Björn Huss*, Florian Kaiser

Induced Abortion and Life Satisfaction in Germany: The Role of Selection Processes and Short-Term Effects

Schwangerschaftsabbrüche und Lebenszufriedenheit in Deutschland: Die Bedeutung von Selektionsprozessen und temporären Veränderungen

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Abstract: Unintended pregnancies resulting in induced abortion are occasionally associated with poor psychological well-being. In the literature, this is attributed to either (1) the consequences of abortion, (2) the consequences of unintended pregnancy, or (3) specific selection processes. This longitudinal study addresses these explanations based on data from the German family panel "pairfam" (n = 3,604 women). It compares changes in life satisfaction among different groups of women: Those who had an abortion, those who had a live birth, and those who were not pregnant. A matching procedure ensures the comparability of the groups. The results show that women reported temporarily lower life satisfaction immediately after abortion than similar women following live birth or in absence of pregnancy, while no significant group differences were found in the long run. However, abortion is preceded by significantly lower pre-event life satisfaction than live birth or absence of pregnancy. Persistent poor well-being should therefore primarily be considered a selection criterion for abortions resulting from unintended pregnancies rather than as their consequence.

Keywords: Induced Abortion; Unintended Pregnancy; Life Satisfaction; Longitudinal Analysis; Propensity Score Matching.

Zusammenfassung: In Schwangerschaftsabbrüchen resultierende unintendierte Schwangerschaften werden gelegentlich mit einem schlechten psychischen Wohlbefinden in Verbindung gebracht. In der Literatur wird dies entweder auf (1) die Folgen des Abbruchs, (2) die Konsequenzen der ungewollten Schwangerschaft oder (3) spezifische Selektionsprozesse zurückgeführt. Anhand von Daten des deutschen Familienpanels „pairfam" (n = 3.604 Frauen) vergleicht diese Längsschnittstudie die Lebenszufriedenheit verschiedener Personengruppen: Frauen nach einem Schwangerschaftsabbruch, Frauen nach einer Lebendgeburt und Frauen ohne Schwangerschaft. Ein Matching-Verfahren stellt die Vergleichbarkeit sicher. Die Ergebnisse zeigen, dass ein Schwangerschaftsabbruch vorübergehend mit einer geringeren Lebenszufriedenheit einherging als eine Lebendgeburt oder eine ausbleibende Schwangerschaft, während sich langfristig keine signifikanten Gruppenunterschiede zeigten. Einem Schwangerschaftsabbruch ging jedoch eine deutlich geringere Lebenszufriedenheit voraus als einer Lebendgeburt oder einer ausbleibenden Schwangerschaft. Ein dauerhaft geringes Wohlbefinden sollte daher in erster Linie als Selektionskriterium für Schwangerschaftsabbrüche infolge unintendierter Schwangerschaften statt als deren Folge betrachtet werden.

Schlüsselwörter: Schwangerschaftsabbruch; Unintendierte Schwangerschaft; Lebenszufriedenheit; Längsschnittanalyse; Propensity Score Matching.

***Korrespondenzautor: Björn Huss**, Deutsches Zentrum für Hochschul- und Wissenschaftsforschung (DZHW), Lange Laube 12, 30159 Hannover, E-Mail: huss@dzhw.eu
Florian Kaiser, Max-Planck-Institut zur Erforschung von Kriminalität, Sicherheit und Recht, Günterstalstraße 73, 79100 Freiburg, E-Mail: f.kaiser@csl.mpg.de

1 Introduction

In view of the more than 100,000 induced abortions taking place in Germany annually, the German Federal Ministry of Health (BMG) recently announced the allocation of

substantial funds to study the long-term psychological effects of unintended pregnancies on the women in question (German Federal Ministry of Health 2019). This plan resulted in an ongoing political and scientific discourse about the need for such studies. While the BMG argued that there is a lack of national evidence regarding the psychological implications of induced abortions (Scientific Services of the German Federal Parliament 2019), critics came to the opposite conclusion: They pointed to a broad body of studies on the consequences of pregnancy termination on an international level, concluding that in fact the phenomenon had been studied sufficiently (Hecht & Riese 2019).

Indeed, there are numerous publications on the psychological consequences of abortion in international journals, most of which focus on various indicators of mental health. While the majority of studies found no evidence that induced abortion increases the likelihood of lasting psychological disorders (Biggs et al. 2018; e. g., Biggs et al. 2016; Steinberg et al. 2014; van Ditzhuijzen et al. 2018), some studies attributed a distinct clinical picture to the consequences of abortion and summarised these assumptions under the term "post-abortion syndrome". Review articles by the American Psychological Association and the British Collaborating Centre for Mental Health, however, have shown that these studies suffer from serious methodological and content-related shortcomings such as a lack of pre-pregnancy mental health controls and the use of inappropriate comparison groups (Major et al. 2008; National Collaborating Centre for Mental Health 2011). Other researchers have even characterised them as selective or politically motivated (Rowlands 2011). Finally, based on the existing literature on the topic, Charles and colleagues (2008) concluded that poor-quality studies are more likely to find an association between abortion and mental health problems, while higher-quality studies find little or no effect. Nonetheless, the reviews state that even research with stronger designs showed various shortcomings in terms of sample composition, analytical methods, control groups, confounding variables, and the interpretation of correlations (for an overview, see Charles et al. 2008; Robinson et al. 2009; Steinberg et al. 2014). Major and colleagues summarized that the vast majority of existing studies, despite further development of research designs, "[...] continue to be plagued by serious methodological problems" (Major et al. 2009: 870).

Although numerous high-quality studies on the consequences of unintended pregnancies and abortions have been published since this statement (with most of them finding no association between abortion and poor mental health), existing research almost exclusively consists of international studies, predominantly from the United States. Since the 1990s, only few European studies have investigated the consequences of abortion, which used data from Denmark (Steinberg et al. 2019), Norway (Broen et al. 2005, 2006), Finland (Toffol et al. 2016), the Netherlands (van Ditzhuijzen 2017), or Great Britain (Gilchrist et al. 1995). Publications from Germany are limited to special cases such as abortions after prenatal diagnostics (Kersting & Bäz, 2002; Schütt et al., 2001), to compare the consequences of different abortion methods (Hemmerling et al. 2005), or to the analysis of life circumstances that shape pregnancy decisions (Minkus & Drobnič 2021). Only one recent study investigated changes in life satisfaction following induced abortions using longitudinal data from Germany (Huss 2021). This research gap is particularly surprising since abortion is subject to a specific legal framework. In Germany, abortion is basically illegal but exceptions are made under specific conditions (see § 218 of the German Criminal Code). Furthermore, medical practitioners can refuse to perform an induced abortion for ethical reasons and have been legally banned from advertising this procedure until 2022 (see § 219a of the German Criminal Code). The psychological consequences of the decision to carry a pregnancy to term or to discontinue it might therefore differ from those in other countries.

