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IAB-DISCUSSION PAPER

Articles on labour market issues

15|2025 The role of physical leisure activities in refugees' structural integration

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ISSN 2195-2663



The role of physical leisure activities in refugees' structural integration

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Abstract

This study investigates the role of engaging in physical leisure activities in facilitating refugees' structural integration through enhancing their social capital, destination-language proficiency, and health. The physical fitness gained from such activities can also be crucial for securing physically demanding jobs. As employment significantly influences refugees' social integration, this research specifically examines the impact of the intensity and regularity of sports engagement on employment outcomes among refugees from the 2015/16 influx in Germany. Utilizing longitudinal data from the IAB-BAMF-SOEP Survey of Refugees, findings reveal that regular and more intensive engagement in physical leisure activities increases refugees' chances of securing gainful employment and obtaining physically demanding jobs in the subsequent year. However, sports involvement does not correlate with higher occupational prestige, potentially locking them into lower-status jobs. Additionally, time spent in other types of leisure activities shows a slightly negative association with labor market outcomes, underscoring the unique benefits of sports. This points to the dual-edged nature of sports as an integration tool – beneficial in fostering initial labor market entry but possibly limiting in terms of career advancement.

Zusammenfassung Diese Studie untersucht die Rolle von Sport als Freizeitaktivität für die strukturelle Integration von Geflüchteten durch die Erhöhung ihres Sozialkapitals, und der Verbesserung ihrer Sprachkenntnisse der Aufnahmegesellschaft und ihrer Gesundheit. Die durch solche Aktivitäten erworbene körperliche Fitness kann auch für das Arbeiten in körperlich anstrengenden Jobs entscheidend sein. Da Arbeitsmarktbeteiligung die soziale Integration von Geflüchteten erheblich beeinflusst, untersucht diese Forschung speziell die Auswirkungen der Intensität und Regelmäßigkeit sportlicher Betätigung auf den Arbeitsmarkterfolg von Geflüchteten aus der Flüchtlingswelle von 2015/16 nach Deutschland. Anhand von Längsschnittdaten der IAB-BAMF-SOEP-Befragung von Geflüchteten zeigen die Ergebnisse, dass eine regelmäßige und intensivere sportliche Betätigung die Chancen von Geflüchteten erhöht, im Folgejahr einer Erwerbstätigkeit nachzugehen und in körperlich anstrengenden Jobs zu arbeiten. Sportliche Betätigung korreliert jedoch nicht mit höherem Berufsprestige, was Geflüchtete möglicherweise an Jobs mit niedrigerem Status bindet. Darüber hinaus zeigt sich für Zeitnutzung in anderen (nicht sportlichen) Freizeitaktivitäten eine leicht negative Assoziation mit Arbeitsmarkterfolg. Dies unterstreicht die einzigartigen Vorteile von Sport für Geflüchtete. Insgesamt weisen die Ergebnisse einerseits darauf hin, dass Sport für Geflüchtete zwar hilfreich beim Einstieg in den deutschen Arbeitsmarkt sein kann, andererseits aber ihren beruflichen Aufstieg einschränken kann.

JEL classification J15, J24, J61, I12, Z13, Z20,

Keywords

sports, time use, labor market integration

Acknowledgements We would like to thank Irena Kogan for providing helpful advice on the earlier versions of this paper; and all those who commented on earlier presentations of this work at the IAB INTER Lunch Seminar (January 2024) and the CDSS Workshop Sociology (March 2023). Kuhle mann gratefully acknowledges support of the University of Mannheim’s Graduate School of Economic and Social Sciences, and the European Research Council (ERC) under the European Union’s Horizon 2020 research and innovation program [grant agreement number 864683]. Kosyakova gratefully acknowledges support of the Deutsche Forschungsgemeinschaft (DFG - German Research Foundation) within the project “Longitudinal Study of Ukrainian Refugees (SUARE). Refugee migration and Labor Market Integration” (project number – 519020285).

1 Introduction

The integration of immigrants remains a pressing issue in German society and politics, particularly following the substantial influx of refugees in 2015/16, predominantly from Syria, Afghanistan, Iraq, Eritrea, and Iran (OECD/EU, 2018). Refugees encounter notably greater challenges in labor market integration compared to other migrant groups due to the circumstances of their flight – war, violence, and persecution. Their typically unprepared migration results in limited destination-language skills, insufficient social networks, and a lack of crucial information about the local job market upon arrival. Furthermore, institutional hurdles such as employment bans, lengthy asylum procedures, and restrictions on residency choice significantly hamper their labor market opportunities (Brell et al., 2020; Kosyakova & Kogan, 2022). This complex backdrop underscores the urgent need to develop effective integration strategies.

Sports and physical leisure activities may provide a vital informal arena where immigrants can engage with the host society’s culture, language, and people (Spaaij, 2012; Spaaij et al., 2019), thereby facilitating both cultural and social integration (Agergaard, 2011; Makarova & Herzog, 2014). Moreover, these activities offer pathways for structural integration in the labor market. Engagement in physical leisure activities can enhance social capital important for job searching (Block & Gibbs, 2017; Spaaij, 2012), improve language skills (Agergaard, 2011), and boost both physical and mental health (Block & Gibbs, 2017; Hartley et al., 2017), all of which contribute to employability. Additionally, physical fitness gained through such activities can be advantageous for physically demanding jobs, which are often more accessible to immigrants due to lower formal entry requirements (Lamba, 2003).

While previous research has highlighted the importance of refugees' participation in sports clubs for their social and cultural integration (Block & Gibbs, 2017; Stura, 2019), it has often overlooked the significance of the time invested in sport activities. The amount of time allocated to, representing the intensity of engagement in physical leisure, might play a pivotal role in integration processes, perhaps more so than mere participation. Furthermore, the impact of sports on refugees' labor market integration has been largely underexplored, despite employment being a critical factor for successful integration (Cheung & Phillimore, 2014).

This study therefore asks: How do the engagement and the intensity of engagement in physical leisure activities impact the labor market integration of refugees? We focus on refugees from the 2015/16 influx in the context of Germany, predominantly young men under 35 (Brücker et al., 2020). Originating from countries with significant discrepancies between the structure and quality of educational and training systems compared to Germany, these individuals face challenges in transferring their educational credentials and employment experience to the German job market. Given their demographic profile and the tendency for young, immigrant men from majority-Muslim cultures to engage in physical activities more than their female counterparts (van Tubergen & Molteni, 2024), this group is likely to leverage physical leisure pursuits as a strategy to enhance employability. To answer these questions, we utilize longitudinal data from the IAB-BAMF-SOEP survey of refugees, representative for refugees who arrived in Germany between 2013 and 2019.

2 Theoretical framework and previous research

2.1 Physical leisure and labor market outcomes

A substantial body of research, particularly in the U.S., has demonstrated the positive impact of sports on educational and employment outcomes. Studies indicate that high school students engaged in athletics generally achieve better educational outcomes (Barron et al., 2000; Gorry, 2016), have higher probabilities of employment as adults (Gorry, 2016), and earn higher wages later in life (Barron et al., 2000; Gorry, 2016). In Germany, research suggests that former athletes earn higher incomes in their post-athletic careers compared to non-athletes (Dewenter & Giessing, 2015), and childhood engagement in sports is linked with improved educational outcomes (Pfeifer & Cornelißen, 2010). Similarly, a study in Sweden has found a correlation between physical fitness at age 18 and higher wages ten to twenty years later (Rooth, 2011). Audit studies, sending fictitious applications to job openings, have found no differences in call-back rates for fictitious applicants in the U.S. who listed collegiate sports involvement compared to those who did not (Paul et al., 2023). Rooth (2011) noted that fictitious Swedish job applicants signaling current engagement in physical leisure activities received more call-backs than those who did not. Further research in Canada and Europe has shown that frequent or intense engagement in sports correlates with higher earnings (Lechner, 2009; Lechner & Downward, 2017; Lechner & Sari, 2015) and reduced unemployment rates (Lechner & Downward, 2017).

Theoretically, the literature identifies four primary channels through which sports engagement can influence employment outcomes:

1. *Health benefits*: Physical activities enhance both physical and mental health, making individuals more productive, which is often reflected in higher income and employment likelihood (Lechner, 2009).
2. *Development of traits and soft skills*: Activities like sports foster traits like motivation, discipline, and stress tolerance, as well as soft skills such as teamwork and leadership, all beneficial for employment (Dewenter & Giessing, 2015; Pfeifer & Cornelißen, 2010). While these traits may inherently increase sports participation (Rooth, 2011), an engagement in sports is argued to further enhance them (Pfeifer & Cornelißen, 2010).
3. *Employment signaling*: Engagement in sports may serve as a signal to potential employers of desirable traits like productivity and discipline, aiding in job acquisition (Lechner, 2009).
4. *Social capital*: By facilitating interaction with others, sports increase social skills and capital, which are argued to benefit employment outcomes (Dewenter & Giessing, 2015; Lechner, 2009).

Beyond these channels through which physical activities impact labor market outcomes, extensive research in psychology, medicine, and health studies underscores the benefits of sports for cognitive development. Reviews of this research indicate that children's regular engagement in sports significantly supports their cognitive growth (Castelli et al., 2014) and that a higher intensity of participation in sports enhances these benefits (Carson et al., 2016). Experiments provide compelling evidence that both coordinated sports activities and general aerobic exercise have a direct positive influence on children's cognitive performance (Alesi et al., 2016; Chang et al., 2013; Davis et al., 2011). Such activities increase brain activity in areas crucial for processing complex cognitive tasks not only in children (Davis et al., 2011) but also in older adults (Colcombe et al., 2004; Prakash et al., 2015). For older adults, regular physical activity is associated with maintained or enhanced cognitive functioning (Paterson & Warburton, 2010) and a reduced rate of cognitive decline (Prakash et al., 2015). Thus, the underlying mechanisms suggest that engagement in sports and physical activities not only supports cognitive functions but, through enhanced brain health and productivity, likely exerts a positive impact on labor market outcomes across an individual's lifespan.

