

REVIEW ARTICLE

Painful and sometimes deadly experiments which Nazi doctors carried out on children

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Abstract

Coerced human experiments are among the most disturbing forms of ethical violations and criminality in medicine under National Socialism. Until 2016, there was no evidence-based analysis concerning numbers of victims and the type of experiments. A reference resource on Victims of Biomedical Research under NS. Collaborative Database of Medical Victims currently covers 28 655 victims who were subjected to 359 different experiments by the Nazis during World War Two. Drawing on this resource, this paper focuses on research on children. Finally, the narrow focus on the experiments, highlighting scientific methodology but disregarding the killing procedures of the Holocaust, is critically analysed.

KEYWORDS

coerced research, history, Nazi paediatrics

1 | INTRODUCTION

Coerced human experiments are among the most disturbing forms of ethical violations and criminality under National Socialism. Until 2016, there was no evidence-based analysis concerning numbers of victims and the type of experiments. A reference resource on 'Victims of Biomedical Research under NS. Collaborative Database of Medical Victims' covers currently 28 655 victims in 359 experiments. This includes children born between 1930 and 1944 amounting to 1154 boys, 916 girls, and 8 gender unknown.¹ The majority were exploited for neuropathology, but a substantial proportion were experimented on in Auschwitz, notably by Josef Mengele.

2 | THE PROBLEM OF NAZI EXPERIMENTS

The Victims Database makes it possible to link involved clinical specialists and the child victims of their researches.² One can, therefore,

ask how many paediatricians and other specialists were involved in unethical medical research on identified children. This includes coercion, harming the children, and research without the aim of helping the children. Further questions arise concerning the locations of experiments/coerced research in clinics and concentration camps, and how many children died? There were known clusters of child victims, but the wider incidence was not apparent. Notable examples were the 20 Jewish children (albeit one Sergio de Simone was baptised with a Christian father), who were killed in Hamburg on 21 April 1945 after deportation from Auschwitz to Neuengamme concentration camp to undergo a tuberculosis vaccine experiment. Eleven boys were sent from Auschwitz to Sachsenhausen for hepatitis research by Arnold Dohmen of the Robert Koch Institute, and in 1945 a Norwegian prisoner concealed an order for the children to be killed.^{3,4} Another notorious example was that of the twins selected by and for Mengele's genetic studies of twins; these twins were in the majority children who had arrived with the Hungarian transports from May 1944 and in the Czech Family Camp in late 1943. Many

Abbreviations: NS, National Socialism; WW2, Second World War.

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children in psychiatric care were abused for research. A comprehensive victim-based analysis of child research victims is now possible.

The study of paediatrics under National Socialism as a form of *Aufarbeitung* or coming to terms with the Nazi past has looked primarily at the forced migration of 446 paediatricians, as well as 63 deportations.⁵ Importantly, there have been studies of the killing of racially 'defective' children deemed to be below Nazi racial standards. What happened in clinics under National Socialism is less well known, and here the study of the large paediatric clinic at Strasbourg during German occupation under Kurt Hofmeier, who was a convinced Nazi, is a noted contribution.⁶

Paediatrics was highly scientised in the Imperial German and Weimar periods with such model establishments as the children's hospital of Arthur Schloßmann at Düsseldorf and the Kaiserin Auguste Victoria Haus for infant care in Berlin. Under National Socialism, medical care for the racial elite was of high quality, whereas children held in camps and homes for disabilities were vulnerable to research taken to the point of death. An example was the abusive treatment of Valentina Zacchini at the Wittenau clinic in Berlin. Valentina's movement difficulties were filmed by the Berlin paediatrician Gerhardt Kujath: 'Eine 4 1/2-jährige Mikrocephalin, Psychiatrische und Nervenklinik der Charité (Berlin), IWF (Göttingen), 1937'. Valentina was severely mishandled on film as—in the words of journalist Ernst Klee—a research object.⁷ Her brain was extracted by the neuro-pathologist Berthold Ostertag who completed the brain dissection in Tübingen after the war.⁸