Finally, the existing scientific literature on the psychological consequences of abortion is mainly based on a pathogenesis approach, which defines mental health on the basis of the dichotomous states of "health" and "illness"(National Collaborating Centre for Mental Health 2011; Major et al. 2008). This approach neglects the fact that the psychological consequences of induced abortion do not necessarily manifest themselves in clinically significant mental disorders (e. g. regarding depression, anxiety, or stress), but can alternatively or additionally be reflected in gradual changes in well-being (e. g. life satisfaction; see Major et al. 2009).

The present study addresses the conceptual and methodological drawbacks of existing research by testing three key theories on the psychological consequences of induced abortion. These attribute poor psychological well-being among women after induced abortion to either (1) the direct consequences of pregnancy termination, (2) a previous unintended pregnancy, or (3) specific selection processes into pregnancy termination (e. g., a poor pre-pregnancy state of well-being). These explanations, which are not necessarily mutually exclusive, are empirically tested using a quasi-experimental research design based on matched longitudinal data from Germany, which allow to contrast the well-being of women who had

an abortion ("treatment" group) and women who had a live birth (control group I) or were no at all pregnant in the study period (control group II) at different points in time before and after the given life events. Following the resource-oriented approach of salutogenesis (Antonovsky 1988), life satisfaction serves in the analysis as an indicator for the psychological consequences of induced abortion.

2 Induced Abortion and Subjective Well-Being

The literature offers various theoretical explanations on the impact of induced abortion on individual well-being, which are not necessarily mutually exclusive. They are, however, accompanied by different conclusions regarding central mechanisms, which can hardly be distinguished from each other based on the methodological approaches used in previous empirical studies (see also Major et al. 2009). This study aims to examine which of these theories offers the greatest explanatory power with respect to the link between abortion and life satisfaction.

The first theoretical model is based on psychological assumptions regarding stress and coping strategies (e. g., Folkman & Lazarus 1988). From this perspective, having an induced abortion can be accompanied by psychological distress (see Major et al. 2009). However, this distress would not be primarily due to the abortion, but due to another event that precedes an abortion: a pregnancy that is unintended in the context of a difficult life situation. It is argued that although it is still seen as a stressful experience that can be accompanied by negative emotional responses and initially affect the well-being (Steinberg & Rubin 2014; Steinberg et al. 2014), abortion on its own does not usually result in clinically significant mental disorders. Rather, according to Lazarus & Folkman (1984), the coping strategies chosen based on the available resources are crucial in stressful life situations. Assuming that an unintended pregnancy induces stress, the woman affected will choose the option (induced abortion or live birth) which, based on her subjective expectations, promises to minimise the negative consequences of an unintended pregnancy. Depending on individual resources and prevailing attitudes in the personal environment and society regarding induced abortions, it would consequently also be possible that an abortion resulting from an unintended pregnancy has fewer negative psychological consequences than a live birth resulting from an unintended pregnancy, since it may be the more effective coping strategy in some cases (see Major et al. 2009). However, the extent to which the subjective expectations regarding the consequences of the chosen course of action actually materialise, depends, among other things, on the information available for reaching a decision. Since this information is limited, the decision-making process itself could cause additional stress and the chosen course of action could have unexpected consequences for the well-being of the woman concerned (Miller et al. 1998).

The common-risk-factors approach also assumes that poor psychological well-being following pregnancy termination is not primarily caused by the event of an induced abortion. However, in contrast to the stress and coping perspective, this explanatory model does not locate the causes of poor well-being in an unintended pregnancy but in the context in which a pregnancy occurs (see Steinberg & Finer 2011). Women with specific individual contexts are more likely to experience unintended pregnancies and subsequent abortions than are other women. In particular, existing psychological problems and poor well-being are considered risk factors (Major et al. 2009; Steinberg & Rubin 2014; see also Luhmann et al. 2013), but so are a low socio-economic status and specific personality and behavioural characteristics. According to the common-risk-factor approach, low post-abortion life satisfaction is not a consequence of an abortion, but precedes it.

Finally, according to trauma theory, the termination of a pregnancy is described as a traumatic experience in a woman's life. By intentionally causing the death of an unborn child, to which the mother has already built up an (un)conscious intimate bond, the trauma theory assumes serious short- and long-term psychological consequences. The consequences of an induced abortion would exceed those of other negative life events and result at worst in clinically manifested psychological disorders. Although some studies claimed to have found an empirical link between abortions and mental disorders which seems to support the assumptions of the trauma theory, the results of these studies are considered to be driven by fundamental methodological flaws and could not be reproduced with a more suitable study design so far (Steinberg & Russo 2008; Steinberg & Finer 2011; see Major et al. 2009). The present study aims at testing the assumptions of trauma theory for the first time based on longitudinal data from Germany and with suitable empirical methods.

To our knowledge, only few relevant empirical publications exist on the effects of induced abortion on life satisfaction. Studies from the USA and Norway have shown that the life satisfaction of the women studied increased steadily in the years following abortion compared to the time immediately after the event (Biggs et al. 2017; Biggs

et al. 2014; Broen et al. 2005), which initially supports the assumptions of the stress and coping perspective. However, since these studies focused on post-event life satisfaction trajectories, they do not allow us to compare pre-abortion well-being with post-abortion well-being and therefore do not provide any reliable conclusions on whether an induced abortion leads to an initial drop in life satisfaction compared to pre-event measures. The short- and long-term consequences from a life course perspective have so far only been examined in one recent study from Germany. This study shows that abortion is associated with a temporary decline in life satisfaction as well as permanent losses in satisfaction with other domains of life (Huss 2021). But even in this study it remains unclear to what extent post-event changes in well-being were caused by an induced abortion or a preceding unintended pregnancy. This distinction is particularly challenging from a methodological perspective, since both events are usually closely linked in time and can only be indirectly distinguished from each other on the basis of the survey designs of existing longitudinal studies. The assumptions of the common-risk-factors approach also find empirical support: Women who had an induced abortion show–on average–a poorer psychological well-being than other women before the event and also differ from these women in terms of pregnancy intentions and family-related characteristics (Huss 2021).

To test the assumptions of the theories presented, analysing intraindividual changes in well-being after abortion is an important first step (see Huss 2021). Equally necessary, however, is a subsequent step to ensure that possible changes in well-being are indeed attributable to the abortion rather than to parallel processes such as an unintended pregnancy. This is the purpose of the present study, which uses matched data to compare the well-being of women who have had an abortion with the well-being of comparable women who have carried their child to term or did not become pregnant.

3 Hypotheses

The explanatory models presented are accompanied by different theoretical implications regarding the underlying causes of differences in the psychological well-being of women who had induced abortions compared to other women. The present study investigates which theory offers the greatest explanatory potential by comparing subsamples of women who have each experienced one out of three different pregnancy-related life experiences during the study period: an induced abortion, a live birth, or absence of pregnancy.

