

Forced adaptations of sporting behaviours during the Covid-19 pandemic and their effects on subjective well-being

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ABSTRACT


Few studies have shown that exercise withdrawal and forced inactivity lead to negative mood states and increased symptoms of depression. Involuntary inactivity has become reality for millions during the Covid-19 pandemic, as mitigation and containment policies included the closings of sports facilities and leisure infrastructures. Based on representative survey data from Germany (≥ 14 years, $N = 1001$), the paper addresses the changes in sport and exercise activities in the pandemic situation and their association with emotional well-being. Findings show a reduced level of emotional well-being in the German population during the Covid-19 pandemic. In particular, those individuals who stopped or considerably reduced their sport and exercise activities during the pandemic report a significant decline of well-being compared to the time before the pandemic. Individuals, who reduced sport and exercise due to external constraints, reported the largest decline in well-being. In contrast, the small group of individuals who intensified their sporting activities during the pandemic stands out with the most positive well-being levels. Irrespective of sport and exercise adaptations, findings additionally show that females report a steeper decline in well-being during the crisis compared to men.

KEYWORDS Coronavirus; SARS-CoV-2; physical inactivity; exercise; sedentariness; social distancing

1. Introduction

The massive spread of a new Coronavirus (SARS-CoV-2) in the beginning of 2020 has become a major threat to public health and changed behaviours and routines of millions worldwide. The World Health Organisation (WHO 2020) called this outbreak a pandemic and advised national governments to implement protective measures to slow down the spread of the virus. Many governments put rules on ‘social distancing’ in force and decided to lock down non-essential public and private

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infrastructure. In Germany, these containment and mitigation policies included the closing of schools, shops, restaurants, theatres, but also sports clubs, community sports grounds, fitness centres, swimming pools and other leisure facilities (German Federal Government 2020). As individuals immediately react to these restrictions, the pandemic provides unique opportunities for researchers to study the effects of behavioural adaptations in a large-scale natural experiment, standing out with a high external validity (Thomson 2020).

Containment and mitigation policies severely restricted the pursuit of *leisure time sport and exercise* (LTSE) activities. The lockdown of sports facilities in Germany started in March and remained effective until late May 2020. Although exercising outdoors (alone, with one accompanying person or with household members) or doing a workout at home was still allowed, the closing of sports facilities and infrastructures for roughly 2 months during the Covid-19 pandemic resulted in a significant general decline of LTSE activity levels in Germany (Mutz and Gerke 2020). It is likely that many Germans perceived the closing of sports infrastructure as an external constraint that forced them to change or to omit regular LTSE routines. Hence, the beginning of the lockdown is a unique opportunity to study effects of LTSE adaptations, particularly a forced reduction of LTSE, on *subjective well-being* (SWB).

Macro-social factors have a considerable effect on individual SWB. Research has pointed to economic prosperity, political freedom or autonomy values as relevant drivers of SWB in affluent countries (Delhey 2010; Minkov, Welzel and Schachner 2020). However, when macro-social conditions change rapidly, as in economic or political crises, changes in SWB and in collective behaviours (e.g. with regard to health or leisure) are a likely consequence. For instance, the financial and economic crisis in 2008 had a measurable negative effect on life satisfaction and subjective health in the most affected European countries (Drydakis 2015; Clench-Aas and Holte 2017). Similar effects are also likely to occur in a public health crisis, as in the case of the Covid-19 pandemic.

Using the restrictions to contain the spread of Covid-19 as a natural experiment, this paper investigates the relationship between (voluntary and involuntary) LTSE adaptations and well-being. Precisely, the present research addresses three questions: (1) Did the Covid-19 pandemic provoke adaptations of LTSE activities, i.e. that people stopped, reduced or increased their LTSE level? (2) Is the change in LTSE associated with SWB during the pandemic or with alterations of SWB compared to the time before the pandemic? (3) Has a forced withdrawal of LTSE

more negative effects on SWB than a voluntary LTSE reduction? Answers to these questions can generally broaden scholarly understandings of the behaviour adaptations following the Covid-19 pandemic as well as the (mental) health impacts of this crisis. More specifically, however, the novel contribution of this approach lies in its potential to describe how abrupt *changes* in sport and exercise behaviours relate to SWB. Given that many (but not all) people perceive pandemic-related behavioural changes as 'forced' by external constraints and not based on their own deliberate choice, this study aims to provide insights on the differential SWB effects that come along with voluntary and involuntary LTSE adaptations.