Recognition that the research on children was not 'pseudoscience' raises wider issues such as the legitimacy of referring to an entity of 'Nazi medicine'. The term, 'pseudoscience' was used by the evolutionary biologist Julian Huxley to criticise Nazi race theory in the 1930s.⁹ The focus of the Nuremberg Medical Trial of 1946–1947 was on Nazi human experiments when the term 'pseudoscience' was extended to murderous and maiming Nazi research.¹⁰ The post-WW2 German medical establishment distanced itself from the professors and clinicians being prosecuted, by contrasting Nazi pseudoscience to their legitimate clinical research. The term pseudoscience appeared in legislation of many countries concerning victim compensation. However, while the WW2 German research was clearly inhumane and unethical in the sense that it was coercive, for the most part there were scientific methods used. More rarely was the research 'thanatological', meaning study of the process of death. This can be documented in 152 cases. The intensification of research as part of Nazi racial policies makes the research distinctively National Socialist in aims and epistemology (Figure 1).

This paper questions the analysis of Volker Roelcke of rejecting the German experiments/coerced research as not distinctively Nazi but instead seeing them in generic terms as authoritarian.¹¹ In terms of Nazi ideology, children were the new generation in a process of Germanic racial rebirth. Did Nazi paediatrics differ with its strong commitments to racial research from paediatrics in other countries and contexts? Under Nazism, one discerns a readiness to coldly exploit children for research when they came from targeted racial groups. The numbers of experiments increased as the Holocaust

Key Notes

- This paper reviews the evidence on paediatricians who worked for the Nazis and carried out painful, and often deadly, experiments on children during World War Two.
- It draws on a biomedical research database that covers 28 655 victims who were subjected to 359 different medical experiments.
- The database, which was established in 2016, provides an evidence-based analysis on the number of victims and types of experiments that were performed.

intensified. This was combined with indifference to the fate of the children as they became for many researchers disposable items. In the context of the Holocaust, severely disabled and mentally disturbed children, along with Roma and Jewish children were deemed of inferior racial value and thus legitimate 'material'. Roelcke takes a detached view seeing these issues as an incidental matter of supply of research subjects.¹² The question arises whether as racially stigmatised, not only the extent but also the methods, aims, and treatment of the children was distinctively Nazi, because many were killed either as having served their purpose as research subjects (for example, the Bullenhuser children), or to link the clinical research with autopsy specimens.

The quality of research was highly variable and verged on the unscientific. The research on the 20 Jewish children transported to Neuengamme concentration camp from Auschwitz was of poor scientific quality. The SS doctor Kurt Heissmeyer was interested in race as a factor in the virulence of TB, and in using live and non-attenuated bacilli as a vaccine. Similar to Arnold Dohmen of the Robert Koch Institute in experimenting at Sachsenhausen, he made no effort to care for the children after their experimental exploitation.^{13–16}

The SS acted as a gatekeeper to concentration camps permitting access to healthy prisoners for the noted malariologist Claus Schilling and the chemical sterilisation researcher and gynaecologist Carl Clauberg. Certain SS doctors along with Himmler took the perverse view that killing improved the quality of science.¹⁷ There are a number of issues which should make one pause and reflect before Roelcke's structural analysis can be endorsed.

Nazi racial policies provided research opportunities in camps and murderous clinics. There is also the issue of the conduct of the research, and whether body parts of children who were first experimented on as living subjects could then be killed either in the context of child 'euthanasia', or in the context of the Holocaust/Shoah in Auschwitz. These were specifically Nazi developments creating research opportunities. While looking at methodology is essential, the issue arises whether the distinctive context additionally shapes the experiment/research in terms of the opportunity, rationales and expectations. These are issues addressed in the conclusions to this paper.