According to the stress and coping perspective, it is not the abortion but a frequently accompanying unintended pregnancy that is the crucial life event which might cause any possible impairment in well-being. The induced premature termination of the pregnancy would consequently be–just like carrying the child to term–a strategy of coping with this unexpected life event. The choice of a particular coping strategy may facilitate or impede adaptation to an unintended pregnancy. Compared to induced abortion, however, absence of pregnancy is likely to be associated with temporarily higher life satisfaction because there is no unintended pregnancy that initially results in losses in well-being. In any case, possible significant differences are expected to be short-lived, as well-being is likely to recover after an unintended pregnancy regardless of the coping strategy chosen (abortion or carrying the pregnancy to term):

H1a Under similar pre-event conditions, induced abortion is not associated with permanent differences in life satisfaction compared to live birth.

H1b Under similar pre-event conditions, induced abortion is temporarily associated with less life satisfaction compared to absence of pregnancy.

In the common-risk-factors approach, the causes of poor well-being are not primarily attributed to induced abortion or unintended pregnancy, but to specific individual contexts that increase the probability of abortion. These different contexts are reflected in systematic differences in proxy variables such as pre-event well-being. Thus, low well-being after abortion could simply reflect (at least in part) a continuation of the pre-event state of well-being. Although the common-risk-factors approach offers an alternative explanation for potentially low well-being among women after abortion, it does not necessarily contradict the stress and coping perspective. Rather, it is possible that the assumptions of both theories apply simultaneously. The common-risk-factors approach yields the following assumption:

H2 Induced abortion is associated with less pre-event life satisfaction than is live birth or absence of pregnancy.

Finally, trauma theory emphasises the possible (more persistent) negative consequences of the abortion itself, which then should be reflected in a particularly low level of well-being, relative to other women:

H3a Under similar pre-event conditions, induced abortion is permanently associated with less life satisfaction compared live birth.

H3b Under similar pre-event conditions, induced abortion is permanently associated with less life satisfaction compared to absence of pregnancy.

4 Methods

4.1 Data and Sample

We used data from eleven waves of the German pairfam study ("Panel Analysis of Intimate Relationships and Family Dynamics", Release 11.0, Brüderl et al. 2020), a nationally representative longitudinal sample of about 12,000 respondents from three birth cohorts (1971–73, 1981–83, 1991–93),[1] which has been conducted annually since 2008. A detailed description of the study can be found in Huinink et al. (2011).

The unit of analysis was 6.930 reproductive-age women aged 16–45 years. On average, these women were observed over a period of 5.7 panel waves, resulting in information from a total of 39,335 person-years being available for the analysis. From this sample, women who had an induced abortion or a live birth during the study period and a comparison group of women who did not become pregnant during the study period were included in the analysis. For women who reported multiple pregnancies during the study period, only information from the first abortion or delivery was considered. The short- and long-term effects of the respective events were captured at four measurement points: participants' last survey year[2] before pregnancy (t0), the first measurement point within one year after abortion or delivery (t1), two to three years after abortion or delivery (t2) and four to five years after abortion or delivery (t3). Participation in the survey at time points t0 and t1 was a prerequisite for inclusion in the subsequent analysis. The aggregated time points t2 and t3 corresponded to the mean values of the respective survey years. The final sample consisted of 184 women with an abortion and 954 women with a live birth during the observation period. Furthermore, information from 2,466 women who did not become pregnant was included in the analysis, for which the fictitious time points t0 to t3 were generated based on the average survey participation wave in which an induced abortion was observed among the women affected (so that t1 was fixed to the fifth individual participation wave for this group). The statistical analysis is thus based on information from 3,604 respondents.

4.2 Measures

4.2.1 Overall life satisfaction as the outcome variable

Information on overall life satisfaction was gathered via the question "All in all, how satisfied are you with your life currently?" Respondents were asked to respond on an eleven-point scale ranging from 0 (very dissatisfied) to 10 (very satisfied). Various studies have shown that the measurement of life satisfaction via individual items is associated with a satisfactory level of reliability (Cheung & Lucas 2014; Diener et al. 2013; Lucas & Donnellan 2012; Wanous et al. 1997).

4.2.2 Operationalisation of pregnancy-related life events

The key explanatory variable is induced abortion. In each wave of the pairfam study, the participants were asked whether they had had an induced abortion since the last interview.[3] In Germany, induced abortion is subject to strict regulations and only permitted under specific conditions (according to § 218a of the German Criminal Code): First, via consulting services that offer abortions within the first 12 weeks of pregnancy; of the women in question, approximately 96 % used this route. Second, when due to medical necessity; about 4 % of abortions take place for this reason.[4] Lastly, as a result of rape; only a very few women make use of abortion services for this reason

1 A complementary fourth birth cohort (2001–2003) was not considered in the present analysis because this cohort first became part of pairfam in wave 11 as part of restocking and refreshment sample.

2 In the following, only the shorter term "year" is used, which is to be understood as the current "survey year" or "survey wave" of the participants. Although the pairfam study is an annual survey, the actual intervals between surveys can vary by several months. Furthermore, how many months elapsed between each interview cannot be defined exactly, as it was only asked whether an abortion had taken place since the last interview, but not when exactly it took place.

3 Exceptions to this are first-time respondents in the pairfam study, for whom the question differed as to whether they had ever had an abortion. Since this is a different reference period, abortions reported by first-time respondents were not considered in the analysis.

4 For this very limited number of women, the stress and coping perspective is not applicable, since live birth is not considered to be a realistic option when serious health consequences for mother or child are imminent.

(Federal Statistical Office of Germany 2020). The majority of induced abortions in Germany can therefore be understood as conscious decisions made for various personal reasons. Which of these conditions underlies the specific decision of the respondents, however, was not surveyed in the pairfam study.

Since abortion is a sensitive subject and therefore often underreported in survey data (Desai et al. 2021), the pairfam study used computer-assisted self-interviews (CASI) for questions on abortion, while most of the information was collected through face-to-face interviews. To avoid bias due to untruthful answers, respondents also had the option to explicitly state that they did not want to answer the question on abortions.

The participants who had had a live birth during the study period form a comparison group for the women who had had an induced abortion. Information on childbirth since the previous interview was gathered in each pairfam wave. While abortion and carrying the child to term represent the outcome of options for action in response to a pregnancy, the absence of pregnancy is a further and preceding scenario that renders the decision to carry a child to term obsolete. In this study, all women who did not report being pregnant at any time during the study period fall into this category. This subpopulation consists of women without a pregnancy-related event ("no treatment"), who constitute a further comparison group in the present analysis.

4.2.3 Confounders

In addition to the key analytical variables, a large number of covariates were taken into account in the analysis, which reflect the person-specific factors prior to the respective event. All confounders originate from measurement time t0 (<= 1 year before the event[5]), as they serve to align the samples in the context of performing a matching procedure.

According to the common-risk-factors approach, poor psychological well-being is a selection criterion for induced abortion and is thus considered a predictor for post-abortion well-being (Steinberg & Rubin 2014). This salutogenetic indicator was supplemented by a variable representing the tendency to depression as a pathogenetic indicator of psychological well-being: The measurement was conducted using the German version of the "State-Trait Depression Scales" (STDS Form Y-2; Spaderna et al. 2002), which contain five items to record a dysthymic mood and another five items[6] to record a euthymic mood, each of which was measured using a four-point scale and added up to a sum index.