2.2 Refugees' labor market outcomes as integration

Understanding the impact of physical leisure activities on refugees' labor market outcomes is crucial, given that employment is described in Ager and Strang's (2008) seminal conceptual framework of integration as a key marker of integration. Refugees' ability to secure jobs is crucial given that refugees encounter unique barriers in the labor market, including limited language

proficiency, underdeveloped social networks, and a lack of crucial local job market knowledge upon arrival. These challenges are compounded by institutional hurdles such as employment bans, lengthy asylum procedures and restrictions on residency, which critically influence their employment opportunities (Brell et al., 2020; Kosyakova & Kogan, 2022).

Ager and Strang's (2008) framework outlines several channels through which labor market integration occurs. Through interaction with locals and other immigrants, refugees can expand their social connections and gain social capital. This social capital is instrumental for refugees' integration, as many find jobs through their networks (Cheung & Phillimore, 2014; Martén et al., 2019). However, while bridging social capital – connections with the majority population (Putnam, 2000) – often leads to better job opportunities (Brell et al., 2020; Damm, 2014) and higher earnings (Damm, 2014), bonding social capital – ties within immigrant communities (Putnam, 2000) – may confine refugees to lower-status jobs, limiting their access to more lucrative positions (Kalter & Kogan, 2014; Portes & Rumbaut, 2001).

For refugees, social networks are especially important as they play a key role in imparting cultural knowledge and facilitating the acquisition of the host country's language. Ager and Strang (2008) highlight these as key facilitators of employment. Refugees typically have lower proficiency in the receiving country's language compared to other immigrant groups, which significantly impacts their labor market integration (Brell et al., 2020; Kosyakova et al., 2022) as higher language proficiency is associated with better occupational status and increased labor market participation (Auer, 2018; De Vroome & Van Tubergen, 2010; Dumont et al., 2016; Knoll, 2020). Thus, social networks play a crucial role in helping refugees navigate the new cultural and linguistic landscape, directly influencing their job opportunities and broader integration.

The integration framework also emphasizes health as a fundamental marker of integration, similar to employment. Ager and Strang (2008) suggest that these markers not only signify integration but also actively promote further integration, thereby serving as both indicators and facilitators. In this context, good health is essential for achieving employment since it allows individuals to better focus on labor market participation and other integration-related activities (Brell et al., 2020). Refugees often face greater challenges in this area, reporting lower physical and mental health compared to other immigrant groups (Brell et al., 2020) and the native population (Ruiz & Vargas-Silva, 2018). Research indicates that poor health, particularly mental health, is strongly linked to refugees' decreased employment chances and lower occupational status (De Vroome & Van Tubergen, 2010; Ruiz & Vargas-Silva, 2018).

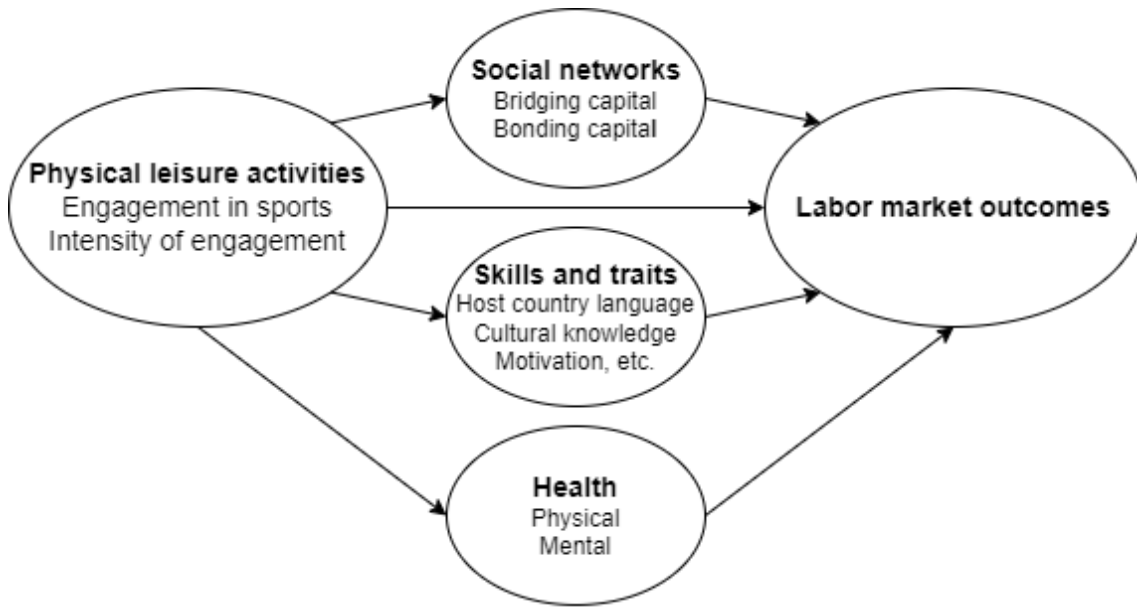
In sum, successful employment outcomes for refugees, as a key aspect of integration, are supported not only by robust social connections and social capital, as well as by deep cultural and language knowledge of the host society, but also by maintaining good physical and mental health.

2.3 Physical leisure and refugees' labor market outcomes

Despite extensive research on the influence of physical leisure activities on labor market outcomes among the general population, the specific impact on refugees remains less explored. From a theoretical standpoint, refugees' labor market integration is facilitated by their social capital, their host country language skills and cultural knowledge, as well as their physical and

mental health, all of which fit into the general framework that explains improved labor market outcomes through engagement in physical leisure activities, as illustrated in Figure 1. This framework posits that for the majority population, engagement in physical leisure activities boosts social capital, enhances skills and traits that increase productivity, and improves physical and mental health, which in turn enhances overall productivity and signals these capabilities to potential employers. The beneficial direct effects of physical leisure activities on cognitive functioning and productivity are universally applicable, irrespective of migrant or refugee status.

Figure 1 How physical leisure activities affect refugees’ labor market outcomes



Source: Own illustration.

For refugees, the involvement in physical leisure activities presents a unique opportunity to forge social connections, not only with others from their ethnic or immigrant communities but also with members of the host society in a relaxed, informal setting. Engaging in sports with other immigrants and co-ethnics can foster social bonds (Ager & Strang, 2008), while interactions with the host society members during these activities offer valuable opportunities for cultural exchange and language practice (Agergaard, 2011; Burrmann et al., 2017; Spaaij, 2012). Particularly sports clubs may provide structured environments that support job search efforts (Burrmann et al. 2017) and foster both social bonding (Spaaij, 2012) and bridging capital (Block & Gibbs, 2017).

Beyond structured club activities, refugees also utilize sports to maintain physical health, as noted in qualitative research (Block & Gibbs, 2017; Hartley et al., 2017). Physical activities can serve as a means to structure their day and relieve stress (Hartley et al., 2017), contributing significantly to mental health (Block & Gibbs, 2017; Hartley et al., 2017). However, not just the engagement, but the intensity of involvement in physical leisure activities is crucial. More time spent in these activities likely leads to greater exposure to social networks and the host country culture, thereby enhancing bridging and bonding social capital, language skills, and overall

contributing to physical and mental health. These benefits should collectively improve refugees' labor market outcomes.

Becker's (1965) economic model of time allocation suggests that individuals cannot constantly engage in productive activities and instead need to allocate time to activities that increase utility beyond economic gain. Hence, allocating more time to physical leisure activities can be a means of using leisure time somewhat productively and would replace an allocation of leisure time to detrimental leisure activities (Pfeifer & Cornelißen, 2010). In the case of refugees, who face significant restrictions in their activities, especially during the initial months after arrival¹, allocating more time to physical leisure activities can effectively substitute for detrimental activities, such as substance use or inactivity – behaviors that are reportedly frequent among refugees (Brekke, 2010; Dupont et al., 2005; Kuhlemann, 2022). This substitution not only helps in avoiding negative behaviors but enhances overall well-being, thereby supporting labor market integration.

Thus, we hypothesize that refugees engaging in physical leisure activities (*H1*) and spending more time in such activities (*H2*) will have positive effects on their labor market outcomes. Both relationships should be direct and indirect via the facilitators of increased interactions with natives and other established immigrants, improved German language skills, and better physical and mental health.

2.4 Physically labor-intensive jobs

Despite the generally low labor force participation among refugees from the 2015/16 influx in many European host countries (Kosyakova & Kogan, 2022), their employment rates are gradually increasing (Bevelander & Luik, 2020; Brell et al., 2020; Kosyakova et al., 2023). Refugees' access to employment is often hindered by language barriers and a lack of knowledge about job finding and qualification requirements (Cheung & Phillimore, 2014). Furthermore, due to the low transferability of educational credentials from their home countries, focusing on physical leisure activities might be a strategic approach for refugees to secure jobs, particularly in physically demanding fields that require less formal education but more physical fitness. Hence, engaging in physical leisure activities (*H3*) and spending more time in such activities (*H4*) will likely increase the probability of refugees securing physically labor-intensive jobs.