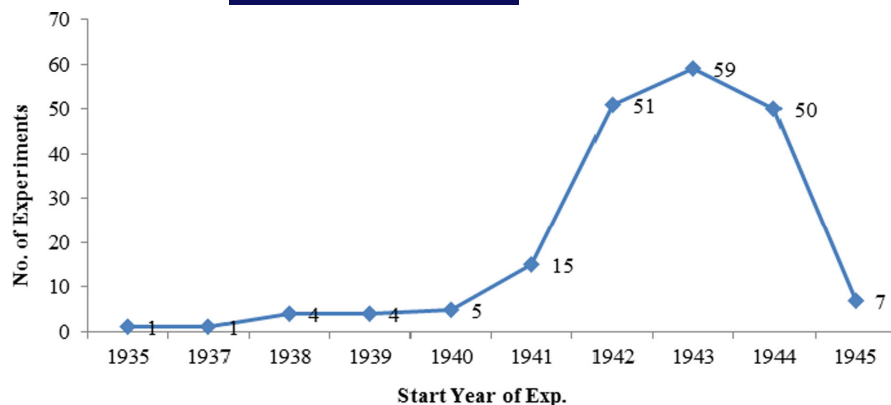


FIGURE 1 New Experiments by Year 1935 to 1945

3 | THE EXTENT OF THE EXPERIMENTS

Between 1933 and late 1939, medical researchers conducted occasional unethical research: ten incidents of unethical experiments are known in this early period, but from the start of the war and especially its intensification in 1941 the numbers of experiments and victims rapidly increased. In turn, this raises the issue of motive in that the research subjects were dehumanised. They were not just a burden on the health of the Germanic/Aryan/Teutonic/Nordic race but also that killing promoted racial fitness and scientific superiority.

Of the 28 655 victims, at least 11 650 victims survived, but with often severe injuries. The incidence of experiments rose massively with the genocidal war in the east from 1941 and the launching of the Holocaust in late 1941. These linked events shaped the aims and extent of the experiments, and the process of intensification. Of 323 perpetrators, 13 were paediatricians: Georg Bessau, Gertrud Reuter, Gertrud Soeken, Felix von Bormann (who conducted research on convalescent blood), Georg Hensel, Elmar Türk, Barbara Uiberrak, Wilhelm Bayer, Marianne Türk, Elisabeth Hecker, Käthe Hell, Friedrich Knigge and Gerhardt Kujath.¹⁸

One of the first large-scale child research interventions combined with racial sterilisations was that carried out on mixed-race Rhineland children. In July 1933, the anthropologist Eugen Fischer and his assistant Wolfgang Abel, an Austrian Nazi, examined 39 children in the district of Wiesbaden. The group included 27 part-Moroccan and 6 part-'Annamite' (Vietnamese) children. Abel took photographs and measured physique and mental capacity. He found degenerative traits, notably tooth decay and recessive gums, and traces of rickets. He concluded that most of the children were subnormal. Abel's findings were publicised by the Racial Political Office in 1934, and its head Walter Gross, a physician and fanatic for racial purity, pressed the case for sterilisation at the expert committee for population and race policy. Abel was by August 1935 an SS member and remained dedicated to racial research, rising to be Fischer's successor to the chair of anthropology at the University of Berlin.

From 11 March 1935, Nazi race hygienists and civil servants planned the sterilisation of the mixed race children. Walter Gross of the Racial Political Office hoped their mothers would give written permission, as the 1933 sterilisation law did not cover race as

a reason for compulsory sterilisation. In all, 385 'mixed-race' children aged 13 to 16 were sterilised in 1937. Importantly, they underwent psychological, anthropological and genetic evaluations. A hereditary health commission from the Kaiser Wilhelm Institute for Anthropology, composed of Abel and Eugen Fischer, measured the children.¹⁹ The sterilisations established a pattern—first, using administrative machinery to identify racial undesirables; then academic evaluation; and finally their sterilisation.

This process happened time and again under National Socialism with research on a 'pathological' group preceding destructive intervention whether forced sterilisation or (for the Sinti and Roma, or Czech and Hungarian Jews) their deportation to Auschwitz as a location for racial research. This combination of racial policy implementation followed by research was typical for Nazi medicine.