Since an unintended pregnancy not only increases the probability of having an abortion, but is also considered to be a central cause of changes in psychological well-being after induced abortion according to the stress and coping perspective, pregnancy intentions were also included in the analysis as potential confounding variables (Biggs et al. 2013; Steinberg & Rubin 2014). Pregnancy intentions were measured using the question "Have you tried to get pregnant since the last interview [...]?" and a binary response option. In addition, we included further fertility-related variables in order to better understand to what extent a pregnancy would be (un)desired and what problems it could cause in interaction with the personal setting: Two variables capture the expectations and concerns regarding life with children (see also Nauck 2014), each of which was gathered via five items and combined into mean value indices. The extent to which the prerequisites for (further) children were considered fulfilled in the self-perception was recorded via a mean value index consisting of eight items. Another variable reflects the willingness to cut back in other areas of life in case of parenthood by means of four items (combined into a mean value index).

The common-risk-factor approach in particular emphasises the importance of the personal environment for the likelihood of an unintended pregnancy as well as for the subsequent decisions to act. The environment was taken into account via two variables: (1) a three-item mean index measuring the expected financial, temporal and emotional support from the personal environment in case of pregnancy, and (2) a two-item mean index measuring the extent to which the parents and friends put pressure on for a pregnancy at time t0.

The likelihood of experiencing an unintended pregnancy and the ability to adjust to this event are moreover influenced by personality factors (see Major et al. 2009; Steinberg & Rubin 2014). For example, people with strong neurotic tendencies show particularly poor resilience to challenging life situations (Oshio et al. 2018). We included the personality traits in the analysis using a short form of

5 Since some information was not collected in each pairfam wave (e. g., the Big Five personality traits), the last available pre-event measure was used as the basis for analysis in this case.

6 Due to the large number of items in this analysis, which were aggregated into sum and mean indices for the individual covariates, we have refrained from explicitly presenting the item formulations. However, these can be found in the scale manual of the pairfam survey (Thönnissen et al. 2020).

the five-factor model of personality ("Big five"; Rammstedt & John 2005). Each personality dimension was represented by a mean index consisting of four (extraversion, agreeableness, conscientiousness, neuroticism) or five items (openness).

Finally, we included a number of socio-demographic factors at time t0 in the analysis, which are considered risk factors for an induced abortion (Charles et al. 2008; Steinberg & Russo 2008; Taft & Watson 2008): the age of the respondents and the number of children as metric variables, as well as the partnership status (binary variable), the educational level and the employment status of the respondents (each aggregated to categories), see Table 1.

Tab. 1: Descriptive distributions at the last measurement before abortion, live birth, or in the absence of pregnancy for the unmatched sample (t0 <= 1 year before event)

	Subsample					
	Abortion		**Live birth**		**No pregnancy**	
Variable	*M*	*SD*	*M*	*SD*	*M*	*SD*
Psychological well-being						
Life satisfaction[a]	7.19	2.09	7.70	1.66	7.47	1.72
Depressiveness (STDS-scale)[b]	19.50	5.96	16.98	4.78	17.70	5.18
Fertility: plans and expectations						
Pregnancy intended[c] (=1)	0.07		0.29		0.03	
Prerequisites for pregnancy fulfilled[d]	0.47	0.35	0.72	0.32	0.36	0.33
Value of children[e]						
Expectations (+)	3.56	0.68	3.61	0.63	3.49	0.64
Concerns (-)	2.69	0.91	2.34	0.75	2.50	0.80
Willingness to cut back in case of parenthood[f]	2.39	1.07	2.87	1.05	2.18	1.00
Pers. environment encourages pregnancy[g]	2.35	1.45	3.23	1.45	1.96	1.30
Pers. environment supports in case of pregnancy[h]	3.18	1.02	3.44	0.91	3.47	1.02
Socio-demographics						
Age	27.79	7.55	31.36	5.74	29.77	8.97
Number of children	0.89	1.01	1.01	0.93	0.82	1.08
Partnered (=1)	0.43		0.77		0.45	
Employment status						
Full-time	0.27		0.35		0.31	
Part-time	0.23		0.30		0.27	
Non-employed	0.26		0.28		0.11	
School / vocational training	0.23		0.08		0.31	
Educational level						
Lower secondary	0.20		0.08		0.08	
Higher secondary	0.46		0.43		0.50	
Post-secondary / tertiary	0.32		0.48		0.41	
No degree / enrolled	0.02		0.02		0.01	
Personality ("Big 5")[i]						
Openness	3.76	0.70	3.67	0.70	3.76	0.68
Conscientiousness	3.77	0.68	3.99	0.58	3.87	0.66
Extraversion	3.72	0.84	3.62	0.80	3.64	0.81
Agreeableness	3.16	0.74	3.34	0.71	3.34	0.72
Neuroticism	3.01	0.83	2.79	0.79	2.84	0.82
n (individuals)	184		954		2,466	

Notes: ***M*** mean, ***SD*** standard deviation. Samples restricted to female respondents between 16 and 45 years of age who were observed across the transition to either induced abortion, live birth, or who did not report any pregnancy-related event during the observation period.
[a] Range of values: 0 (very dissatisfied) to 10 (very satisfied). [b] Sum index, 10 items, a score of 25 or higher indicates a potential clinically relevant depression. [c] in the previous 12 months. [d] Mean index, 8 items, range of values: 0 (not fulfilled) to 1 (fully fulfilled). [e] Mean indices, 5 items each, range of values: 1 (very low) to 5 (very high). [f] Mean index, 4 items, range of values: 1 (no willingness to restrict) 5 (very high willingness to restrict). [g] Mean indices, 2 items each, range of values: 1 (no agreement) to 5 (full agreement). [h] Mean index, 3 items, range of values: 1 (no support) to 5 (high support). [i] Mean indices, 5 items each or 6 items (openness), range of values: 1 (very low) to 5 (very high).

4.2.4 Descriptive characteristics

The descriptive distributions of all variables measured at t0 can be found in Table 1. They show that women in the unmatched abortion sample already had significantly lower life satisfaction (7.19 on average) before this event than did women in the unmatched live birth sample (7.70) or in the unmatched nulliparous sample (7.47). Regarding the personal factors, there were particularly large significant differences between the abortion sample and the live birth sample: participants with an abortion later in the pregnancy term were younger at time t0 with an average age of just under 28 years (compared to 31.36 years), had fewer children (0.89 to 1.01 on average) and were partnered less often (43 % to 77 %) than women who carried to full term. While 29 % of all women actively sought pregnancy before a live birth, only 7 % did so before an abortion (3 % of nulliparous women). With regard to attitudes and assessments of parenthood, there are also distinct differences: almost half of all women with a later induced abortion considered the prerequisites for (further) children to be fulfilled at time t0, while this was true for almost three quarters of all women before a live birth. Before an abortion, the women concerned also showed a lower willingness to constrain themselves by having children (2.39 to 2.87 on average) and greater concerns regarding parenthood than did women before a live birth (2.69 to 2.34). Respondents who were about to have an abortion expected less support from their personal environment in the event of a birth than those who were about to have a live birth (3.18 to 3.44 on average). Differences were also found in the tendency towards depression, which was significantly more pronounced before an abortion than before a birth, with an average of 19.50 versus 16.98 points on the STDS scale (Spaderna et al. 2002).

