervisors use the tools to spy on them rather than as decision support systems. However, this is an element not yet found in the theory,

whereas the other benefits and risks of the Algorithmic Decision Support Systems are consistent with the theory.

Practitioners in Germany and Australia agree that the tools do not alleviate their workload, which opposes the suggestions of the theoretical framework about algorithmic support. Instead of spending more time in the children's environment, they are occupied with additional, time-consuming paperwork. Furthermore, in both countries, a lack of training for using the support tools is noted. Hence, algorithmic systems are not being used most effectively by Child Protection workers. The theoretical framework does not discuss these aspects.

The accountability issues mentioned in the theory were not found in practice for Germany or Australia. This does not mean that the algorithms for CPS do not cause accountability problems. However, it indicates that the research about algorithmic support tools for child welfare agencies in either country has not considered the aspect of questionable accountability.

In sum, it can be said that despite the different designs of the algorithmic risk assessment and support tools, the general opinions of practitioners and researchers in both countries are similar. In Germany and Australia, using algorithmic decision tools promises benefits for CPS. Nevertheless, the current usage indicates more risks and disadvantages. The access to other organizations and databases appears to be a practical benefit for CPS in the compared countries. However, younger caseworkers have more favorable opinions towards Algorithmic Decision Support Systems. In contrast, more experienced CPS workers are skeptical or hostile towards the algorithms. The algorithmic decision tools in both countries promise to support practitioners in processing and deciding about child abuse cases. According to the negative feedback of researchers and CPS agents, these promises are unaccomplished, as it can be said that for Australia and Germany, the risks of the algorithmic tools overshadow the possible benefits. The theoretical advantages could not be implemented into practical use so far.

6. Discussion

Looking at Algorithmic Decision Support Systems in Child Protective Services in the two countries, the tools used are different. The Australian systems have an emphasis on algorithmic risk assessment and decision support (Gillingham, 2009). The German tools are focused on structured filing and cross-organizational communication. Decision support is secondary (IBM, 2017; Schroth, 2021).

Despite the design differences, the findings for both countries indicate that the promised benefits of the algorithmic tools do not coincide with the actual practical use. Most strikingly, the promised alleviation of workload and more consistent outcomes are unfounded. Filling out the questions for the algorithms in addition to the casefiles leaves workers with more paperwork and less time for home visits (Gillingham, 2016; Stein, 2017). Further, practitioners believe the risk evaluations and recommendations of the tools to be inaccurate. Therefore, they fall back on using discretion or manipulate the algorithms

(Ackermann, 2021; Gillingham, 2009). As this is not the intended purpose of the tools, they are not adequate for the work of CPS, and their full potential is unused. Another aspect of risk discussed in the theory and by practitioners is the algorithmic categorization of abuse (Gillingham & Graham, 2017). As it is unclear how the algorithmic tools classify different kinds of abuse, practitioners are not confident whether the systems will provide the best suitable care plans for the children (Gillingham, 2020; Schneider & Seelmeyer, 2018). However, one practical benefit of the Algorithmic Decision Support Systems is the connection to other organizations and databases. This offers faster communication and helps in urgent child abuse situations (Gillingham & Graham, 2017; IBM, 2017). Information from other data sources can lead to more informed decision-making. Sharing data can also be helpful to other justice or child care organizations as it can provide guidance on how to deal with a specific child care scenario. Nevertheless, the analyses of Algorithmic Decision Support Systems in German and Australian Child Protective Services have shown a divergence between theory and practice. The effectiveness and supportiveness of the current algorithmic tools can be questioned. The intended purpose of supporting practitioners in their decision-making is not fulfilled in either country.

There are also limitations to this work, mainly caused by the few German cases available for research. The methodological choice for a systematic literature review was made due to this constraint. Even with limited literature applicable, analyzing and comparing the information about Algorithmic Decision Support Systems in Australia and Germany has provided valuable inside for future research. The generalizability of the results is also limited by the fact that only two German systems were considered. Further, the German tools had the secondary task of risk assessment and decision support. However, in Germany, the digitalization process of public organizations is still ongoing. In the Digital Government Index of 2019, Germany constantly ranks below OECD average in the digitalization of government agencies (OECD, 2020). The limited number of algorithmic systems in German Child Protective Services also impacts the reliability of the outcomes. Therefore, in-depth data about the practical use in German child welfare agencies are scarce. Despite this, the German results show that the advantages and disadvantages correspond with the Australian findings. These corresponding results contribute to the greater reliability of the findings. However, further research needs to be done to address the limitations accordingly, especially for Algorithmic Decision Support Systems for Child Protective Services in Germany.

Building on the existing theoretical evidence and findings of this analysis, one can say that the algorithmic tools currently have flaws that need to be resolved in order to operate adequately. The inconsistency between theory and actuality of algorithmic support tools shows the users are neglected in the systems' development process. Results have shown that practitioners do not use the tools as intended. Caseworkers need discretion and context for child welfare decisions. Therefore, they revert to professional judgment instead of using algorithmic tools. Involving practitioners more in the design process of the tools can contribute to filling gaps in the theory and solve issues that this research has uncovered.