Each instance of research on children exploited their vulnerability as victims of racial policy. The 'special children's wards' were a favoured location of experiments on immunisation and, for those children who were killed, for neuropathological research. The Spiegelgrund at the Steinhof in Vienna, Wiesengrund at Wittenau in Berlin, and the research on living and killed 'idiotic children' at the Heidelberg Psychiatric Clinic all illustrate such research.²⁰

The largest location of coerced research was Auschwitz from 1943 to 1944: with 5479 victims identified in the database. Children became a significant group as they flooded into Auschwitz but had no use for forced labour. Eva Justin was a nurse who completed her doctoral dissertation on the racial inferiority of Sinti and Roma children at a Catholic orphanage at Mulfingen: 39 children were sent to Auschwitz on the basis of her findings, and only 4 survived.²¹

The researches of Josef Mengele at Auschwitz were shaped by the exterminatory procedures. Mengele's Habilitation supervisor was Otmar von Verschuer who ran the Poliklinik für Erb- und Rassenpflege at the Kaiserin Auguste Victoria Haus for infant welfare in Berlin, and from 1941 was Director of the Kaiser Wilhelm Institute for Anthropology. Before his transfer to Auschwitz in March 1943, Mengele visited Verschuer, but the twin research in Auschwitz had to wait until May 1944. Mengele gathered most twins on the Auschwitz ramp during the genocidal selections of new arrivals from May 1944. He had already stockpiled Czech twins from Theresienstadt retaining the 11 pairs of twins from the Czech Family Camp mass killing on 8–9 March 1944.²²

Other specialists were also involved in research on children. Like Fischer and Abel, Mengele was a human geneticist who planned to use the twin research at Auschwitz for a Habilitation thesis, thereby using racial research for laying the foundations for a future career. Mengele worked in conjunction with the prisoner-paediatrician Berthold Epstein from Prague in researching Noma, or necrotising fasciitis among Roma children.

4 | SPECIAL CARE

Research in neuropathology arose primarily from the implementation of Nazi 'euthanasia' policies. In contrast to the T4 killing programme (where there were some child victims), child 'euthanasia' continued for the duration of the war. The T4 killing organisation was suspended but it continued to administer clinical research at the large state hospital of Brandenburg-Görden, and by the psychiatrist Carl Schneider at the Psychiatric Clinic, Heidelberg.

While many child-killing wards (Kinderfachabteilungen) did not conduct research, two of the largest certainly did: the Vienna psychiatric hospital of Steinhof with its Spiegelgrund facility (founded in July 1940) killed 789 children retaining brain tissues. Franz Hamburger as professor of paediatrics was supportive of the Spiegelgrund. In 1932, the paediatrician Hans Asperger started working at the Children Clinic's Heilpädagogik ward as an 'auxiliary physician' (Hilfsarzt), and in May 1935, he took charge of the ward. Six children died out of 46 children examined by the paediatrician Hans Asperger after transfer to the Spiegelgrund.²³ The Steinhof's first director, Erwin Jekelius was partly trained in the therapeutic paedagogy ward under Asperger from 1933 to 36, and the paediatrician Marianne Türk joined the Spiegelgrund staff.

The Nazi psychiatrist Ernst Illing came to Spiegelgrund from the Kinderfachabteilung of Brandenburg-Görden. Here, 1270 children and adolescents died at the Forschungsabteilung Landesanstalt Brandenburg-Görden with 160 beds under Hans Heinze.²⁴ Many brains went to the Kaiser Wilhelm Institute for Brain Research on the outskirts of Berlin at Berlin-Buch.

The Spiegelgrund saw the murder of 789 children, predominantly through luminal, starvation or exposure to freezing conditions. In 1943, the paediatrician Elmar Türk tested a TB vaccine on five Spiegelgrund children, previously infected with TB. They were then killed at the Spiegelgrund by starvation, medication or exposure to cold, and their bodies were dissected and the brains and glands were examined by the pathologist Barbara Uiberrak and by Türk. Anatomical specimens were later utilised for neuropathological research at the clinic.²⁵ The foundations for the brain tissue collection were laid in the context of the implementation of Nazi 'euthanasia'. The children's brains were dissected and the specimens formed a noted collection curated by Heinrich Gross as a Boltzmann Institute until the brains were buried in the Zentralfriedhof Vienna in April 2002 and a further batch in May 2012 with a named memorial for each child victim.