4.3 Analytical Strategy

The multivariate analysis was conducted with the aim of testing the competing theoretical models by comparing the psychological consequences of an induced abortion with those of alternative events. As the descriptive distributions in Table 1 show, however, women with and without abortion did not differ randomly: women who had an abortion showed specific socio-demographic characteristics, attitudes and personalities that in some cases fundamentally distinguished them from women who had a live birth or those who did not become pregnant. In order to counteract possible selection effects, a propensity score matching (PSM) was first performed (Kainz et al. 2017; Rosenbaum & Rubin 1983).

A PSM allows only for the finding and inclusion of those women from the control groups in the analysis who reported similar characteristics to women who underwent an induced abortion. To identify these statistical "twins", Bayesian logistic regressions were first performed to estimate the individual probabilities of having an abortion during the study period – either (1) versus carrying a child to term or (2) versus not getting pregnant. This probability is also referred to as the propensity score (PS). Women from the comparison groups who had a similarly high PS to women who underwent an abortion were matched to those women in a second step. Only those participants for whom a match was found were included in the later analysis. Some of the women from the comparison groups, however, were excluded through PSM for the following analysis because they showed a combination of characteristics that made an induced abortion unlikely.[7] They would thus not be suitable participants in a comparison group aiming at a reliable estimation of causal effects.[8] Women who had an abortion were also excluded from the analysis if a very high PS was estimated for them and they thus showed combinations of characteristics that could not be found in the comparison groups.[9] By excluding the cases described above, the PSM aligned the different groups with regard to the distribution of decisive characteristics and thus counteracted selection effects.

In the present study, a "nearest neighbour matching" (Gangl 2014) best balanced the groups with regard to their characteristics (for a comparison of the balance achieved by various neighbourhood matching procedures, see Figure A3 in the online appendix). Based on similarities in the linear PS, each woman who underwent an abortion was matched with exactly one woman from the control

7 An example of this would be married women who wanted to have children, who considered all the prerequisites for pregnancy to be fulfilled and were equipped with high expectations and a high willingness to restrict themselves with regard to have children.

8 Matching techniques aim at minimizing heterogeneities between treatment and control groups and thus allow for much better comparability compared to other statistical methods. Nevertheless, even with matching techniques, causal inferences are subject to the problem of unobserved heterogeneity (depending on the quality of the information available for matching) and should only be made with caution.

9 Our treatment effects are thus not necessarily generalizable to the entire population of women who had an abortion because they may not apply to women at highest risk of abortion. This finding indicates that standard regression models extrapolate beyond existing data to estimate causal effects for the entire population of women who have had an abortion. This extrapolation may be problematic since women with high-risk characteristics may respond differently to abortion than other women.

group (ratio: 1:1, without "lay back", caliper: 0.1 standard deviations). To account for the proportion of women who had missing values[10] on matching indicators and life satisfaction measures in the analysis, a multiple imputation procedure (multiple imputation by chained equations, 40 imputations) was performed before applying the PSM (van Buuren 2018). Finally, using the imputed data, the PSM created two matched subsamples. The first matched subsample includes an average of 151.8 women who had an induced abortion and the same number of mothers who had a live birth. The second subsample includes 172.1 women who had an induced abortion and the same number of nulliparous women.[11]

Assuming that the subsamples were balanced by the PSM with respect to all relevant characteristics, a comparison of means (based on linear regression) between the samples allows the estimation of a specific effect: the Average Treatment Effect on the Treated (ATT; see Gangl 2014; Morgan & Winship 2015). The ATT reflects the average difference in life satisfaction after an abortion compared to a (hypothetical) alternative event at different measurement time points.

5 Results

5.1 Propensity Score Matching

Standardised mean differences in the covariates (also called standardised bias[12]) are typically used to test the quality of balance across subgroups achieved by a PSM (Kainz et al. 2017; Gangl 2014). We follow the literature recommending a quite stringent threshold of 0.1, above which the covariates are considered unbalanced (Kainz et al. 2017). The bias statistics for the samples at t0 show that women in the abortion sample differed substantially from women in the live birth sample in 18 of the 25 characteristics considered before the PSM and from women in the nulliparous sample in 13 of the 25 characteristics (see Figure 1). This result is in line with the expectations of hypothesis 2a, according to which women with an abortion show significant pre-event differences in life satisfaction and the covariates compared to other women.

These partly considerable differences in relevant characteristics were almost completely eliminated by the PSM. After the matching process, women who gave birth and women who did not become pregnant no longer differed substantially in any of the covariates from women who had an abortion (see Figure 1). The adjustment for relevant characteristics counteracts possible selection effects that would be accompanied by a distortion of the abortion effects.

5.2 The Impact of Pregnancy-Related Life Events on Life Satisfaction

Before the respective events, the life satisfaction of the participants in the subsamples was at a comparable level due to the PSM (Figure 2). While the level of satisfaction after induced abortion decreased significantly until t1, it increased after live birth. In the following years, the trends reversed and life satisfaction of the women concerned increased (abortion) or decreased (live birth), resulting in both groups returning to the satisfaction level of before the respective event by time t3. In contrast, life satisfaction of women from the matched sample who did not become pregnant remained at a largely constant level over the analysis period.

The ATT estimates show that the average life satisfaction of women immediately after an induced abortion (t1) was −0.77 points (95 % CI = −1.11; −0.43) lower than it would have been after a live birth (Table 2, Model 1). However, two to three years after the event (t2), this difference was only −0.17 satisfaction points (95 % CI = −0.48; 0.19). Four to five years after the respective event (t3), an induced abortion was no longer associated with any substantial differences in average life satisfaction compared to a potential live birth (ATT = 0.10; 95 % CI = −0.26; 0.49).

Life satisfaction was also estimated to be lower immediately after an abortion than it would have been in the absence of pregnancy (ATT = −0.47; 95 % CI = −0.78; −0.12; Table 2, Model 2). This gap in satisfaction with life in the absence of an event was reduced by t2 (ATT = −0.25; 95 % CI = −0.54; 0.05) and levelled off by time t3 (ATT = 0.00; 95 % CI = −0.30; 0.31).

10 For most variables, the proportion of missing values was less than 10 %. Exceptions for individual variables ("Prerequisites for pregnancy fulfilled," "Willingness to cut back in case of parenthood," "Pers. environment encourages pregnancy," and "Pers. environment supports in case of pregnancy") can be attributed primarily to filtering and not to respondents' willingness to answer. For more information on the distribution of missing values before multiple imputation, see Table A1 in the Online Appendix.