3 Data and methods

3.1 Data and sample

This study draws on data from the IAB-BAMF-SOEP Survey of Refugees (Brücker et al., 2017; IAB-BAMF-SOEP, 2023),² which covers extensive longitudinal data collected over the period from 2016 to 2021. It targets asylum-seekers who arrived in Germany from 2013 to 2019, regardless of their

¹ For an overview of refugees' access to the German labor market and language courses, see Kosyakova and Brenzel (2020); for an overview of refugees' residence obligations, see Kuhlemann (2022).

² The survey is conducted jointly by the Institute for Employment Research (IAB), the research data center of the German Federal Office for Migration and Refugees (BAMF), and the German Socio-Economic Panel (SOEP) at the German Institute for Economic Research (DIW).

asylum status. The survey is conducted annually, incorporating refreshment samples to mitigate panel attrition and to encompass more recent arrivals, thus maintaining a representative dataset over time (Kroh et al., 2017; Steinhauer et al., 2022). The original dataset encompasses 10,802 individuals with indication of direct refugee background, yielding a total of 28,141 person-year observations surveyed at least once during the 2016-2021 survey period. Our analytical sample is confined to respondents with immediate refugee background who are also classified as having a direct migration background (6 respondents dropped) who arrived in Germany in 2013 or after (830 respondents dropped) and who were aged between 18–45 years at the time of their first interview (1,405 respondents were dropped). This age restriction ensures that the respondents are of working age and physically capable of engaging in sports activities. Given the youthful demographic of the 2015/16 influx, this age limit covers approximately 84% of the refugees in our dataset.

Furthermore, our sample is confined to panel respondents to leverage prior wave data (t-1) for constructing certain measurements. For the main predictor variables, in cases of non-participation in consecutive waves, we impute t-1 information with that of t-2, or t-3, or t-4, to preserve a larger sample size. This restriction resulted in an exclusion of 1,075 respondents. Due to the biennial nature of the mental and physical health information in the data, missing data from these waves are filled in from the previous waves. Listwise deletion is utilized for cases with missing values on any of the included variables except level of education and traumatic experience during flight (3,317 respondents dropped). Lastly, the respondents from very small country of origin groups were excluded (Western countries and Latin America; 13 respondents dropped).

The resulting analytical sample comprises 9,647 observations (person-years) from 4,156 refugee respondents collected over six years.

3.2 Dependent variables, facilitators, and method

The outcome of structural integration is assessed at time point t_1 , focusing on three key dimensions: employment status, occupational status, and the physical requirements of the occupation. Paid employment is self-reported and coded as employed respondents (full- or part-time employed, in paid internships or apprenticeships, or marginally employed) contrasting with those without paid work (unemployed, currently available and seeking work, or inactive).

Respondents who report being employed but do not have any labor income, are coded as not employed. In t_1 , about 35% of the analyzed refugee-observations are employed (see Table A1 in the Appendix; also for a comprehensive overview of all the measures utilized in the analyses).

Occupational status is quantified using the International Socio-Economic Index of Occupational Status (ISEI) by Ganzeboom et al. (1992), which provides a continuous measure of socio-economic status based on occupation. The ISEI scores of refugees in the sample tend to be skewed towards the lower end, indicating that refugees frequently occupy lower-prestige jobs.

The type of occupation in terms of physical demands is evaluated using the Overall Physical Exposure Index (OPI), which classifies jobs as either “1 – high physical exposure” or “0 – low or medium physical exposure” according to Job Exposure Matrices (JEM) developed for the ISCO08 scale (Kroll, 2011, 2015). Jobs with high physical exposure are jobs with a score of at least 9 (out

of max. 10) points on the OPI, such as armed forces and firefighters, plasterers, laborers, and plant operators. More than 25% of the analytical sample of employed refugees work in jobs with high physical exposure, i.e., in physically labor-intensive jobs.

Additionally, three key facilitators—health, language ability, and social capital—are measured at t_1 . Health is measured through continuous indices on the Summary Scale Physical (PCS) and Summary Scale Mental (MCS) (SOEP Group, 2020). Both indices reveal that refugees maintain relatively high health levels (mean physical health score=54; mean mental health score=50). Compared to the reference sample from the SOEP 2004 population (SOEP Group, 2020), with mean indices of 50 for both physical and mental health, refugees exhibit slightly better physical health while their mental health aligns with the average.

German language skills are measured using a continuous additive index based on self-reported writing, reading, and speaking abilities, where higher scores (max. 12) indicate greater German proficiency (Kosyakova et al., 2022). Refugees' mean proficiency of 7 in the sample indicates a medium level.

Social capital is measured by two ordinal variables that reflect the frequency of contact with native Germans and persons from the same origin as the respondents, ranging from “0 – never” to “5 – daily.” Refugees in our sample are actively engaged with the native German population, with nearly a third interacting with them at least daily, while fewer than 20% report no such interactions. Conversely, daily engagement with same-origin individuals is comparatively lower at around 16%.

Our analytical approaches vary by the examined outcome. For employment status, we apply pooled logit regression models to the entire analytical sample. For occupational status and type of occupation—restricted to those currently employed—we estimate pooled OLS and logit regressions, respectively. These models also include the lag of the respective outcome variable, rendering them lagged-dependent variable models (Keele & Kelly, 2006). Additionally, we estimate models assessing the effects of sports on the facilitators, where we employ pooled OLS regressions for the dependent variables of mental and physical health, German language proficiency, and the frequency of contact to majority native Germans and same-origin individuals. All models are estimated with robust standard errors clustered at the individual level.

3.3 Measures of physical leisure activities

The focal predictors are the engagement and the intensity of engagement in physical leisure activities. Engagement in sports is determined by responses to the survey question “Please indicate how often you take part in each activity [activity: taking part in sports]: daily, at least once per week, at least once per month, seldom or never?”. This response is coded as “1 – engaged in sports at least once a week” to indicate regular engagement in physical leisure activities, and “0 – irregular or no engagement in sports” for less frequent participation.

The intensity of engagement in sports is quantified by the number of hours spent in physical leisure activities on a typical weekday. The measurement is based on the survey question “What is a typical day like for you? How many hours do you spend on the following activities [activity: physical activities (sports, fitness, gymnastics)] on a typical weekday?”. For analytical purposes,

the hours of daily engagement in sports are capped at eight hours, with the assumption that responses indicating “8” include those who participate in sports for eight hours or more daily. Both measures of engagement in physical leisure activities are utilized at t_0 , which is the wave prior to (and if missing, the closest available information prior to the current wave t_1) when the outcomes of structural integration are measured. This temporal arrangement allows for an examination of how prior physical activity levels may influence later integration outcomes and addresses the issue of reverse causality.

3.4 Controls

All estimated models include controls for variables measured at t_1 such as gender (male vs. female), age, country of origin (categorized into Eastern Europe, MENA, Asia, and Africa), years since migration to Germany, and survey year fixed effects. We further account for pre-migration factors relevant to the labor market, such as the highest level of schooling completed before arrival in Germany (categorized into unfinished compulsory, completed compulsory, secondary school degree, other school degree, and a category for those with missing information) and a dummy indicator for having work experience before arrival in Germany. These variables provide a baseline sociodemographic and temporal context for the analysis.

To further enhance the robustness of our findings, we control for the number of traumatic experiences encountered during refugees’ flight. Due to filtering enabling to skip this sensitive topic in the survey, this information is missing for 36% of the data, and we include a corresponding dummy indicator for these cases. We also consider potentially time-varying confounding factors that could influence the employment outcomes at t_1 and engagement in sport activities. Specifically, information from t_0 (wave prior to t_1) on marital status (married vs. not married), number of children in respondent’s household, rural vs. urban area of living, legal status (non-secure vs. secure status³), and daily hours spent in other leisure activities (other than sports). Finally, we include job characteristics from t_0 – such as employment status, ISEI score, or OPI score – to capture the dynamics of how the previous labor market situation determines the current labor market outcomes (see visual representation of relationships among these variables in Figure A2 and Figure A3 the Appendix).

4 Results

4.1 Physical leisure and refugees’ labor market outcomes

Refugees in the analytical sample spend on average, 0.63 hours in physical leisure activities on a typical weekday at t_1 (see Table A2 in the Appendix). However, this average includes nearly 52% of the refugee sample who reported no daily engagement in sports. Among refugees who participate in sports (reporting more than zero hours per weekday), there is a notably higher average intensity of participation (1.30 hours).

³ Category “non-secure legal status” includes refugees still in the asylum process and those with temporary suspension of deportation (*Duldung*). “Secure status” includes those with secure mid-term prospects of staying in Germany with approved asylum application (asylum status, refugee status, permanent residence permit (*Niederlassungserlaubnis*), and other humanitarian protection status).

Turning our focus to the central question of our research, we explore how both the engagement and the intensity of engagement in sports activities impact labor market outcomes for refugees. Table 1 presents the findings on the relationship between refugees' sports involvement and their employment status and jobs' ISEI score, controlling for socio-demographic confounders. Note, that these models do not account for facilitator variables and, thus, we capture indirect effects of physical leisure activities on refugees' labor market outcomes.

Following M1.1, the association of refugees' weekly engagement in physical leisure activities with their probability of being employed in the subsequent wave appears to be significantly positive, with an average marginal effect (AME) of 2.92 percentage points (p.p.). M1.2 indicates that the intensity of engagement in sports also has a beneficial effect, albeit slightly less pronounced: each additional hour spent on daily sports activities increases the probability of employment by 1.24 percentage points. In contrast, more time dedicated to non-physical leisure activities is not significantly associated with employment probabilities, highlighting the specific value of physical activities. M1.3 introduces a squared term for daily hours invested in sports, which renders the main effect of invested hours in sports statistically insignificant. However, the introduced squared term is minor and insignificant, affirming a linear relationship between sports involvement and employment probability.