The Heidelberg Psychiatric Clinic saw a major interdisciplinary research on hereditary idiocy by Carl Schneider with the support of professor of paediatrics Johannes Duken. Fifty-two children and

adolescents were subjected to an extensive diagnostic programme. Twenty-one of these 'idiot' children (as they were referred to) were murdered at Eichberg psychiatric asylum to obtain their brains for further research.²⁶ Their brains were sluiced away when the University Rector Volker Sellin ordered their removal on 12 January 1989 so as to avoid public controversy.^{27,28}

Other locations were the Wiesengrund Kinderfachabteilung at the Berlin psychiatric clinic of Wittenau. Here, children experimented on by Gerhardt Kujath had their brains shared between the neuropathologists Julius Hallervorden and Berthold Ostertag.⁸ The senior paediatrician Georg Bessau supported by Gertrud Reuter and Gertrud Soeken conducted TB research at Berlin-Charité and the Wittenau/Wiesengrund Psychiatric Hospital. In summer 1942, the children were divided into 3 groups, and until the beginning of 1943, the children were infected with tuberculosis. Those, who did not have any immunity, were vaccinated again. The first group of children were 9 older boys (10–14 years old) and one 3-year-old girl. Their physical condition was good. In June and July 1942, they were injected in the abdomen area or thigh. Five children were vaccinated again in September 1942. Two boys died in connection with the experiment. From November 1942 to April 1943, a second group of children was injected (one 7 years old, and the others under 4 years old). Seven of the children died in connection with the experiment. On 22.02.1945, there were 11 children alive with TB-infected pathogens. At least eight of these children were killed after the experiment.²⁹ Similar retention of victims' brains occurred with Wilhelm Bayer and Friedrich Knigge who collected 'euthanasia' brains, at Hamburg-Eppendorf. Indeed, the professor of paediatrics at Hamburg, Rudolf Degkwitz, became disillusioned with National Socialism primarily because of child 'euthanasia'.

Elisabeth Hecker conducted dangerous luminal experiments on children at Loben when luminal was one of the main poisons used to kill children in the Kinderfachabteilungen.³⁰ The search for children who might be carriers of deleterious genes at Görden can be seen with two brothers Kutschke and their cousin Alfred. They all were carriers of the Pelizeus-Merzbacher gene. That one was asymptomatic suggests that scientists, likely including Hallervorden, were proactive in searching for cases.³¹

When children were used for immunological research, many of their brains were retained. Some children's brains went to the Deutsche Forschungsanstalt für Psychiatrie neuropathology department of Willibald Scholz. A group of children were subjected by Georg Hensel to an experimental TB vaccination, which was carried out in the psychiatric hospital of Kaufbeuren. All children had swollen lymph nodes, abscesses and fever. All died from a severe reaction to this experimental vaccination.^{17,32,33} Konrad Viertler, Agnes Gschnell and Fidelius Hofer were infected experimentally with TB and were among the five children who died at Kaufbeuren and were all from the South Tyrol, whereas the other seven survived. The Austrian population of the South Tyrol were subject to racial resettlement, and especially psychiatric patients were removed. Gschnell was born on 22.12.1936 in Girlan, and far from uncertain as a cause of death on 29.5.1943 her tuberculosis was contracted in the TB experiment. Their deaths show how experimental infection and brain

pathology were linked. Agnes Gschnell's brain tissues were used for a study published in the *Zeitschrift für Kinderheilkunde* in 1949.³⁴ Her tissues remain in what is today the Max Planck Institute for Psychiatry, albeit transferred to the institute's memorial room.

5 | AUSCHWITZ

In each of the experimental cases, the children were available as research subjects because of racial deportations. This is clearly shown by Josef Mengele using his genocidal selections on the ramp at Auschwitz from May to November 1944 to collect twins for research. Most of the approximately 700 twins were children. Roelcke reduces Mengele's research to genetic experiments on twins. Again, this is a denial of context. For Mengele, the racial and genocidal aims of National Socialism were fundamental. As a doctor to the 'Zigeunerlager', Mengele examined chronic illness of Noma or Wasserkrebs assisted by the prisoner doctor Berthold Epstein from Prague. Epstein had been captured by the Germans in Norway and survived Auschwitz. Mengele also looked out for physical anomalies such as heterochromic eyes, especially among the inmates of the Zigeunerfamilienlager for which Mengele was the assigned physician. These eyes were sent to the human geneticist Karin Magnussen at the Kaiser Wilhelm Institute for Anthropology.³⁵ Mengele's selecting for the gas chambers made the twin research and growth defect research possible. It meant that Mengele's research was shaped not just by 'genetics' but ideologically and contextually by Mengele's conviction as to the racial justification for implementing the Holocaust and the need for racial research. Roelcke screens out ideological parameters, which shaped Nazi clinical science, in order to allege that there was no such entity as Nazi medical research and effectively to detach Nazi racial research from the often deadly research on children.³⁶