2. State of research

In their classic accounts of sociological theorizing, Elias and Dunning (1986) have argued that leisure has an important function in modern societies, generating excitement, stimulation and positive affective states that contrast with monotonous daily (work) routines. More recent accounts claim that leisure activities help to fulfil basic human needs (for relatedness, mastery experiences, relaxation or autonomy), thereby positively influencing SWB (Sirgy, Uysal and Kruger 2017). However, among all leisure activities, sports are among those with the largest positive effect on SWB (Schulz et al. 2018). Research further shows that LTSE is associated with a variety of SWB measures, for instance, happiness, life satisfaction and health-related quality of life (Wiese, Kuykendall and Tay 2018; Yang, Kim and Heo 2019), whereas physical inactivity is related to symptoms of depression, anxiety and poor life satisfaction (Rebar et al. 2015; Pengpid and Peltzer 2019). Moreover, intrinsically motivated LTSE activities are regarded as more beneficial for SWB compared to activities that functionalize sport for external goals, like losing weight or staying healthy (Downward and Dawson 2016).

Given that the Covid-19 mitigation policies prevented people from sticking to their usual LTSE routines, this period likely was a time of involuntary inactivity for many. While the relationship between sport and SWB has been studied extensively, few studies investigated the effects of exercise withdrawal and forced sedentariness. In a series of experiments, Edwards and Loprinzi (2016, 2017) were able to show that even a short period of 1 week, in which physically active individuals are deprived from sport and exercise activities and forced to reduce their daily steps (to <5000) has negative consequences for mental health. Individuals in

the forced inactivity condition reported more negative mood states, reduced life satisfaction and deprived sleep quality. With retaining their usual physical activity levels after 1 week of sedentariness, the negative symptoms vanished and mental health and sleep quality were re-approaching their baseline levels. Moreover, another experiment shows that reducing versus stopping exercise and physical activity yield similar negative effects for mental health (Blough and Loprinzi 2018). Finally, forced inactivity is not only associated with negative mood, but these mood disturbances are in turn related to pro-inflammatory responses (Endrighi, Steptoe and Hamer 2016). However, all of these studies are based on very small samples of mostly students, which limits the generalizability of findings. The Covid-19 pandemic can provide a more solid fundament to this research. At the time of the lockdown and shelter in place rules LTSE withdrawal has become a reality for millions, hence studying how abrupt changes of LTSE behaviours relate to SWB appears as a novel and unique research opportunity.

At the beginning of the Covid-19 pandemic many people reduced sporting activities (Constandt et al. 2020; Mutz and Gerke 2020). Some of them may have reduced LTSE voluntarily by own decisions, while others experienced the closing of sports infrastructure as an external constraint, eliminating opportunities to be physically active and thus 'enforcing' inactivity. With regard to well-being, it may be crucial whether the reduction of LTSE is based on a voluntary decision or on external constraints. Autonomy is regarded as a basic human need (Ryan and Deci 2000) and satisfaction of the need for autonomy is associated with higher levels of well-being (Reis et al. 2000). Cross-national research has also demonstrated that higher levels of autonomy in a society are positively related to SWB (Fischer and Boer 2011). Reductions of LTSE due to external constraints deprive autonomy needs and subjective freedom. Hence, if people withdraw from sports involuntarily, the overall impact on SWB could be more negative than in case of a voluntary reduction of LTSE. However, studies have not yet tested this assumption.

3. Materials and methods

3.1. Study design

The present study is based on a representative, large-scale and cross-sectional survey. A sample of 1001 respondents was questioned using computer-assisted web interviewing (CAWI). To be able to receive timely

and high-quality data, several questions on sport, physical activity and emotional well-being were integrated into *Forsa omninet*, an existing online panel, administered by Forsa, one of the leading organizations of public opinion polling in Germany. One of the strengths of this panel is that participants cannot select themselves for this survey, but are recruited solely offline using Random Digit Dialing procedures. The sample represents the population (≥ 14 years) living in Germany. Sample composition matches with population statistics with regard to age, gender, education and residency. The field period of the survey was scheduled from 27 March to 6 April 2020, hence encompassing the second and third week after the German Federal Government put strict regulations for social distancing and self-quarantine in force and locked down all non-essential public infrastructure.