Evaluating the CPS workers' experiences with the tools can help the programmers to understand why there is a dislike against the systems and why algorithms are not being used as intended. Information gathered from the practitioners can be incorporated into the development process of the decision support systems.

Currently, the algorithmic tools are promoted as providing more consistent outcomes and decreasing work pressure. However, Child Protective Service is a non-routine field in which consistency cannot be guaranteed and, thus, should not be the main focus of the tools. More attention needs to be paid to the practitioners in the design process. Caseworkers know which aspects of an abuse evaluation need further support and how the workload of CPS could be alleviated best. Their input and expertise are crucial for future research and development.

In the theory, accountability presents an issue. It is questioned if humans can be held accountable for algorithmically made decisions. The investigated cases have not identified it as a problem. However, in a digital world, accountability is of great importance. Transparent accountability chains have to be instated when using Algorithmic Decision Support Systems. Especially with the automation bias of younger practitioners in mind, it has to be evident that human operators are involved in child welfare decisions and are responsible for possible negative consequences. Relying on the tools to create the advice and holding the algorithms responsible is not a viable option. Therefore, more training has to be offered to practitioners. They have to understand how the tools function and how they should support the caseworkers' decision-making. Practitioners with less technological knowledge also need to receive training to better understand the tools and their use. Generally, it has to be investigated how tools can be created that allow for professional discretion but provide the benefits of algorithmic calculations in areas where they are needed and appropriate.

The categorizations of abuse used in the algorithms also need further research. Disclosing how the algorithm has reached a particular abuse classification for a child can help the practitioner understand the procedure within the system leading to the conclusion. Using the input of CPS workers to clarify and adjust the categorization could solve the mistrust issues practitioners have towards the algorithms.

Furthermore, the stated issues of Algorithmic Decision Support Systems in CPS need to be studied at a larger scale. Future research should focus on a large-scale project because this project's scope made it unfeasible to research more countries and different algorithmic support systems. Tools in German Child Protection agencies need to be examined more extensively. This will be possible when more advances have been made to digitalize public organizations in Germany.

Overall, forthcoming studies need to focus on how algorithmic decision tools need to be programmed to support CPS workers in the evaluation and decision process. It should not be forgotten that these tools are intended to provide better care and protection to children in maltreatment situations through algorithmic analysis of their circumstances. This can only happen if the technology is implemented to support CPS decision-making and is combined with the discretion necessary for an individual child's case.

7. Conclusion

This paper has provided insight into Algorithmic Decision Support Systems in CPS agencies in Germany and Australia. To answer the main research question *"How are Algorithmic Decision Support Systems used in the sector of Child Protective Services and what are potential advantages and risks?"*, one can say the tools promote structured decision-making and workload alleviation in theory. In reality, the main advantage of the algorithmic tools is the access to other organizations and their databases for fast communication. However, the findings illustrate the practical risks and disadvantages. The practitioners found ways to work around the systems by manipulating them or falsifying information to receive specific outcomes. Additionally, the algorithms are perceived as not providing accurate outcomes, and many caseworkers believe the pre-given abuse categorizations are unfit to evaluate a child's abuse situations. Another risk is the fear of de-professionalization as young practitioners rely too much on the tools and do not use discretion or develop professional judgment.

Regarding the sub-question *"To what extent do design and use of Algorithmic Decision Support Systems in Child Protective Services differ in Australia and Germany?"* one can say the design of the tools in Germany and Australia is different. The Australian systems provide more decision support, whereas the German tools focus primarily on standardization, and decision support is not as well developed yet. Nevertheless, results indicate similar opinions of researchers and social workers about the disadvantages of the tools. In both countries, practitioners have found a way to bypass the algorithms to continue to work with discretion when evaluating childcare situations. Generally, the current Algorithmic Decision Support Systems in CPS do not fulfill the promised advantages of higher-quality, more consistent decision-making with a decreased workload for practitioners in Australia or Germany.

This leads to the last sub-question, *"How should Algorithmic Decision Support Systems be designed to ensure better usability and effectiveness for Child Protective Services?"*. Practitioners should be included in the design process of the tools. They know which aspects of CPS work need to be supported by algorithms and where human decision qualities should prevail. Research about algorithmic decision support should focus less on consistency and process structuring as this currently hinders practitioners. Algorithmic decision support needs to be subject to further, extensive investigation to become a valuable asset for CPS in the studied countries and worldwide. Ultimately, understanding how caseworkers can be assisted in their decision-making is not only necessary to relieve work pressure. Improving CPS evaluations and decisions is essential to help the many children that are now and will become part of the child welfare system. More efficient decision-making in CPS can eventually provide a better life for those who cannot fend for themselves.