6 | CONCLUSIONS

While the research had medical rationales, the research subjects were available because of displacements arising from the implementation of racial policies. One point is fundamental: the research occurred as part of Nazi racial policies which made children available for research. The conduct towards the children was cruel and placed their lives in jeopardy, and many were killed. Neuropathologists were opportunistic in exploiting the brains of the children to build up their collections at the same time as supporting Nazi racial policies through the mechanisms of the child 'euthanasia' and the residual T4 administrations.

Roelcke justifies his case that the research practices were not 'pseudoscience', but purely scientific in methodology. This was often (although not always) the case, but what Roelcke overlooks is that the research was carried out on children who were victims of racial persecution, or (as for the South Tyrol children) at least racially displaced. It is artificial to draw a distinction between the destruction of children as part of racial policy implementation and the research conducted on them. Roelcke's generic screening out of Nazi racial ideology denies a form of exterminatory Nazi racism linked

to science. Just as with the immunologist and scientific theorist, Ludwik Fleck contingent elements of culture shape a scientific fact, so too these instances of paediatric research were linked to Nazi racial research and its implementation in the Holocaust.

The issue of 'neuro-hatred' raises the question of motivation. If the research on children was motivated by analysis of a cosmic racial struggle against pathogenic racial and hereditary factors, was the attitude to the carriers of genetic pollution also sadistic? Nazi doctors conducted painful operations and tests on their child subjects. This in turn raises the issue whether the research on children in Nazi Germany was no different to other abusive research either before or after National Socialism in Germany and Austria, or in other countries notably the United States. Roelcke has argued that coercive, damaging and lethal research is inherent in scientific medicine. According to Roelcke, the experiments arose from adherence to an extreme scientific logic of genetics. This means that there was no specifically Nazi content shaping the research in terms of epistemological values or practices, and while ethically abusive, the ethical breaches were no worse than in, for example, abusive research elsewhere such as on tooth decay at the Vipeholm Mental Institution.^{37,38} Roelcke sees National Socialism in generic terms as an authoritarian system, so that the expression 'Nazi medicine' is meaningless beyond periodisation. The approach de-historicises Nazism and eliminates cultural specificities of Nazi medicine such as purity of blood, Germanic culture as superior manifested by Nazi science, and the obsession with the cleansing of the *Volkskörper*/body politic culminating in the factory processes of mass killing at Auschwitz using an adapted form of the pesticide Zyklon B. Roelcke's generic and structural interpretation overlooks fundamental historical issues concerning the place of medical research in the unfolding of the Holocaust/Shoah.

Instead, I demonstrate that the research was oriented to realisation of the Holocaust. In this sense, we have 'Nazi research' condoned by senior Nazis. Roelcke's denial of a distinctively 'Nazi medicine' by using generic categories of 'authoritarian' and normal science should be refuted as the experiments drew on Nazi racial policies and specifically on the Holocaust in its unfolding. Paediatricians exploited the unfolding of racial policies as both a research opportunity and policy implementation to build a racially 'cleansed' nation.