Regarding occupational prestige, neither regular nor intensive engagement in sports are significantly associated with the ISEI score. The β -coefficients from the regression models M2.1 and M2.2 are relatively minor, with M2.2 even showing a negative influence. M2.3 incorporating a squared term for daily hours spent in sports indicates that while a moderate level of physical leisure activity might be beneficial, overly intense engagement could potentially detract from occupational prestige. However, neither the coefficients for daily hours nor the squared term for daily hours in sports reach statistical significance.

Table 1 Physical leisure and employment status, ISEI

	Employed vs. not (t_1) AME in p.p.	ISEI (t_1) β -coefficients
	M1.1	M2.1
Engaging in sports (weekly) (t_0)	2.92** (0.01)	0.38 (0.51)
N	7,374	1,822
	M1.2	M2.2
Daily hours in sports (t_0)	1.24* (0.01)	-0.04 (0.33)
Daily hours in other leisure (t_0)	-0.32 (0.00)	-0.17 (0.23)
N	9,598	2,019
	M1.3	M2.3
Daily hours in sports (t_0)	1.23 (0.01)	0.67 (0.53)
Squared term of daily hours in sports (t_0)	0.002 (0.00)	-0.26 (0.15)
N	9,598	2,019

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

OLS and logit models with clustered standard errors. For full models with β -coefficients of all included variables see Table A3 and Table A7 in the Appendix.

4.2 Physical leisure and the facilitators of refugees' structural integration

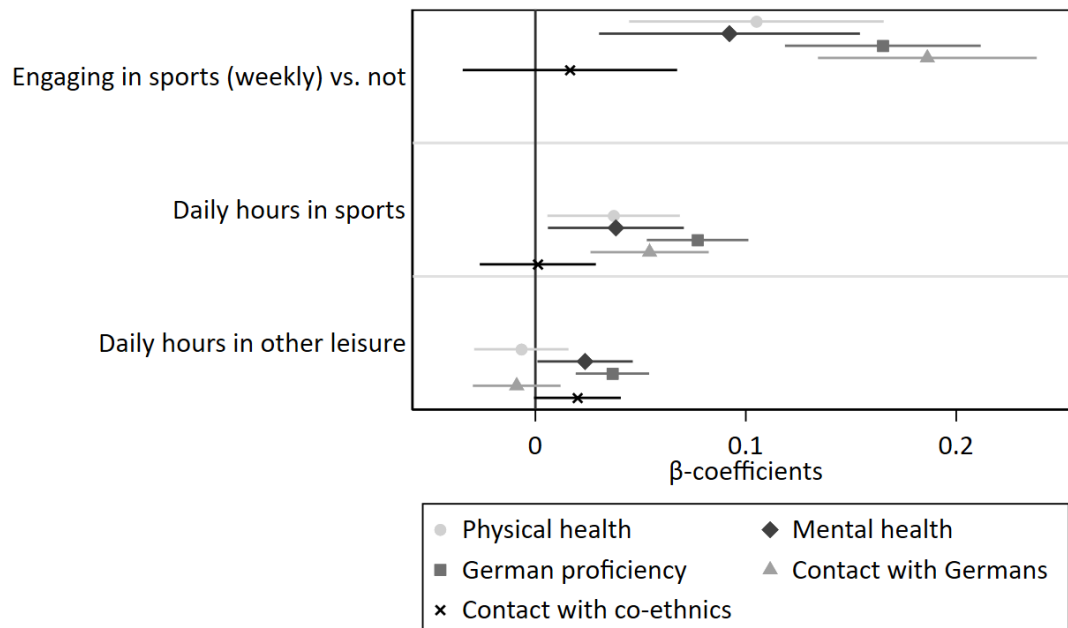
To determine the relationship between sports involvement and key facilitators, we utilized linear regression models for health and German language proficiency, and social networking outcomes. The results are visualized in Figure 2, with dependent variables standardized for comparability purposes.

Our findings corroborate prior research, indicating that regular sports engagement significantly boosts physical and mental health, and German language proficiency. Figure 2 reveals that engagement in sports is slightly more strongly associated with German language proficiency than with both health indicators. Moreover, the intensity of engagement in sports strongly correlates with improved language proficiency, more so than with the other facilitators. While other leisure activities are also significantly positively associated with mental health and German language skills, their effects are less substantial compared to those of sports, particularly for language proficiency. In addition, daily hours in other leisure have a slightly negative association with physical health, underscoring the unique benefits of physical leisure activities.

In terms of social networking, both weekly sports engagement and increased hours in sports activities are significantly associated with higher frequency of interactions with native Germans. The impact of weekly engagement is stronger than that of daily invested hours. However, no discernible patterns suggest increased contact with co-ethnics due to heightened sports involvement. Additionally, more hours spent in other leisure activities do not significantly alter the likelihood of increased contact with Germans or persons of the same origin⁴.

⁴ In addition, we estimated ologit models with the contact to Germans and persons of the same origin as ordinal dependent variables (see Table A5 and Figure A1 in the Appendix). The results showed the same patterns as did the analyses in Figure 2.

Figure 2 Physical leisure and the facilitators of structural integration



Note: Coefficient plot; β -coefficients correspond to those reported in Table A4 in the Appendix (models MFs1.1, MFs1.2, MFs2.1, MFs2.2, MFs3.1, MFs3.2, MFs4.1, MFs4.2, MFs5.1, MFs5.2). Standardized dependent variables.

4.3 Physical leisure activities and refugees' labor market outcomes – Accounting for the facilitators

To further dissect the impact of physical leisure activities, we adjusted our analysis to account for the key facilitators: health, German language proficiency, and social network. While initial findings indicated a significantly positive association of weekly sports engagement in t_0 and employment probability in t_1 , this relationship turns insignificant upon controlling for facilitators (M1.4, Table 2). Similarly, the positive relationship between daily hours invested in sports and the probability of being employed in the subsequent wave diminishes and loses statistical significance when facilitators are considered (M1.5). The association of weekly sports engagement with occupational prestige similarly diminishes when controlling for facilitators and stays insignificant (M2.4), while the association of daily hours invested in sports in t_0 with the ISEI at t_1 grows further into the negative, staying statistically insignificant (M2.5).

These results show that when facilitators are accounted for, effects sizes are less than half as big as in the main model, and the coefficients become non-significant. Overall, this suggests that the benefits of sport engagement, particularly on employment probability, are primarily exerted indirectly through improvements in health, language skills, and social connections. Consequently, the direct impact of sports involvement appears to be minimal.

Table 2 Physical leisure and employment status, ISEI – Controlling for facilitators

	Employed vs. not (t_1) AME in p.p.	ISEI (t_1) β -coefficients
	M1.4	M2.4
Engaging in sports (weekly) (t_0)	1.02 (0.01)	0.08 (0.50)
N	7,374	1,822
	M1.5	M2.5
Daily hours in sports (t_0)	0.45 (0.00)	-0.21 (0.32)
Daily hours in other leisure (t_0)	-0.22 (0.00)	-0.10 (0.21)
N	9,598	2,019
	M1.6	M2.6
Daily hours in sports (t_0)	0.04 (0.01)	0.31 (0.51)
Squared term of daily hours in sports (t_0)	0.15 (0.00)	-0.19 (0.14)
N	9,598	2,019

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

OLS and logit models with clustered standard errors. For full models with β -coefficients of all included variables see Table A6 and Table A7 in the Appendix.

4.4 Physical leisure and the type of occupation

The analysis regarding the type of occupation in terms of physical demands is presented in Table 3. The results reveal that weekly engagement in sports is only slightly positively associated with the increased probability of holding a physically labor-intensive job. This relationship attains no statistical significance at conventional levels both when not controlling and when controlling for the facilitators, with effect size halving when controlling for the facilitators (see models M3.1 and M3.4).

Analyses on the impact of daily hours spent in sports reveal that each additional hour spent in physical leisure activities raises the probability of securing a job with high physical exposure by more 1.62 p.p., albeit insignificantly on conventional levels (see model M3.2). The type of occupation is thereby the only labor market outcome for which the impact of intensity of sports is higher than that of engagement in sports. Additionally, when controlling for facilitators in model M3.5, the AME does not diminish as it does for the other labor market outcomes, but it is slightly higher (AME = 1.67). Introducing a squared term for the hours invested in physical leisure (see models M3.3 and M3.6) even shifts the coefficients to statistical significance at 5% level and produces much larger effect sizes. Every additional daily hour spent in physical leisure activities increases the probability of having a physically labor-intensive job by 5.12 p.p. if not controlling for facilitators and by 5.52 p.p. if controlling for facilitators. In both models, the squared term of daily invested hours in sports is moderately negative, suggesting a curvilinear relationship between invested hours in sports and the type of occupation. While initial increases in physical activity are therefore highly beneficial, there is a point beyond which further time investment does not yield additional benefits and is counterproductive.

Table 3 Physical leisure and type of occupation

	High vs. low Overall Physical Exposure Index (OPI) (t1)
	AME in p.p.
	M3.1
Engaging in sports (weekly) (t0)	1.06 (0.02)
N	1,479
<i>Controlling for facilitators</i>	M3.4
Engaging in sports (weekly) (t0)	0.53 (0.02)
N	1,479
	M3.2
Daily hours in sports (t0)	1.62 (0.01)
N	1,666
<i>Controlling for facilitators</i>	M3.5
Daily hours in sports (t0)	1.67 (0.01)
N	1,666
	M3.3
Daily hours in sports (t0)	5.12* (0.02)
Squared term of daily hours in sports (t0)	-1.31 (0.01)
N	1,666
<i>Controlling for facilitators</i>	M3.6
Daily hours in sports (t0)	5.52* (0.02)
Squared term of daily hours in sports (t0)	-1.48* (0.01)
N	1,666

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Logit models with clustered standard errors. For full models with β -coefficients of all included variables see Table A8 and Table A9 in the Appendix.