11 The numbers for the matched subsamples represent the average of the women matched across the imputations. In each imputed dataset, a different number of individuals could be matched, as the PS varies for each imputation to account for the uncertainty of the missing values in the estimates (see within approach described by Penning de Vries & Groenwold 2017).

12 Standardised bias = $(M_{Treated} - M_{Control}) / SD_{Treated}$

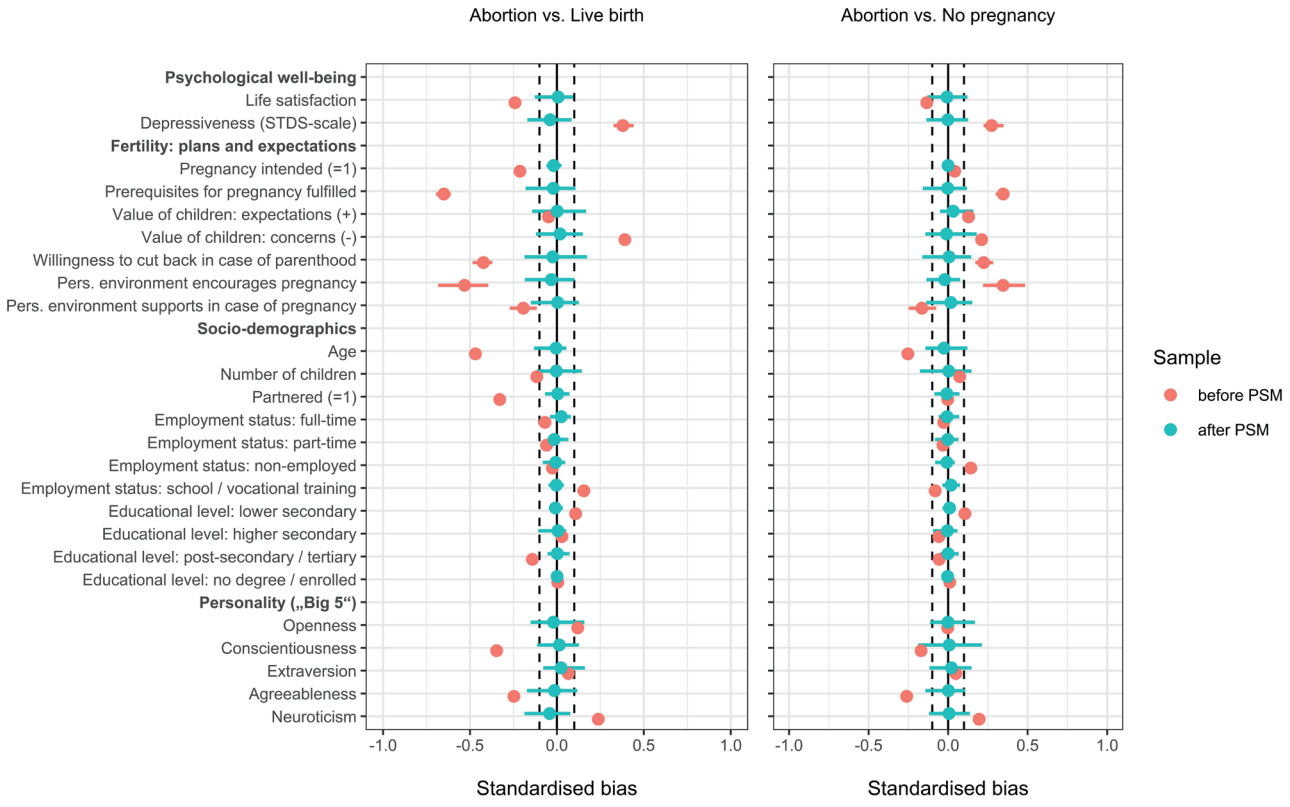

Fig. 1: Standardised bias of the abortion sample at t0 (<= 1 year before event) compared to the subsamples before (red) and after (blue) propensity score matching[13]

Overall, the results provide support for the assumptions from the stress and coping perspective as well as those from the common-risk-factors approach. Consistent with the assumptions of Hypothesis 1a and 1b, under the same pre-event conditions, abortion was not associated with lasting differences in well-being compared with live birth, but was associated with at least temporarily lower life satisfaction compared with absence of pregnancy. Moreover, as hypothesized in Hypothesis 2, induced abortion was associated with less pre-event life satisfaction than were live birth or absence of pregnancy. Since there were no long-term differences between the groups under investigation, we found no evidence for the assumptions of trauma theory (hypotheses 3a and 3b).

We also conducted some sensitivity analyses using fixed effects regression models (with the unmatched and matched samples; see also Huss 2021). These alternative modelling approaches produced very similar results (see online appendix, Table A2), despite FE models rely on a quite different strategy to identify causal effects than matching methods (see Morgan & Winship 2015).

6 Discussion

This study examined the relationship between induced abortion and life satisfaction. The analysis focused on the question of whether women report poor psychological well-being after induced abortion and whether any possible impairment in well-being can primarily be attributed to (1) the consequences of the abortion, (2) the consequences of an unintended pregnancy, or (3) specific selection processes into pregnancy termination. Various central findings result from the analysis:

First, even before the event, women who had an induced abortion showed individual characteristics that fundamentally distinguished them from other women. This not only applied to life satisfaction as an indicator of psychological well-being, but also to personality traits, socio-demographic background as well as attitudes and values regarding prospective pregnancies. These findings support the assumptions of the common-risk-factors

13 Standardised bias was computed for all variables except of binary or categorical covariates (for these variables, the differences are presented in the raw format, i. e., in percentages).