Racial policies, shaped in terms of Nazi ideological priorities created the circumstances for the experiments. Roelcke's structural position screens out historical events shaping the research, in terms of context, aims, timing and the availability of victims. This is a classic case in the history of science when a restricted view of relevant factors denies the full historical dynamics. Ludwik Fleck's analysis of a 'fact' shows how context, values and scientific practices represent a continuum.³⁹ It is important to address research practices both methodologically and historically. Roelcke isolates methodology to prioritise scientificity. He fails to consider the victims of the research, and deadly outcomes as victims of a distinctive Nazi medicine. Furthermore, one cannot view Holocaust victims of the past as if a clinical case in the present. This is the fundamental error not only of Roelcke but also of German bioethicists who support 'postmortal' rights of living descendants over victim biographical reconstructions.⁴⁰ The denial of history has far-reaching repercussions in terms

of the depersonalising of victims. This bodes ill for current research on the provenance of Nazi victim specimens.

CONFLICT OF INTEREST

No conflicts of interest.

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REFERENCES

1. The Database "Victims of Biomedical Research under NS. Collaborative Database of Medical Victims", Research Centre Leopoldina, German National Academy of Sciences is held at the Leopoldina German National Academy of Sciences, Halle It will be an online resource in 2024.
2. Weindling P, von Villiez A, Loewenau A, Farron N. The victims of unethical human experiments and coerced research under National Socialism. *Endeavour*. 2016;40(1):1-6.
3. Oren-Hornfeld S. Wie brennend Feuer: Ein Opfer medizinischer Experimente im Konzentrationslager Sachsenhausen erzählt. Metropol; 2005.
4. Schwarberg S. Meine zwanzig Kinder. Steidl; 1996.
5. Seidler E. Verfolgte Kinderärzte 1933–1945. Entrechtet – geflohen – ermordet. Bouvier Verlag; 2000.
6. Shalvey A. History of Paediatric Treatment at the Reichsuniversität Strassburg (1941–1944). PhD Université de Strasbourg; 2021.
7. Klee E. Deutsche Medizin im Dritten Reich. Karrieren vor und nach 1945. Frankfurt am Main: S. Fischer; 2001:116-119.
8. Weindling P. Hiding in plain view: burial and commemoration of children's specimens from Wittenau in the "Gräberfeld/Cemetery X" Tübingen, 4 and 8 July 1990. *Medizinhistorisches Journal*. 2021;56:219-235.
9. Huxley J, Haddon AC, Carr-Saunders AM. *We Europeans*. Cape; 1936.
10. <https://plato.stanford.edu/entries/pseudo-science/>
11. Roelcke V. Nazi medicine and research on human beings. *Lancet*. 2004;364(suppl 1):s6-s7.
12. Roelcke V. Medizin im Nationalsozialismus – historische Evidenz und aktuelle Implikationen: Aktivitäten und Herausforderungen für medizinische Organisationen. In: Czech H, Weindling P, eds. *Österreichische Ärzte und Ärztinnen im Nationalsozialismus. Dokumentationsarchiv des Österreichischen Widerstandes*; 2017:205-210.
13. Schwarberg G. Der SS-Arzt und die Kinder. Bericht über den Mord vom Bullenhuser Damm. Hamburg; 1979.
14. Prokop O, Stelzer E. Die Menschenexperimente des Dr. med. Heißmeyer (Medizinische und kriminalistische Erhebungen). *Kriminalistik Und Forensische Wissenschaften*. 1970;1(3):67-104.
15. Rundberg G, Meyer H. Rapport från Neuengamme. Svenska Röda korsets hjälpaktion bland koncentrationslägerfångar i Tyskland tiden den 7 mars–5 maj 1945. ; 1945.
16. Von Villiez A. Heißmeyer's forgotten victims: tuberculosis experiments on adults in Neuengamme 1944–45, P Weindling, *From Clinic to Concentration Camp: Reassessing Nazi Medical and Racial Research, 1933–1945*. Routledge; 2017:272-289.