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Appendix

Table 1. Keywords used in literature research

Number	Keyword
1	Algorithmic decision-making
2	Automated decision-making
3	Risks of algorithmic decision-making
4	Risks of automated decision-making
5	Benefits of algorithmic decision-making
6	Benefits of automated decision-making
7	Child Protective Services Australia
8	Child Welfare Agencies Australia
9	Jugendamt Deutschland
10	Jugendschutz Deutschland
11	Kinder- und Jugendhilfe Deutschland
12	Algorithmic decision-making in Child Protective Services
13	Automated decision-making in Child Protective Services
14	Jugendamt und algorithmische Risikoeinschätzungsinstrumente
15	Jugendamt und digitale Fallbearbeitung
16	Algorithmic decision support tools CPS Australia
17	Algorithmic risk assessment CPS Australia
18	Family Risk Evaluation Tool
19	Queensland Child Protection Guide
20	Philip Gillingham
21	Kinderschutzbogen
22	IBM Cúram
23	JUS-IT Hamburg
24	SoPart® Berlin

Table 2. List of relevant literature - Australia

Author	Year	Research Object	Findings
Gillingham	2009	Algorithmic data use; practitioners' handling of tools	Use of actuarial data; more consistency through data use; reasons for practitioners' mistrust; manipulation of tools; tools allow for no context
Gillingham	2011	Description of algorithmic tools used; questioning practitioners with different expertise levels	Tools are mandatory; practitioners with different expertise levels see different risks and advantages; decision support throughout process; reasons for manipulation of tools; over-reliance; tools hinder discretion; oversimplification; no practitioner involvement in tool development; not more consistency; lack of training
Gillingham	2016	Use of algorithmic tools	More reflected decision-making; non-transparent decision-making; reasons for practitioners' aversions; time-consuming
Gillingham	2020	Evaluating algorithmic tools	Categorization issues; need for discretion
Gillingham & Graham	2017	Evaluating algorithmic tools	Guidance; additional justification; access to other databases; abuse pattern detection; manipulation of tools; de-individualization; unclear if algorithms have biases; no workload alleviation
Gillingham et al.	2017	Structured Decision-Making tools; "Child Protection Guide"	Better advice by entering more information; filtering of relevant information; more objective and consistent outcomes; guidance for practitioners; tools do not consider important aspects of family circumstances

Gillingham & Humphreys	2010	Screening tool; Response Priority tool; Safety Assessment tool; FRET	Used for file analysis and referral; risk assessment; faster decision-making
Queensland Government	2013	Practice information for "FRET"	Risk assessment; structuring decision process; more objectivity; use of discretion possible
Queensland Government	2021	"Child Protection Guide"	Structuring referral process; faster family support; forwarding cases; recommendations; guidance for practitioners; use of discretion possible; more objectivity

Table 3. List of relevant literature - Germany

Author	Year	Research Object	Findings
Ackermann	2020	General evaluation of algorithmic tools	Over-reliance in young practitioners; aversions in older practitioners; communication with other organizations
Ackermann	2021	General use of algorithmic tools	Practitioners' aversion; inconsistent recommendations; falsified data; more reflected decision-making; more research needed
Büchner	2017	General use of algorithmic tools	Potentially false recommendations due to infrequent data updates
Dahmen	2021	Kinderschutzbogen; general use of algorithmic tools	Algorithms are experimental; de-professionalization; additional justification; more research needed
GAUSS-LVS	2015	Description of software "SoPart®"	Explanation of system and usage areas; better and more consistent outcomes; development of risk and abuse statistics; recommendations; use of discretion possible
IBM	2017	Description of IBM software "Cúram"	Explanation of system and usage areas; actuarial data; developed with practitioners;

			recommendations; preventive measures; accounting system; access to other organizations; faster decision-making; development of risk and abuse statistics; additional justification
Kröckel	2015	Integrierte Berichterstattung Niedersachsen	Filing and communication system in Lower-Saxony; no decision support or risk assessment
Schneider & Seelmeyer	2018	Researchers' opinions;	Categorization issues; tools not far enough developed; more research needed
Schroth	2021	Jugendamt Berlin; Use of software "SoPart®" in Berlin; practitioners' opinions	Theoretical advantages and areas of usage of system; actuarial data; control mechanisms for tools and practitioners; guidance for young practitioners; aversions in older practitioners; tools hinder discretion; categorization issues; battle between standardization and flexibility
Sozialbehörde Hamburg	2021	Description of software "JUS-IT" in Hamburg	Areas of usage of system in Hamburg; intake; case management; accounting system; consistent outcomes
Stein	2017	Use of software "JUS-IT" in Hamburg	Theoretical advantages of system; opinions; practical use and risks; recommendations; time-consuming; no consistency; no fast support
Strobel & Kindler	2008	Kinderschutzbogen	Questionnaire is mandatory; analog or digitized; structured intake and evaluation; no decision support or risk assessment