3.2. Measures

Sport and exercise. Respondents indicated their involvement in LTSE in hours per week. Precisely, they were asked to indicate the amount of LTSE (*‘How much time did you play sport or exercise in your leisure time’*) on an 8-point rating scale with the following answer categories: 1 = ‘did not exercise or play sports’, 2 = ‘less than 1 h’, 3 = ‘about 1 h’, 4 = ‘about 2 h’, 5 = ‘about 3–4 h’, 6 = ‘about 5–6 h’, 7 = ‘about 7–14 h’ and 8 = ‘15 h or more’. To compare the LTSE activities during the Covid-19 pandemic with the usual level of sport from the time before this crisis, the question was asked twice: first, with referral to the time of the pandemic (*‘Please think of the last week, i.e. since the measures to contain the spread of the Coronavirus were in force’*) and second, with referral to a normal week (*‘before the measures of containment were put in place’*). These answers are used to estimate the change in LTSE that was due to the Covid-19-related mitigation policies.

Forced and voluntary reduction of sport and exercise. Respondents were further asked to indicate the main changes regarding their LTSE activities. Using an open-ended question format, the majority of the respondents (731 from 1001) gave further details on activities, which they omitted, substituted or started new. The large majority of ‘reducers’ (82%) filled out this question and many stated a short reason for the adaptations made. Based on these answers, respondents who reduced LTSE and explicitly mentioned the closing of sports infrastructure (sports clubs, fitness centres, public swimming pools, etc.) as the main reason in the open-ended question are distinguished from those ‘reducers’ who did not

mention external constraints as a reason or did not answered the open-ended question. Although this is a rather simple measure, it still allows to compare a group of 'involuntary reducers' of LTSE from those whose decision to reduce LTSE was more voluntary, i.e. where external constraints were not in the foreground.

Affect balance. For assessing SWB, the paper takes positive and negative affective states into account. Affects and emotions make up a key component of SWB. They are susceptible to short-term changes (Schimmack et al. 2002), but also highly correlated with satisfaction of life ratings (Mutz and Kämpfer 2013). Eight items are used, adapted from the European Social Survey Module on 'Personal and Social Well-being' (Huppert et al. 2005). Respondents indicated the frequency with which they experienced specific positive and negative affective states during the last week on a 4-point rating scale ranging from 1 = 'not at all', 2 = 'on a few days', 3 = 'more than half of all days' up to 4 = 'almost every day'. Four of these items measure positive affective states ('were happy', 'enjoyed life', 'felt vital and energetic', 'felt well-balanced'; Cronbach's $\alpha = .83$) and four items capture negative affective states ('felt sad', 'felt lonely', 'felt tired, could not get going', 'felt anxious and worried'; Cronbach's $\alpha = .70$). Based on these items, the mean scores of positive affect and negative affect were calculated. Thereafter, the 'affect balance' was calculated (Bradburn 1969), i.e. the difference between positive and negative affective states. The final measure used here indicates the relative dominance of positive affect over negative affect and can take on values ranging from +4 to -4.

Changes of affect balance. Positive and negative affective states were further assessed with questions that address the experience of changes in relation to the period before the Covid-19 pandemic. For each of the 8 affective states (happiness, joy, energy, balance, sadness, loneliness, lack of energy, anxiety), respondents evaluated inasmuch the frequency of these states has changed 'much' or 'somewhat' since the beginning of the pandemic (from -2 = 'much less often', -1 = 'somewhat less often' up to 1 = 'somewhat more often' and 2 = 'much more often'). The middle category of the 5-point scale allowed the respondents to report no changes in the frequency of that state (coded with 0). The mean scores regarding changes of positive affective states (Cronbach's $\alpha = .92$) and negative affective states (Cronbach's $\alpha = .75$) were calculated, and once more, the difference between positive and negative affect is used as a general measure of changes in emotional well-being at the beginning of the pandemic.