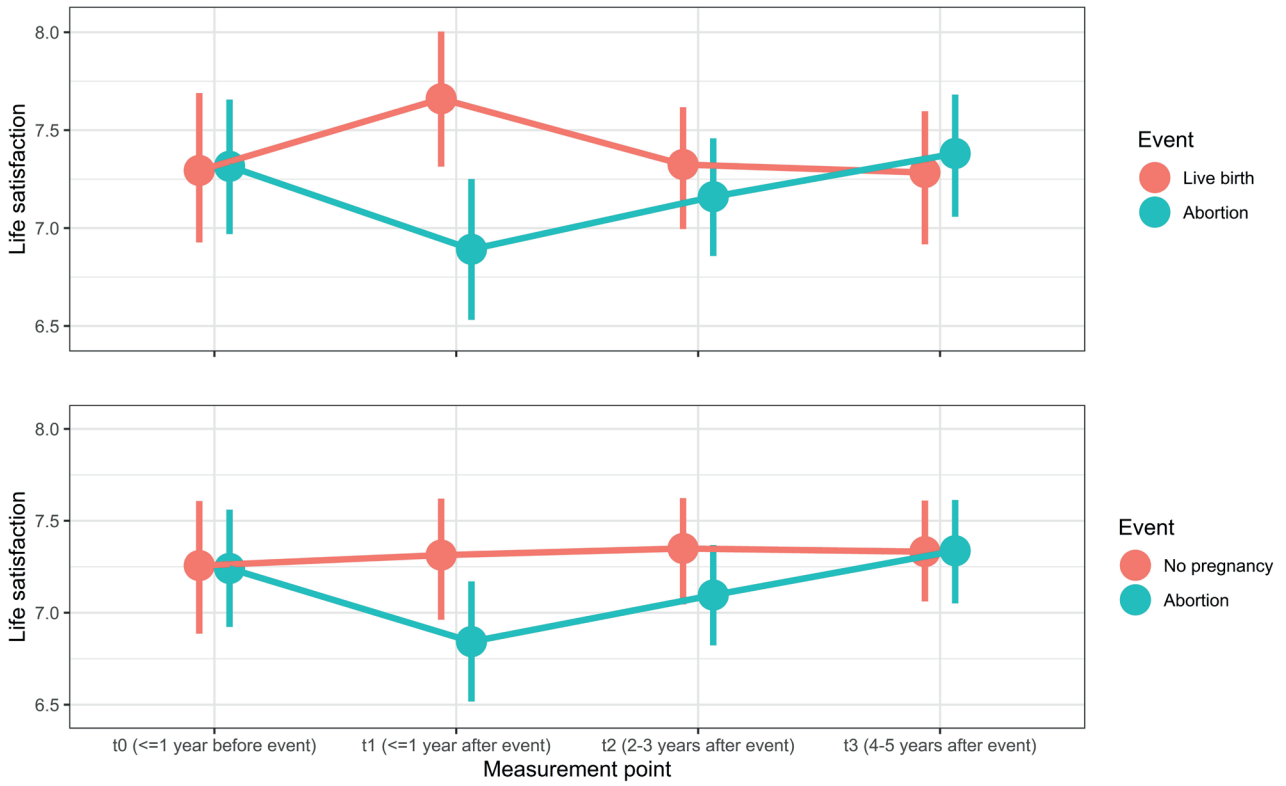

Fig. 2: Changes in life satisfaction after abortion, live birth, and in the absence of pregnancy for the matched subgroups; results of ATT estimates (margins)

Tab. 2: Differences in life satisfaction: abortion sample compared to live birth sample and no pregnancy sample

Life satisfaction	**Induced Abortion vs.**			
	Live birth (1)		**No pregnancy (2)**	
	ATT	*CI (95 %)*	*ATT*	*CI (95 %)*
Pretreatment				
t0 (<=1 year before event)[a]	0.02	[−0.50; 0.52]	−0.01	[−0.49; 0.47]
Posttreatment				
t1 (<=1 year after event)	−0.77	[−1.11; −0.43]	−0.47	[−0.78; −0.12]
t2 (2–3 years after event)	−0.17	[−0.48; 0.19]	−0.25	[−0.54; 0.05]
t3 (4–5 years after event)	0.10	[−0.26; 0.49]	0.00	[−0.30; 0.31]

Notes: Estimates of Average Treatment Effects on the Treated (ATT). ***CI*** confidence interval. [a] At t0, mean differences were reported rather than ATT, since this time point was prior to the event and consequently cannot have been influenced by it.

approach, according to which low life satisfaction after induced abortion may be, in part, a continuation of low well-being prior to abortion. This low pre-abortion well-being is accompanied by specific individual and social circumstances commonly faced by women who undergo abortion. The importance of these circumstances, however, has been underestimated in many existing studies, which have often been limited to a simple comparison between women who have and have not had an abortion, without sufficiently adjusting for person-related pre-event confounders (for an overview, see Charles et al. 2008; Steinberg et al. 2014). Failing to account for existing selection effects presumably led to the estimation of biased abortion effects in these studies (see Robinson et al. 2009). In the present study, this problem was addressed by a matching procedure aiming to restrict the control groups to women with

similar personal factors compared to those of women in the treatment group. This allowed us to compare the consequences of an induced abortion with those of alternative events (carrying the child to term, not becoming pregnant).

Second, consistent with the assumption of the stress and coping perspective, induced abortion was not associated with lower life satisfaction in the long run compared with live birth or absence of pregnancy. Life satisfaction initially dropped significantly following abortion and rose in the same period following a live birth, indicating that abortion might indeed initially be associated with negative consequences for well-being. However, both groups of women returned to their initial levels of satisfaction in the years following. These findings contradict the assumptions of trauma theory, according to which an abortion would be a particularly stressful life event and would lead to permanent losses in psychological well-being. Instead, our findings provide evidence that the phenomenon of "hedonistic adaptation", which has been proven for various other life events, can be also observed in the case of induced abortion (see Brickman & Campbell 1971): After significant positive or negative life events, the persons affected often report initial changes in their basically constant life satisfaction. These changes, however, are followed by adaptation to or coping processes for the respective event, which in the mid-term are accompanied by an extensive or complete return to the individual's initial level of well-being (see also Diener et al. 2006; Huss & Pollmann-Schult 2020; Lucas 2007).

Third, the assumptions of the stress and coping perspective and those of the common-risk-factors approach are not necessarily in conflict. It is possible that women have a different likelihood of having an abortion, depending on the individual context (including a prior lack of well-being), and that an unintended pregnancy has additional effects on the well-being of the women affected. Indeed, the results of the present study appear to support the assumptions of both the common-risk-factors approach and the stress and coping perspective: Low post-abortion well-being can be attributed at least partly to well-being and other personal circumstances before abortion (or, more precisely, before pregnancy). In addition, given similar individual contexts, well-being temporarily decreased after abortion, although no differences were found in the long term compared with live birth. Immediately after a live birth, and in contrast to after abortion, life satisfaction rose sharply. This result indicates that live birth may in many cases initially be the more effective coping strategy after an unintended pregnancy compared to abortion, which could be related to the phenomenon of a negative correlation between high expectations and psychological well-being that Richard A. Easterlin calls "aspiration theory" (Easterlin 2001). Women who are sceptical about motherhood and have low expectations, and yet become pregnant without planning to, thus have a high potential to benefit from an unexpected psychological value of parenthood and to increase their life satisfaction in the short term.

A limitation of the present study is the assessment of induced abortions. Pregnancy termination is a sensitive issue for the persons concerned and is often associated with stigmatisation processes (Major et al. 2009). This is accompanied by a high proportion of non-response, which correlates systematically with various socio-demographic indicators (e. g. age, education, or income) (Jones & Kost 2007). For the United States, for example, Desai et al. (2021) have estimated that less than half of the abortions officially reported to have occurred during the study period were recorded in the National Survey of Family Growth (NSFG) between 2006 and 2015. It is therefore possible that certain population groups are slightly underrepresented in the sample studied. Multiple imputation was used to minimise the effects of this problem, but minor distortions of the analysis results cannot be completely ruled out.