5 Robustness checks and further analyses

We performed several sensitivity analyses to ensure robustness of our findings, employing Structural Equation Modeling (SEM) to simultaneously model the indirect and direct paths linking sports involvement with labor market outcomes (see Tables A10, A11, and A12 in the Appendix). The SEM-analyses are consistent with our main models that incorporate facilitators. Models SEM1.1, SEM2.1, and SEM3.1 also reaffirm the significant positive associations of weekly sports engagement with increased frequency of contact with German natives, enhanced German language proficiency, and improved physical health – paralleling our earlier findings. The models highlight the substantial role all facilitators play in connecting weekly sports engagement to the likelihood of employment in the subsequent year (see model SEM1.1). Similarly, the SEM models for the daily hours spent in physical leisure activities align with our primary analyses.

Given the documented gender gap in sports participation among minorities, with women participating less often than men (Higgins & Dale, 2013; van Tubergen & Molteni, 2024), we conducted gender-specific analyses. Within our sample, refugee men reported higher average daily sports activity (mean: 0.74) compared to women (mean: 0.43), with 64% of women and 45% of men reporting no daily sports participation. Our findings (see Table A13 and Table A14 in the

Appendix) show that the results for men align closely with our main analyses, likely influenced by the relatively small proportion of employed refugee women in our sample.

6 Discussion

This study set out to explore the role of sports as a facilitative channel for labor market integration among refugees, addressing a critical aspect of their broader social integration process. Given the unique challenges faced by refugees, such as forced migration experiences and institutional barriers in host countries that complicate linguistic and societal adaptation and economic participation, understanding mechanisms that can enhance these processes is crucial. Sports, as universally accessible and scalable activities, offer potential not just for personal well-being but also as a strategic lever in policymaking aimed at improving integration outcomes.

Utilizing recent longitudinal data from the IAB-BAMF-SOEP Survey of Refugees in Germany, we find that regular and intensive engagement in sports significantly improves refugees' employment chances in the subsequent year, supporting hypotheses H1 and H2. This association remains positive even when accounting for key facilitators like physical and mental health, German language proficiency, and social interactions with both co-ethnics and native Germans, even though it becomes smaller and non-significant. This indicates that much of the beneficial impact of sports is mediated through improvements in these facilitative factors. This evidence underscores the multifaceted benefits – both direct and indirect – of sports participation for refugees' chances to secure gainful employment.

Furthermore, our findings reveal that refugees' engagement and intensity of engagement in sports positively correlate with the likelihood of obtaining jobs with high physical demands, supporting the direct and mediated pathways proposed in hypotheses H3 and H4. Particularly for securing physically labor-intensive jobs, the daily hours invested in sports prove to be crucial. However, our analysis indicates that while increasing sports hours has a strong positive impact, this benefit plateaus at a certain point, beyond which additional hours do not yield further gains. Conversely, involvement in sports only has minimal or slightly negative impact on occupational prestige, contradicting hypotheses H1 and H2. This unexpected outcome may be explained by the role of co-ethnic networks, which while facilitating employment, often do so at lower occupational levels. Additionally, the propensity of those engaging in sports to secure physically demanding jobs might explain the observed lower occupational prestige among employed refugees. This finding aligns with our theoretical considerations and suggests a plausible explanation for the minimal or negative impact on occupational prestige.

In sum, while sports activity correlates with increased employment, it does not appear to influence the occupational prestige of refugees, potentially locking them into lower-status jobs. Moreover, time spent in other types of leisure activities shows a slight negative association with labor market outcomes, underscoring the unique benefits of sports. This points to the dual-edged nature of sports as an integration tool – beneficial in fostering initial labor market entry but possibly limiting in terms of career advancement.

The implications of these findings are twofold. Firstly, for policymakers, integrating sports programs into broader refugee integration strategies could be beneficial, but needs to be aware

of their limitations and potential unintended consequences. Rather than merely supporting refugees' sport activities, integration programs should leverage sports as a complementary tool alongside language education and vocational training to enhance integration outcomes. Secondly, for researchers, this study highlights the need for further investigation into the causal mechanisms between physical activity and integration outcomes. While our study carefully considers the chronological order of events to approximate causal relationships between physical leisure activities and refugees' labor market outcomes, its design limits the ability to completely rule out other time-varying confounders. Future research should aim to establish a clearer causal relationship with experimental designs, which could provide deeper insights into how and why sports impact labor market outcomes and whether these impacts are sustained over the long term and across various population groups.

Finally, the reliance on self-reported data on sports participation could introduce bias related to social desirability or recall inaccuracies. Even though we conducted further analyses using samples in which social desirability was minimized and accuracy of respondents' answer maximized, yielding similar results to our main analyses (see Table A15 and Table A16 in the Appendix), future research could incorporate objective measures such as activity trackers or direct observation to provide more accurate and reliable data on physical activity levels, in order to mitigate corresponding biases.

Disclosure statement

The authors report there are no competing interests to declare.

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Appendix

Table A1 Descriptive statistics

Variable	t	Obs	Mean/ Percent	Std. Dev.	Min/Max
Dependent outcomes					
Employed vs. not	1	9,598	34.52		0/1
ISEI	1	4,000	29.11	15.39	11.56–88.70
High vs. low Overall Physical Exposure Index (OPI)	1	3,061	25.71		0/1
Facilitators					
Physical health index	1	9,647	53.73	9.27	12.29–77.81
Mental health index	1	9,647	49.58	10.85	6.23–77.00
German language proficiency	1	9,647	7.01	2.78	0–12
Contact with Germans	1	9,647	2.82	1.90	0–5
Contact with persons of same origin	1	9,647	2.81	1.54	0–5
Physical leisure activities					
Engaging in sports (weekly) vs. not	0	7,416	36.45		0/1
Daily hours in sports (on weekdays)	0	9,647	0.63	0.79	0–8
Control variables					
Male	1	9,647	63.34		0/1
Age	1	9,647	33.06	7.72	18–50
Country of origin	1	9,647	100.00		
Eastern Europe			2.57		0/1
MENA			75.41		0/1
Asia			12.91		0/1
Africa			9.11		0/1
Years since migration	1	9,647	3.92	1.44	1–8
Survey year	1	9,647	100.00		
2017			19.03		0/1
2018			26.90		0/1
2019			20.77		0/1
2020			19.94		0/1
2021			13.35		0/1
Education at immigration	-1	9,647	100.00		
Compulsory, no degree			28.90		0/1
Compulsory, degree			20.58		0/1
Secondary school degree			31.55		0/1
Other school degree			2.90		0/1
Information missing			16.07		0/1
Work experience before migration vs. not	-1	9,647	64.71		0/1
Number of traumatic experiences during flight	-1	9,647	1.08	1.35	0–7
Share with missing information			35.97		
Married vs. not married	0	9,647	66.12		0/1
Number of children in HH	0	9,647	1.93	1.75	0–11
Rural area of living vs. urban	0	9,647	25.95		0/1
Legal status: non-secure vs. secure	0	9,647	21.84		0/1
Daily hours in other leisure (on weekdays)	0	9,647	0.90	1.05	0–8
Employed vs. not	0	9,647	25.05		0/1
ISEI	0	2,729	29.28	15.83	11.56–88.70
High vs. low Overall Physical Exposure Index (OPI)	0	2,309	26.63		0/1

Table A2 Intensity of sports engagement (t₁) – descriptive

Time use variable and migrant group	Mean	SD	Min	Max	Share not engaging (%)	Mean if engaging
Daily hours in sports						
Natives	0.67	0.76	0	8	46.32%	1.25
2 nd generation migrants	0.69	0.80	0	8	47.13%	1.31
1 st generation migrants	0.53	0.72	0	8	56.74%	1.22
Refugees	0.63	0.79	0	8	51.80%	1.30

Table A3 Physical leisure and employment status, ISEI – Full table

	Employed vs. not in t ₁		ISEI in t ₁	
	M1.1	M1.2	M2.1	M2.2
Engaging in sports (weekly) in t ₀	0.20**	-	0.38	-
Empty cell	(0.06)	-	(0.51)	-
Daily hours in sports in t ₀	-	0.09*	-	-0.04
	-	(0.03)	-	(0.33)
Gender				
Female	reference	reference	reference	reference
Male	1.30***	1.31***	-0.11	0.58
	(0.09)	(0.08)	(0.95)	(0.95)
Education at immigration				
Compulsory, no degree	-0.31***	-0.35***	-2.50***	-3.13***
	(0.08)	(0.07)	(0.59)	(0.61)
Compulsory, degree	-0.03	-0.09	-2.47***	-2.70***
	(0.09)	(0.08)	(0.70)	(0.70)
Secondary school degree	reference	reference	reference	reference
Other school degree	-0.29	-0.38*	0.50	-0.77
	(0.20)	(0.18)	(2.03)	(1.87)
Information on education missing	-0.47***	-0.53***	0.43	-0.18
	(0.10)	(0.09)	(0.86)	(0.84)
Number of children in HH in t ₀	-0.12***	-0.12***	-0.17	-0.28
	(0.02)	(0.02)	(0.20)	(0.18)
Marital status in t₀				
Not married	reference	reference	reference	reference
Married	-0.06	-0.13	0.22	0.20
	(0.08)	(0.08)	(0.72)	(0.68)
Legal status in t₀				
Secure	reference	reference	reference	reference
Non-secure	-0.32***	-0.35***	1.23	1.10
	(0.09)	(0.08)	(0.76)	(0.76)
Country of origin				
Eastern Europe	0.60**	0.79***	-4.51***	-5.02***
	(0.23)	(0.20)	(1.31)	(1.45)
MENA	reference	reference	reference	reference
Asia	0.17	0.12	-2.29**	-2.23**
	(0.10)	(0.09)	(0.79)	(0.77)
Africa	0.36***	0.36***	-3.20***	-3.42***
	(0.11)	(0.09)	(0.70)	(0.75)
Years since migration	0.18***	0.23***	0.40	0.55
	(0.05)	(0.04)	(0.33)	(0.32)
Age	-0.02***	-0.02***	-0.02	-0.02
	(0.01)	(0.00)	(0.05)	(0.05)
Employment status in t₀				
Not employed	reference	reference	-	-
Employed	2.19***	2.10***	-	-