3.3. Analytical approach

In a first step, the self-reported change of LTSE activities during the Covid-19 pandemic is analysed. Therefore, the LTSE level in the week before the survey (i.e. during the lockdown) is compared to the level of 'a normal week' (i.e. before the pandemic). Based on the change scores, four groups are identified: (1) inactive individuals (i.e. those who were not engaged in LTSE neither before nor during the Covid-19 pandemic), (2) those who reduced LTSE by more than 1 h/week, (3) maintained LTSE (i.e. who changed LTSE only within the small margin of ± 1 h/week) and (4) increased their LTSE activity by more than 1 h/week during the Covid-19 pandemic. As explained above, the group of 'reducers' was further differentiated according to the degree of voluntariness on which the decision to reduce LTSE was based on.

After identifying these groups, linear regression analyses were run to test for group differences with regard to emotional well-being (i.e. affect balance and the change in affect balance since the start of the lockdown). In the regression models, age (in years), education (based on school leaving certificates), gender and residency in East Germany or West Germany serve as additional predictors, because a majority of studies shows that these variables predict sport participation in Germany (e.g. Nobis and El-Khayed 2019; Haut 2020). Sport participation is generally higher among younger and higher educated social groups as well as among males and West Germans. The regression models use affect balance and the pandemic-related change in affect balance as outcome variables. However, additional regression analyses with single positive and negative emotions as outcomes are briefly summarized in the results section and fully documented in an online appendix accompanying this paper.

4. Results

4.1. Pandemic-related changes in LTSE activities

The largest fraction of the German population (36%) did not engage in LTSE, neither before nor during the lockdown, and is thus considered 'inactive'. A share of 31% scaled down their LTSE activities (23% completely stopped and 8% reduced by at least 1 h/week). A proportion of 27% maintained their usual level of LTSE activity during the pandemic and another 6% reported increased LTSE activities, making up a small group of 'intensifiers' (Table 1).

Table 1. Lockdown-related changes in leisure time sport and exercise activities and affective well-being in the German population

	Descriptive results					
	<i>N</i>	%	<i>PA</i>	<i>NA</i>	<i>AB</i>	<i>CH</i>
Involuntary reducers	125	13	2.42	1.99	0.43	-1.09
Voluntarily reducers	182	18	2.53	1.88	0.65	-0.82
Inactive individuals	358	36	2.51	1.86	0.64	-0.61
Active maintainers	267	27	2.66	1.84	0.82	-0.53
Active intensifiers	57	6	2.85	1.83	1.02	-0.11
Full sample	1,001	100	2.56	1.88	0.68	-0.65

Note: *PA* = Positive Affect Score, *NA* = Negative Affect Score, *AB* = Affect Balance (*PA* minus *NA*), *CH* = Self-reported change in Affect Balance compared to the period before lockdown.

Moreover, within the group who reduced or stopped LTSE during the lockdown, some explicitly mentioned the closing of sports infrastructure as the main reason, suggesting that their LTSE reduction was made involuntarily (13%). The rest within the group of ‘reducers’ did not mention external constraints, hence their decision to reduce LTSE was rather voluntary (18%). Both of these groups of reducers are treated separately in the analyses to test if SWB effects are more negative when reductions are based on constraints instead of own choice.

4.2. Relationship of LTSE activity with well-being

Descriptive results show that ‘forced reducers’ of LTSE stand out with the lowest level of positive affect and the highest level of negative affect at the beginning of the lockdown (Table 1). Consequently, the affective balance in this group is the most negative among all five groups analysed. In contrast, ‘intensifiers’ of LTSE report the highest well-being level.

In a first regression analysis, the affect balance score was regressed on pandemic-related LTSE adaptations as well as gender, age, education and residency (Table 2, left column). Regression results indicate that respondents who involuntarily reduced LTSE activities report a more negative affect balance compared to those who maintained LTSE levels ($b = -.470$, $p = .001$). Moreover, the group who reduced LTSE voluntarily ($b = -.234$, $p = .068$) as well as the group who remained inactive ($b = -.183$, $p = .096$) both report a more negative affect balance compared to individuals who maintained LTSE. Both differences are marginally significant with $p < .10$. With regard to socio-demographic controls, results further show that females report a lower level of affective well-being during the lockdown than males ($b = -.316$, $p < .001$). Finally, a higher education is associated with a more positive affect balance ($b = .113$, $p = .041$).

Table 2. Associations between changes in leisure time sport and exercise activities and affective well-being in the German population.