17. Weindling P. *Victims and Survivors of Nazi Human Experiments: Science and Suffering in the Holocaust*. Bloomsbury; 2014:69-73.
18. "Victims of Biomedical Research under NS. Collaborative Database of Medical Victims", Research Centre Leopoldina, German National Academy of Sciences, Halle, Germany.
19. Weindling P. The dangers of white supremacy: Nazi sterilisation and its mixed-race adolescent victims. *Am J Public Health*. 2022;112(2):248-254.
20. Schmuhl H-W. Kinderheilkunde in der NS-Zeit: Sozialsanitäres Großprojekt – Arzt am „Volkkörper“. *Dtsch Arztebl*. 2010;107(45):A-2226/B-1926/C-1894.
21. Benedict S, Shields L, Holmes C, Kurth J. A nurse working for the Third Reich: Eva Justin, RN, PhD. *J Med Biogr*. 2018;26(4):259-267.
22. Weindling P. "The Czechoslovak Twins of Mengele, 1943–1945." In: Simunek, M, ed. Prague (in press).
23. Czech H. Hans Asperger, National Socialism, and "race hygiene" in Nazi-era Vienna. *Molecular Autism*. 2018;9:1-43.
24. <http://www.uvm.edu/~lkaelber/children/goerden/goerden.html>
25. Gabriel E, Neugebauer W, eds. *Von der Zwangssterilisierung zur Ermordung*. Böhlau; 2000.
26. Hohendorf G, Rotzoll M. Johann Duken und die Kinderklinik im Nationalsozialismus, Hoffmann GF, Eckart, WU, Osten P, eds. *Entwicklungen und Perspektiven der Kinder- und Jugendmedizin – 150 Jahre Pädiatrie*. Kirchheim & Co; 2010:77-98.
27. Wolfgang Eckart personal communication to author, 2012.
28. Weindling P. Cleansing anatomical collections: the politics of removing specimens from German Anatomical and Medical collections 1988–92. *Ann Anat*. 2012;194(3):237-242.
29. Beddies T, Schmiedebach H-P. "Euthanasie"-Opfer und Versuchsobjekte. Kranke und behinderte Kinder in Berlin während des Zweiten Weltkriegs. *Med J*. 2004;39:121-131.
30. Uzarczyk K. Der Kinderfachabteilung vorzuschlagen: the selection and elimination of children at the Youth Psychiatric Clinic Loben (1941-45). In: Weindling P, ed. *From Clinic to Concentration Camp. Reassessing Nazi Medical and Racial Research. The History of Medicine in Context*. Routledge; 2017:183-205.
31. Gedenkfeier 28 October 2003. *Landesklinik Brandenburg*. [Brandenburg; 2003].
32. Schweizer-Martinschek P. Tbc-Versuche an behinderten Kindern in der Heil- und Pflgeanstalt Kaufbeuren-Irsee 1942-1944. *Nationalsozialismus in Bayerisch-Schwaben, Ostfildern*; 2004:231-260.
33. Steger F. Medizinische Forschung an Kindern zur Zeit des Nationalsozialismus. Die "Kinderfachabteilung" der Heil- und Pflgeanstalt Kaufbeuren-Irsee. *Sudhoffs Archiv Bd. 89, H. 2*; 2005:129-150.
34. Meyer JP. Zur Aetiologie und Pathogenese des fetalen und frühkindlichen Cerebralschadens. *Zeitschrift Für Kinderheilkunde*. 1949;67:123-136.
35. Hesse H. Augen aus Auschwitz. *Der Fall Dr. Karin Magnussen*. Klartext; 2001.
36. Roelcke V. Medicine during the Nazi period: historical facts and some implications for teaching medical ethics and professionalism. In: Rubinfeld S, ed. *Medicine After the Holocaust From the Master Race to the Human Genome and Beyond*. 2010:17-28.
37. <https://edition.cnn.com/2019/10/30/health/swedish-cavity-experiment-wellness/index.html>
38. Petersson B. The mentally retarded as research subjects. A research ethics study of the Vipeholm investigations of 1945-1955. In: Hallberg M, ed. *Studies in Research Ethics*; No. 3. Centre for Research Ethics; 1993:1-32.
39. Fleck L. Entstehung und Entwicklung einer wissenschaftlichen Tatsache. Einführung in die Lehre vom Denkstil und Denkkollektiv. Schwabe und Co., Verlagsbuchhandlung; 1935.
40. Rotzoll M, Hohendorf G, Fuchs P, Richter P, Eckart WU, Mundt C, eds. *Die nationalsozialistische „Euthanasie“-Aktion „T4“ und ihre Opfer - Geschichte und Ethische Konsequenzen für die Gegenwart*. Schöningh; 2010.

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