	Employed vs. not in t ₁		ISEI in t ₁	
	M1.1	M1.2	M2.1	M2.2
ISEI in t ₀	(0.08)	(0.07)	-	-
	-	-	0.68***	0.65***
	-	-	(0.03)	(0.03)
Daily hours in other leisure in t ₀	-	-0.02	-	-0.17
	-	(0.03)	-	(0.23)
Rural area of living in t₀				
No	reference	reference	reference	reference
Yes	0.02	0.03	-0.75	-0.48
	(0.07)	(0.06)	(0.52)	(0.51)
Number of traumatic experiences during flight				
0	reference	reference	reference	reference
1	-0.09	-0.04	-0.26	-0.36
	(0.10)	(0.09)	(0.67)	(0.69)
2	-0.21	-0.13	0.31	0.25
	(0.12)	(0.11)	(0.95)	(0.92)
3	-0.03	0.03	-1.09	-1.18
	(0.15)	(0.13)	(0.90)	(0.86)
4	0.13	0.13	0.47	0.43
	(0.17)	(0.15)	(1.39)	(1.39)
5	0.05	0.001	0.50	0.64
	(0.28)	(0.24)	(0.96)	(0.96)
6	0.70	0.95	-2.20	-2.43
	(0.69)	(0.55)	(2.17)	(2.28)
7	0.43	0.39	-1.72	-1.57
	(0.79)	(0.79)	(0.88)	(0.93)
Information missing on traumatic experiences	-0.20*	-0.16*	-0.48	-0.44
	(0.08)	(0.07)	(0.66)	(0.65)
Work experience before migration				
No work experience	reference	reference	reference	reference
Yes, work experience	0.37***	0.38***	-1.63*	-1.69*
	(0.09)	(0.08)	(0.74)	(0.75)
Survey year				
2017	-	-0.05	-	2.13
	-	(0.17)	-	(1.76)
2018	-0.27	-0.06	1.42	2.00
	(0.16)	(0.14)	(1.19)	(1.14)
2019	-0.20	-0.04	1.47	1.87*
	(0.13)	(0.12)	(0.91)	(0.88)
2020	-0.44***	-0.30**	1.07	1.33
	(0.11)	(0.10)	(0.77)	(0.74)
2021	-	-	-	-
	-	-	-	-
_cons	-1.75***	-2.11***	11.06***	10.71***
	(0.32)	(0.28)	(2.89)	(2.89)
N	7,374	9,598	1,822	2,019

Table shows β -coefficients and standard errors in parentheses.

* p < 0.05, ** p < 0.01, *** p < 0.001

OLS and logit models with clustered standard errors.

Table A4 Physical leisure and the facilitators of structural integration – Standardized dependent variables

Standardized DV	Physical health	Mental health	German language proficiency	Contact to Germans	Contact to persons of same origin
	MFs1.1	MFs2.1	MFs3.1	MFs4.1	MFs5.1
Engaging in sports (weekly) in t ₀	0.11*** (0.03)	0.09** (0.03)	0.17*** (0.02)	0.19*** (0.03)	0.02 (0.03)
N	7,416	7,416	7,416	7,416	7,416
	MFs1.2	MFs2.2	MFs3.2	MFs4.2	MFs5.2
Daily hours in sports in t ₀	0.04* (0.02)	0.04* (0.02)	0.08*** (0.01)	0.05*** (0.01)	0.001 (0.01)
Daily hours in other leisure in t ₀	-0.01 (0.01)	0.02* (0.01)	0.04*** (0.01)	-0.01 (0.01)	0.02 (0.01)
N	9,647	9,647	9,647	9,647	9,647
	MFs1.3	MFs2.3	MFs3.3	MFs4.3	MFs5.3
Daily hours in sports in t ₀	0.09*** (0.03)	0.08** (0.03)	0.14*** (0.02)	0.09*** (0.03)	0.02 (0.02)
Squared term of daily hours in sports in t ₀	-0.02* (0.01)	-0.02* (0.01)	-0.03*** (0.01)	-0.01 (0.01)	-0.01 (0.01)
N	9,647	9,647	9,647	9,647	9,647

Table shows β -coefficients and standard errors in parentheses.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

OLS models with clustered standard errors. Controlling for: gender, education at immigration, number of children in the household in t₀, marital status in t₀, legal status in t₀, country of origin, years since migration, age, daily hours in other leisure in t₀, rural area of living in t₀, traumatic experiences during flight, survey year.

Table A5 Physical leisure and the facilitators of structural integration – Social network

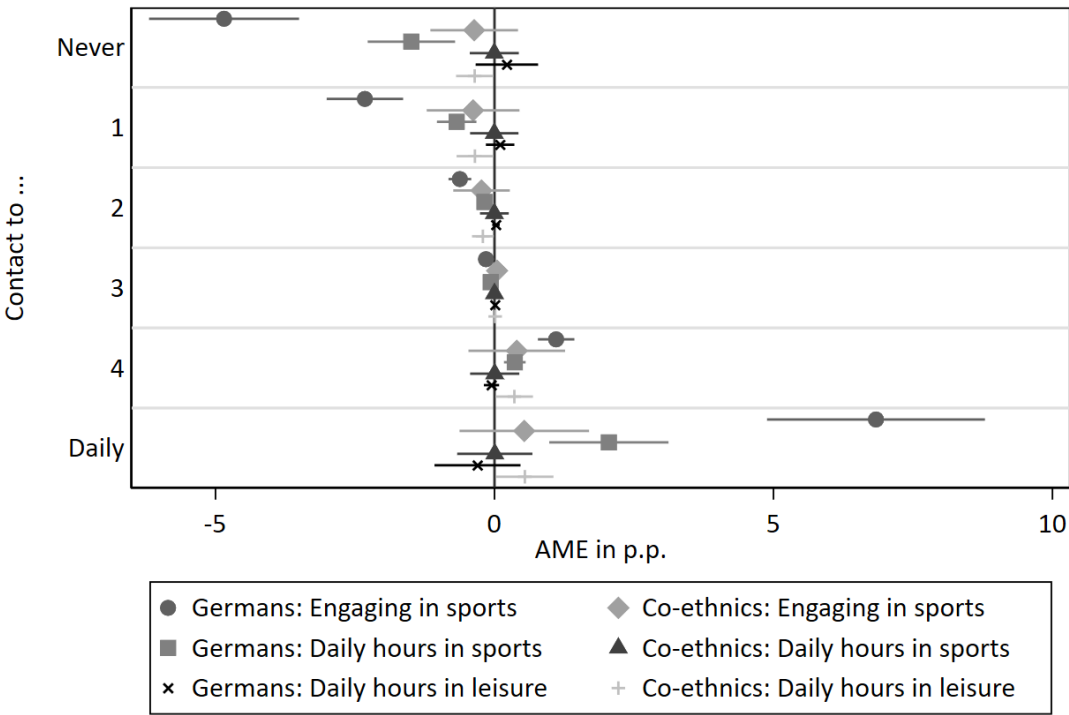
DV: Contact with ...	Engaging in sports (weekly) in t ₀		Daily hours in sports in t ₀		Daily hours in other leisure in t ₀	
	MF6.1	MF7.1	MF6.2	MF7.2	MF6.2	MF7.2
	...Germans	...persons of same origin	...Germans	...persons of same origin	...Germans	...persons of same origin
Never	-4.85*** (0.01)	-0.36 (0.00)	-1.49*** (0.00)	-0.004 (0.00)	0.22 (0.00)	-0.36* (0.00)
1	-2.32*** (0.00)	-0.38 (0.00)	-0.68*** (0.00)	-0.004 (0.00)	0.10 (0.00)	-0.35* (0.00)
2	-0.62*** (0.00)	-0.23 (0.00)	-0.18*** (0.00)	-0.002 (0.00)	0.03 (0.00)	-0.21* (0.00)
3	-0.15* (0.00)	0.05 (0.00)	-0.07** (0.00)	0.0001 (0.00)	0.01 (0.00)	0.01 (0.00)
4	1.10*** (0.00)	0.40 (0.00)	0.36*** (0.00)	0.004 (0.00)	-0.05 (0.00)	0.36* (0.00)
Daily	6.84*** (0.01)	0.53 (0.01)	2.05*** (0.01)	0.006 (0.00)	-0.31 (0.00)	0.55* (0.00)
N	7,416	7,416	9,647	9,647	9,647	9,647

Table shows Average Marginal Effects (AME) in percentage-points (p.p.) and standard errors in parentheses.

* p < 0.05, ** p < 0.01, *** p < 0.001

Ordered logit models with lustered standard errors. Controlling for: gender, education at immigration, number of children in the household in t₀, marital status in t₀, legal status in t₀, country of origin, years since migration, age, daily hours in other leisure in t₀, rural area of living in t₀, traumatic experiences during flight, survey year.