Moreover, the stress and coping perspective could only be tested indirectly in this study, as the pairfam data do not provide any measures between the occurrence of pregnancy and the pregnancy outcome. It is therefore possible that (a lack of) differences in post-event satisfaction are driven by other unobserved processes: for example, an unintended pregnancy might indeed be accompanied by immediate negative consequences, which, however, might be masked by the positive effect of later parenthood. In addition, to maintain the highest possible degree of representativeness, we did not further restrict the treatment sample (abortion) before the PSM. Consequently, this sample also contains a small proportion of women who had pregnancy intentions before their induced abortion. Additional robustness checks, however, showed that the results did not differ substantially when the PSM was only conducted for women without pre-event pregnancy intentions (not reported). Nevertheless, the measurement of pregnancy intentions in the pairfam study is not ideal ("Have you tried to get pregnant since the last interview [...]?"), since it captures concrete pregnancy plans rather than the more general wish for a child. It would be desirable to replicate the results of this study with data that provide (1) measures between the occurrence of pregnancy and pregnancy outcome and (2) a better operationalization of pregnancy intentions.

It should also be noted that the analysis was conducted with data from Germany and the results are not

necessarily generalisable for countries with a different legal, religious, or socio-cultural environment (see also Halman & van Ingen 2015). In the Federal Republic of Germany, for example, induced abortions are only permitted under strict legal parameters and medical practitioners can refuse to perform an induced abortion for ethical reasons. In various EU countries–such as Ireland, Poland, or Malta–the legal requirements for induced abortions are even more restrictive. Such rules may lead to a (re)production of taboos and stigmatisation processes, which can have negative consequences for psychological well-being after induced abortions (Sundstrom 2014; Hatzenbuehler et al. 2013; Major & O'Brien 2005). In contrast, other nations–such as the Netherlands–have comparatively liberal abortion laws (Levels et al. 2012). It can be assumed that the national legal context and social norms have an influence on the consequences of induced abortion, calling for more high-quality research on the consequences of abortion in international contexts.

Another limitation is the measurement of psychological well-being using a single indicator. Although overall life satisfaction correlates strongly with the absence of mental illness (Touburg & Veenhoven 2015), they do not form opposite ends of the same scale: High life satisfaction, for example, does not exclude mental illness (Westerhof & Keyes 2010). Future studies on the consequences of induced abortion should, in view of this, consider several dimensions of psychological well-being.

Finally, due to the limited number of women reporting an induced abortion, it was not possible to further stratify the sample. According to the salutogenesis approach, the extent of the consequences of (negative) life events is closely linked to the individual sense of coherence of the persons concerned: According to this, fewer resources would be associated with a higher likelihood that these events would have a negative impact on psychological well-being (Antonovsky 1988). Future research is thus faced with the question of which resources are of particular importance for maintaining psychological well-being following induced abortion. Moreover, due to low case numbers and relatively long intervals between survey waves, the pairfam data unfortunately do not allow us to draw more precise conclusions about the duration, intensity, and heterogeneity of temporary changes in well-being. It would be desirable in future research to link the findings of this study with further research on short-term effects following unintended pregnancies and abortions, not least to allow us to better examine the extent to which initial changes in well-being can be attributed to abortion or a previous unintended pregnancy. However, this will require more fine-grained data (with more measurement points at shorter intervals) and a more specific survey design.

Overall, the results of the present study do not provide any evidence for the assumption that psychological well-being is permanently worsened by an induced abortion or a preceding unintended pregnancy. Although women who underwent an induced abortion show lower levels of well-being than other women, this is primarily a result of the individual context these individuals face and in which a pregnancy (termination) occurs. Induced abortion per se, in contrast, is only associated with a temporary decline in life satisfaction. The term "post-abortion syndrome" used in some studies therefore does not accurately reflect the state of scientific knowledge.[14] On the basis of the data available, it is instead reasonable to discuss the existence of a "pre-abortion impairment".

Data Replication Information

The replication data of this paper can be found in SowiDataNet | datorium under the following title: "Code/Syntax: Induced Abortion and Life Satisfaction in Germany: The Role of Selection Processes and Short-Term Effects", https://doi.org/10.7802/2455

Supplemental Material: The online version of this article offers supplementary material (https://doi.org/10.1515/zfsoz-2022-0022).

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14 In individual cases, an induced abortion can indeed have traumatic consequences (Robinson et al. 2009). Future large-scale research should look at exactly when this is the case by exploring the heterogeneity of responses to abortion.

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Autoren

Björn Huss
Deutsches Zentrum für Hochschul- und Wissenschaftsforschung (DZHW)
Lange Laube 12
30159 Hannover
E-Mail: huss@dzhw.eu

Björn Huss, geb. 1988 in Bad Oeynhausen, Studium der Politischen Wissenschaft und Soziologie in Hannover und Bielefeld, Promotion in Hannover. Zwischen 2016 und 2021 wissenschaftlicher Mitarbeiter an den Universitäten Bielefeld, Magdeburg und Hannover. Seit 2021 Postdoctoral Researcher am Deutschen Zentrum für Hochschul- und Wissenschaftsforschung; Forschungsschwerpunkte: Familiensoziologie, Zufriedenheitsforschung, empirische Bildungsforschung. Publikationen (Auswahl): Huss, B., 2021: Well-Being Before and After Pregnancy Termination: The Consequences of Abortion and Miscarriage on Satisfaction With Various Domains of Life. Journal of Happiness Studies 22: 2803–2828; Huss, B. & M. Pollmann-Schult, 2020: Relationship Satisfaction Across the Transition to Parenthood: The Impact of Conflict Behavior. Journal of Family Issues 41: 383–411. Huss, B. & M. Pollmann-Schult, 2020: Don't blame the kids: mothers' satisfaction with different life domains after union dissolution. Journal of Family Studies.

Florian Kaiser
Max-Planck-Institut zur Erforschung von Kriminalität, Sicherheit und Recht
Günterstalstraße 73
79100 Freiburg
E-Mail: f.kaiser@csl.mpg.de

Florian Kaiser, geb. 1989 in Nürnberg, Studium der Soziologie in Bremen und Bielefeld, eingereichte Promotion in Bielefeld. Zwischen 2015 und 2021 wissenschaftlicher Mitarbeiter an der Universität Münster. Seit 2021 Senior Researcher am Max-Planck-Institut zur Erforschung von Kriminalität, Sicherheit und Recht in Freiburg. Forschungsschwerpunkte: Quantitative Sozialforschung, Kriminalsoziologie. Publikationen (Auswahl): Kaiser, F., 2022: Does Contact with the Justice System Influence Situational Action Theory's Causes of crime? A study of English and German Juveniles. International Criminal Justice Review; Kaiser, F., Huss, B., & Reinecke, J., 2022: Revisiting the Experiential Effect: How Criminal Offending Affects Juveniles' Perceptions of Detection Risk. Journal of Developmental and Life-Course Criminology 8: 1–28; Kaiser, F., 2021: The Influence of Differential Peer Associations on Delinquency Varies Depending on the Combination of Unstructured Socializing and Personal Morals. Kriminologie – Das Online-Journal | Criminology – The Online Journal 3: 72–99.