	Affect balance at beginning of the lockdown			Change of affect balance compared to the time before the lockdown		
	<i>b</i>	<i>SE</i>	<i>p</i>	<i>b</i>	<i>SE</i>	<i>p</i>
Sport and Exercise Activity (Ref. Active Maintainers)						
Involuntarily reducers	−.470	.144	.001	−.599	.143	<.001
Voluntarily reducers	−.234	.128	.068	−.361	.127	.005
Inactive individuals	−.183	.110	.096	−.110	.109	.310
Active intensifiers	.239	.200	.232	.463	.197	.019
Socio-demographics						
Gender (Ref. male)	−.316	.085	<.001	−.222	.084	.008
Age	.005	.003	.066	−.003	.003	.295
Educational level	.113	.055	.041	−.023	.055	.675
East German Residency (Ref. West Germany)	−.012	.126	.926	.062	.125	.618
Model Fit (<i>R</i>²)		.040			.047	

4.3. Relationship of LTSE activity with changes of well-being

Germans also reported considerable alterations of affective well-being at the beginning of the pandemic compared to the time before. Overall, 15% report a steep decline and 27% a moderate decline in their SWB level. A relative majority of 44% reported no changes. A proportion of 11% expressed that their SWB moderately improved and 2% reported a strongly improved SWB level (Figure 1). Hence, a substantial share of people suffered from the lockdown, whereas only a small proportion felt more comfortable in that period.

Results of the regression analysis indicate that alterations in affect balance relate to adaptations of LTSE activities (Table 2, right column). Findings show that respondents who reduced LTSE report a significantly larger decline in affective well-being compared to inactive individuals. The decline is significant in both groups of LTSE ‘reducers’, however more pronounced among forced reducers ($b = -0.599$, $p < .001$) than among voluntary reducers ($b = -0.361$, $p = .005$). In contrast, a strong positive effect is found for those who intensified LTSE ($b = 0.463$, $p = .019$) during the pandemic. ‘Intensifiers’ were able to retain a higher level of affective well-being during the pandemic compared with all of the other groups, whereas ‘forced reducers’ stand out with the most negative change in well-being (see also Table 1). With regard to socio-demographic variables, it is shown that females report a more negative shift in their affect balance compared to males ($b = -0.204$, $p = .029$), buttressing the notion that the lockdown had more negative consequences for females than for males.

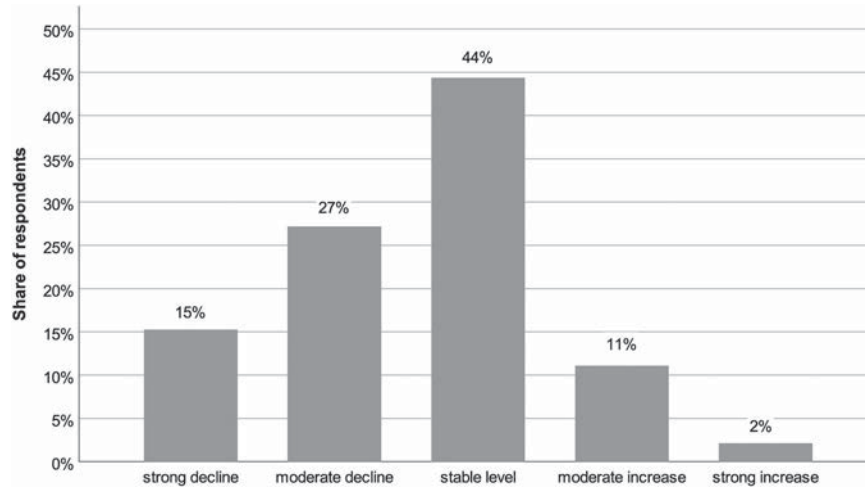


Figure 1. Change of hedonic well-being levels in the German population at the beginning of the Covid-19 related lockdown.

Further analyses (see Online Appendix) on changes of single affective states reveal that respondents who involuntarily reduced LTSE reported a stronger decline in happiness, enjoyment of life, vitality and mental balance as well as a stronger increase in sadness, fatigue and anxiety compared to individuals who maintained their LTSE level. Moreover, those who intensified LTSE reported an increase in vitality and mental balance during the lockdown.