Figure A1 Physical leisure and the facilitators of structural integration – Social network



Average marginal effects in percentage points; correspond to those reported in Table A5

Table A6 Physical leisure and employment status, ISEI – Controlling for facilitators – Full table

	Employed vs. not in t1		ISEI in t1	
	M1.4	M1.5	M2.4	M2.5
Engaging in sports (weekly) in t ₀	0.08 (0.07)	- (0.50)	0.08 (0.50)	- (0.50)
Daily hours in sports in t ₀	- (0.04)	0.03 (0.04)	- (0.04)	-0.21 (0.32)
Gender				
Female	reference	reference	reference	reference
Male	1.16*** (0.09)	1.15*** (0.08)	0.24 (0.95)	0.86 (0.94)
Education at immigration				
Compulsory, no degree	-0.12 (0.09)	-0.15 (0.08)	-1.48* (0.58)	-1.89** (0.59)
Compulsory, degree	0.04 (0.09)	-0.01 (0.08)	-1.77* (0.70)	-1.95** (0.69)
Secondary school degree	reference	reference	reference	reference
Other school degree	-0.23 (0.20)	-0.34* (0.17)	0.05 (1.92)	-1.03 (1.77)
Information on education missing	-0.29* (0.11)	-0.33** (0.10)	1.57 (0.84)	1.01 (0.82)
Number of children in HH in t ₀	-0.14*** (0.03)	-0.14*** (0.02)	-0.20 (0.20)	-0.30 (0.18)
Marital status in t₀				
Not married	reference	reference	reference	reference
Married	0.01 (0.09)	-0.07 (0.08)	0.45 (0.71)	0.41 (0.67)
Legal status in t₀				
Secure	reference	reference	reference	reference
Non-secure	-0.33*** (0.09)	-0.35*** (0.08)	1.72* (0.76)	1.66* (0.76)
Country of origin				
Eastern Europe	0.56* (0.23)	0.76*** (0.20)	-5.40*** (1.36)	-6.09*** (1.46)
MENA	reference	reference	reference	reference
Asia	0.16 (0.11)	0.11 (0.10)	-2.24** (0.80)	-2.21** (0.79)
Africa	0.47*** (0.12)	0.48*** (0.10)	-2.64*** (0.72)	-2.84*** (0.77)
Years since migration	0.14** (0.05)	0.19*** (0.04)	0.38 (0.32)	0.52 (0.32)
Age	-0.003 (0.01)	0.001 (0.01)	0.04 (0.05)	0.05 (0.05)
Employment status in t₀				
Not employed	reference	reference	-	-
Employed	2.08*** (0.08)	1.97*** (0.07)	- (0.07)	- (0.07)
ISEI in t ₀	- (0.03)	- (0.03)	0.64*** (0.03)	0.62*** (0.03)
Daily hours in other leisure in t ₀	- (0.03)	-0.02 (0.03)	- (0.03)	-0.10 (0.21)
Rural area of living in t₀				
No	reference	reference	reference	reference
Yes	-0.01 (0.07)	-0.002 (0.06)	-0.88 (0.51)	-0.66 (0.51)
Number of traumatic experiences during flight				
0	reference	reference	reference	reference
1	-0.08 (0.10)	-0.01 (0.09)	-0.13 (0.66)	-0.16 (0.68)
2	-0.19 (0.13)	-0.10 (0.11)	0.31 (0.95)	0.14 (0.92)
3	0.05	0.11	-1.21	-1.23

	Employed vs. not in t1		ISEI in t1	
	M1.4	M1.5	M2.4	M2.5
	(0.16)	(0.14)	(0.89)	(0.85)
4	0.21	0.21	0.62	0.64
	(0.17)	(0.16)	(1.35)	(1.36)
5	-0.03	-0.09	0.17	0.28
	(0.29)	(0.25)	(1.11)	(1.11)
6	0.62	0.98 [*]	-2.63	-2.75
	(0.72)	(0.49)	(2.24)	(2.24)
7	0.02	0.02	-3.48 ^{**}	-3.40 ^{**}
	(0.78)	(0.77)	(1.08)	(1.08)
Information missing on traumatic experiences	-0.16 [*]	-0.12	-0.20	-0.12
	(0.08)	(0.08)	(0.65)	(0.64)
Work experience before migration				
No work experience	reference	reference	reference	reference
Yes, work experience	0.42 ^{***}	0.42 ^{***}	-1.42 [*]	-1.42
	(0.09)	(0.08)	(0.72)	(0.73)
Survey year				
2017	-	-0.16	-	2.89
	-	(0.18)	-	(1.75)
2018	-0.26	-0.03	1.99	2.57 [*]
	(0.17)	(0.15)	(1.20)	(1.15)
2019	-0.24	-0.05	1.80	2.24 [*]
	(0.14)	(0.12)	(0.93)	(0.89)
2020	-0.35 ^{**}	-0.20	1.07	1.27
	(0.11)	(0.10)	(0.76)	(0.73)
2021	-	-	-	-
	-	-	-	-
Mental health index	0.01 [*]	0.01 ^{**}	-0.02	-0.03
	(0.00)	(0.00)	(0.03)	(0.03)
Physical health index	0.02 ^{***}	0.02 ^{***}	-0.01	-0.01
	(0.00)	(0.00)	(0.03)	(0.03)
Contact with persons of same origin				
Never	reference	reference	reference	reference
1	0.13	0.18	-2.00	-2.02 [*]
	(0.14)	(0.13)	(1.04)	(1.01)
2	0.37 ^{**}	0.36 ^{**}	-1.48	-1.69
	(0.14)	(0.13)	(1.01)	(0.97)
3	0.10	0.16	-1.55	-1.58
	(0.13)	(0.11)	(0.93)	(0.87)
4	-0.12	-0.11	-2.39 [*]	-2.54 ^{**}
	(0.14)	(0.12)	(1.06)	(0.97)
Daily	-0.18	-0.22	-3.09 ^{**}	-3.32 ^{***}
	(0.14)	(0.13)	(1.05)	(0.97)
Contact with Germans				
Never	reference	reference	reference	reference
1	-0.09	-0.07	-0.27	0.47
	(0.12)	(0.11)	(1.09)	(1.06)
2	-0.01	-0.01	1.56	1.91
	(0.14)	(0.13)	(1.27)	(1.26)
3	0.18	0.16	0.62	1.66
	(0.12)	(0.11)	(0.99)	(1.04)
4	0.43 ^{***}	0.41 ^{***}	1.74	1.62
	(0.12)	(0.10)	(1.08)	(1.01)
Daily	1.52 ^{***}	1.54 ^{***}	0.64	1.04
	(0.10)	(0.09)	(0.83)	(0.78)
Additive index of German language proficiency	0.06 ^{***}	0.06 ^{***}	0.86 ^{***}	0.93 ^{***}
	(0.01)	(0.01)	(0.14)	(0.14)
_cons	-4.44 ^{***}	-4.97 ^{***}	4.49	3.30
	(0.48)	(0.42)	(4.42)	(4.36)
N	7,374	9,598	1,822	2,019

Table shows β -coefficients and standard errors in parentheses.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

OLS and logit models with clustered standard errors.

Table A7 Physical leisure and employment status, ISEI – Including squared term of daily hours of physical leisure – Full table

	Employed vs. not in t_1		ISEI in t_1	
	M1.3	M1.6	M2.3	M2.6
	Controlling for facilitators		Controlling for facilitators	
Daily hours in sports in t_0	0.08 (0.06)	0.003 (0.06)	0.67 (0.53)	0.31 (0.51)
Squared term of daily hours in sports in t_0	0.0002 (0.02)	0.01 (0.02)	-0.26 (0.15)	-0.19 (0.14)
Gender				
Female	reference	reference	reference	reference
Male	1.31*** (0.08)	1.15*** (0.08)	0.52 (0.95)	0.82 (0.95)
Education at immigration				
Compulsory, no degree	-0.35*** (0.07)	-0.15 (0.08)	-3.06*** (0.61)	-1.84** (0.59)
Compulsory, degree	-0.09 (0.08)	-0.01 (0.08)	-2.67*** (0.70)	-1.93** (0.69)
Secondary school degree	reference	reference	reference	reference
Other school degree	-0.38* (0.18)	-0.34* (0.17)	-0.75 (1.87)	-1.02 (1.77)
Information on education missing	-0.53*** (0.09)	-0.33** (0.10)	-0.15 (0.84)	1.03 (0.81)
Number of children in HH in t_0	-0.12*** (0.02)	-0.14*** (0.02)	-0.28 (0.18)	-0.30 (0.18)
Marital status in t_0				
Not married	reference	reference	reference	reference
Married	-0.13 (0.08)	-0.07 (0.08)	0.25 (0.68)	0.44 (0.67)
Legal status in t_0				
Secure	reference	reference	reference	reference
Non-secure	-0.35*** (0.08)	-0.35*** (0.08)	1.13 (0.76)	1.67* (0.76)
Country of origin				
Eastern Europe	0.79*** (0.20)	0.76*** (0.20)	-5.08*** (1.46)	-6.12*** (1.46)
MENA	reference	reference	reference	reference
Asia	0.12 (0.09)	0.11 (0.10)	-2.21** (0.77)	-2.19** (0.79)
Africa	0.36*** (0.09)	0.48*** (0.10)	-3.44*** (0.75)	-2.86** (0.77)
Years since migration	0.23*** (0.04)	0.19*** (0.04)	0.55 (0.32)	0.51 (0.32)
Age	-0.02*** (0.00)	0.001 (0.01)	-0.01 (0.05)	0.06 (0.05)
Employment status in t_0				
Not employed	reference	reference	reference	reference
Employed	2.10*** (0.07)	1.97*** (0.07)	- (0.03)	- (0.03)
ISEI in t_0	- (0.03)	- (0.03)	0.65*** (0.03)	0.62*** (0.03)
Daily hours in other leisure in t_0	-0.02 (0.03)	-0.02 (0.03)	-0.16 (0.23)	-0.10 (0.21)
Rural area of living in t_0				
No	reference	reference	reference	reference
Yes	0.03 (0.06)	-0.002 (0.06)	-0.47 (0.51)	-0.66 (0.50)
Number of traumatic experiences during flight				
0	reference	reference	reference	reference
1	-0.04 (0.09)	-0.01 (0.09)	-0.31 (0.68)	-0.13 (0.68)