5. Discussion

Whereas numerous previous studies have shown that LTSE is beneficial for a variety of quality of life and mental health outcomes (e.g. Wiese et al. 2018; Mutz, Reimers and Demetriou 2020), only few accounts addressed the role of LTSE changes and particularly forced LTSE reductions for health and well-being. A handful of experiments with small and non-representative samples indicate that a forced withdrawal of sport and exercise for a short period is detrimental for mental health (Edwards and Loprinzi 2016; Endrighi et al. 2016; Blough and Loprinzi 2018). The present study adds to this research as it indicates that LTSE adaptations influence SWB levels in large population groups. Precisely, key findings of this study indicate that a reduction of LTSE was associated with a decline of well-being. Findings further show that the negative effect on well-being is roughly twice as high, when the reduction of LTSE results from external constraints rather than voluntary decisions. This finding aligns well with research on autonomy in post-industrial societies, which found that happiness increasingly relies on freedom of choice (Minkov et al. 2020). Hence, if individuals perceive their valued lifestyle to be curtailed by external conditions, a negative shift of SWB is a likely consequence.

Periods of (self-)quarantine usually trigger negative mood states, including frustration, distress, anxiety and boredom (Brooks et al. 2020). The Covid-19 related lockdown has obviously led to similar effects in the German population given the general decline in well-being. Results indicate that remaining active and engaging in LTSE has a buffering effect with regard to these challenges of the pandemic. Stress buffering effects of LTSE have often been described in the literature (e.g. Klaperski 2018) and these functions can be helpful in threatening and insecure situations like pandemics. Hence, governments and public health authorities should encourage people to keep up LTSE activities during a pandemic, as far as these activities can be pursued in line with

the necessary spatial distancing regulations. However, given that individualized and home-based forms of LTSE are harder to pursue for many, as they require sporting competence as well as space and equipment, they may bolster existing inequalities or create novel forms of inequality with regard to leisure, sport and well-being.

Concerning social inequality, results of the present study also show that the pandemic influenced gender inequalities. Females in Germany reported lower levels of SWB and a steeper decline of SWB compared to males. Most studies do not find systematic happiness differences between genders (Batz and Tay 2018), so that findings presented here are likely to mirror the peculiarities of the pandemic, for instance, increased strain for women resulting from school closings or higher risks of losing their jobs (Oreffice and Quintana-Domeque 2020).

The present study intended to gather data from the beginning of the lockdown, i.e. relating to the first reactions and adaptations to this new situation in the German population. It informs about initial reactions but not on long-term effects regarding LTSE adaptations or alterations in mental health. It is likely that people who omitted LTSE in the beginning of the crisis gradually try to develop new, home-based and individual forms of sport and exercise. Hence, LTSE data from later stages of the pandemic would be helpful to complement the picture. Moreover, it would be worthwhile to include a wider range of social inequality indicators in future studies that cover, for instance, the employment situation, financial insecurity or childcare obligations. These variables can help to better explain the wide range of LTSE adaptations and how they relate to existing inequalities. Another limitation is the collection of retrospective data on LTSE activities in a 'normal week' before the pandemic. The validity of self-reports on physical activity are debated (van Poppel et al. 2010), however, structured LTSE is usually easier to remember in surveys than unstructured physical activities. Nevertheless, the retrospective question may provoke bias resulting from memory lapse or social desirability. Finally, the findings hold true for the German context, but may differ in other countries depending on the scope and strictness of containment policies put in force. Compared to Germany, shelter in place confinements were longer and stricter in countries like Spain and Italy, for instance, so that different results may emerge in these countries.

Keeping collective well-being levels up during a pandemic is crucial. Hope and optimism are key for coping and persevering, whereas frustration and dissatisfaction can erode commitment to public health measures and containment policies. Taken together, this paper has shown that

abrupt alterations of sport and exercise behaviours during the Covid-19 related lockdown were associated with well-being in Germany. The forced reduction of LTSE was associated with a particularly strong decline of well-being, whereas individuals who intensified their activities were almost able to keep up their pre-pandemic well-being levels. Helping people to stay active should thus be considered an integral part of pandemic-related public health measures.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Notes on contributor

Michael Mutz is Professor for Sociology of Sport at Justus-Liebig-University Giessen, Germany. His research focus on social inequalities of sports participation (e.g., gender, social class, ethnicity), sport clubs' capacity to foster social integration and personal development as well as on health and well-being effects that come along with sports activities and active lifestyles. His research has been published in leading social science and sports science journals.

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