	Employed vs. not in t ₁		ISEI in t ₁	
	M1.3	M1.6	M2.3	M2.6
	Controlling for facilitators		Controlling for facilitators	
2	-0.13 (0.11)	-0.10 (0.11)	0.29 (0.92)	0.17 (0.92)
3	0.03 (0.13)	0.11 (0.14)	-1.18 (0.86)	-1.23 (0.85)
4	0.13 (0.15)	0.21 (0.16)	0.51 (1.40)	0.70 (1.36)
5	0.002 (0.24)	-0.09 (0.25)	0.58 (0.95)	0.23 (1.09)
6	0.95 (0.55)	1.00* (0.49)	-2.38 (2.28)	-2.71 (2.25)
7	0.39 (0.79)	0.02 (0.77)	-1.79 (0.94)	-3.56** (1.10)
Information missing on traumatic experiences	-0.16* (0.07)	-0.12 (0.07)	-0.42 (0.65)	-0.11 (0.64)
Work experience before migration				
No work experience	reference	reference	reference	reference
Yes, work experience	0.38*** (0.08)	0.42*** (0.08)	-1.70* (0.74)	-1.43 (0.73)
Survey year				
2017	-0.05 (0.17)	-0.16 (0.18)	2.14 (1.76)	2.89 (1.75)
2018	-0.06 (0.14)	-0.03 (0.15)	2.03 (1.14)	2.58* (1.14)
2019	-0.04 (0.12)	-0.05 (0.12)	1.89* (0.88)	2.25* (0.89)
2020	-0.30** (0.10)	-0.20* (0.10)	1.32 (0.73)	1.26 (0.73)
2021	-	-	-	-
Mental health index	-	0.01** (0.00)	-	-0.03 (0.03)
Physical health index	-	0.02*** (0.00)	-	-0.01 (0.03)
Contact with persons of same origin				
Never	-	reference	-	reference
1	-	0.18 (0.13)	-	-2.03* (1.01)
2	-	0.36** (0.13)	-	-1.68 (0.97)
3	-	0.16 (0.11)	-	-1.60 (0.87)
4	-	-0.11 (0.12)	-	-2.55** (1.00)
Daily	-	-0.22 (0.13)	-	-3.30*** (1.00)
Contact with Germans				
Never	-	reference	-	reference
1	-	-0.07 (0.11)	-	0.40 (1.06)
2	-	-0.003 (0.13)	-	1.83 (1.26)
3	-	0.16 (0.11)	-	1.58 (1.04)
4	-	0.41*** (0.10)	-	1.56 (1.02)
Daily	-	1.54*** (0.09)	-	0.97 (0.79)
Additive index of German language proficiency	-	0.06*** (0.01)	-	0.93*** (0.14)
_cons	-2.11***	-4.97***	10.39***	3.27

	Employed vs. not in t_1		ISEI in t_1	
	M1.3	M1.6	M2.3	M2.6
	Controlling for facilitators		Controlling for facilitators	
	(0.28)	(0.42)	(2.89)	(4.36)
<i>N</i>	9,598	9,598	2,019	2,019

Table shows β -coefficients and standard errors in parentheses.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

OLS and logit models with clustered standard errors.

Table A1 Physical leisure and type of occupation – Full table

High vs. low Overall Physical Exposure Index (OPI) in t1 Controlling for facilitators				
	M3.1	M3.2	M3.4	M3.5
Engaging in sports (weekly) in t ₀	0.09 (0.17)	- -	0.05 (0.18)	- -
Daily hours in sports in t ₀	- -	0.14 (0.09)	- -	0.15 (0.09)
Gender				
Female	reference	reference	reference	reference
Male	1.50*** (0.45)	1.74*** (0.46)	1.50** (0.47)	1.77*** (0.49)
Education at immigration				
Compulsory, no degree	0.47* (0.20)	0.47* (0.20)	0.34 (0.21)	0.37 (0.20)
Compulsory, degree	0.22 (0.20)	0.31 (0.20)	0.13 (0.21)	0.24 (0.20)
Secondary school degree	reference	reference	reference	reference
Other school degree	0.14 (0.37)	0.07 (0.35)	0.17 (0.40)	0.13 (0.37)
Information on education missing	0.15 (0.28)	0.18 (0.25)	0.07 (0.28)	0.13 (0.26)
Number of children in HH in t ₀	-0.004 (0.06)	-0.01 (0.06)	0.001 (0.06)	-0.01 (0.06)
Marital status in t0				
Not married	reference	reference	reference	reference
Married	0.09 (0.22)	0.04 (0.20)	0.07 (0.22)	0.03 (0.21)
Legal status in t0				
Secure	reference	reference	reference	reference
Non-secure	0.05 (0.26)	-0.02 (0.24)	0.02 (0.25)	-0.04 (0.23)
Country of origin				
Eastern Europe	0.70 (0.38)	0.82* (0.34)	0.72 (0.38)	0.87* (0.35)
MENA	reference	reference	reference	reference
Asia	0.09 (0.25)	0.15 (0.25)	0.04 (0.25)	0.11 (0.25)
Africa	0.11 (0.29)	-0.03 (0.27)	0.12 (0.29)	-0.01 (0.27)
Years since migration	-0.14 (0.11)	-0.13 (0.11)	-0.12 (0.11)	-0.12 (0.11)
Age	0.01 (0.01)	0.01 (0.01)	0.01 (0.02)	0.01 (0.01)
Overall Physical Exposure (OPI) in t0				
Low	reference	reference	reference	reference
High	3.06*** (0.18)	3.04*** (0.17)	3.09*** (0.19)	3.07*** (0.18)
Daily hours in other leisure in t ₀	- -	-0.15 (0.08)	- -	-0.15 (0.08)
Rural area of living in t0				
No	reference	reference	reference	reference
Yes	0.22 (0.17)	0.23 (0.16)	0.23 (0.17)	0.23 (0.16)
Number of traumatic experiences during flight				
0	reference	reference	reference	reference
1	0.08 (0.21)	-0.003 (0.21)	0.08 (0.21)	-0.002 (0.21)
2	-0.31	-0.35	-0.32	-0.33

High vs. low Overall Physical Exposure Index (OPI) in t1 Controlling for facilitators				
	M3.1	M3.2	M3.4	M3.5
3	(0.28) 0.03 (0.31)	(0.26) -0.02 (0.30)	(0.28) 0.03 (0.32)	(0.26) 0.02 (0.31)
4	0.11 (0.38)	0.18 (0.37)	0.17 (0.37)	0.23 (0.36)
5	-0.34 (0.95)	-0.13 (0.82)	-0.29 (0.87)	-0.12 (0.77)
6	1.64* (0.83)	1.51 (0.84)	1.68* (0.79)	1.52 (0.80)
7	- -	- -	- -	- -
Information missing on traumatic experiences	-0.23 (0.21)	-0.32 (0.20)	-0.25 (0.21)	-0.32 (0.20)
Work experience before migration				
No work experience	reference	reference	reference	reference
Yes, work experience	0.17 (0.25)	0.05 (0.23)	0.15 (0.25)	0.04 (0.23)
Survey year				
2017	- -	-0.60 (0.53)	- -	-0.61 (0.54)
2018	-0.46 (0.38)	-0.47 (0.37)	-0.42 (0.39)	-0.43 (0.38)
2019	-0.46 (0.29)	-0.50 (0.28)	-0.45 (0.30)	-0.48 (0.29)
2020	-0.29 (0.23)	-0.35 (0.22)	-0.22 (0.24)	-0.28 (0.22)
2021	- -	- -	- -	- -
Mental health index	- -	- -	0.004 (0.01)	0.01 (0.01)
Physical health index	- -	- -	0.001 (0.01)	0.001 (0.01)
Contact with persons of same origin				
Never	-	-	reference	reference
1	- -	- -	-0.05 (0.32)	-0.23 (0.30)
2	- -	- -	-0.06 (0.29)	-0.11 (0.28)
3	- -	- -	-0.04 (0.28)	-0.11 (0.25)
4	- -	- -	0.12 (0.31)	0.01 (0.28)
Daily	- -	- -	-0.28 (0.34)	-0.34 (0.31)
Contact with Germans				
Never	-	-	reference	reference
1	- -	- -	-0.37 (0.39)	-0.36 (0.37)
2	- -	- -	-0.32 (0.47)	-0.40 (0.46)
3	- -	- -	0.28 (0.37)	0.28 (0.36)
4	- -	- -	0.03 (0.36)	-0.06 (0.35)
Daily	- -	- -	0.39 (0.29)	0.34 (0.28)
Additive index of German language proficiency	- -	- -	-0.08* (0.04)	-0.06 (0.04)
_cons	-3.51*** (0.88)	-3.50*** (0.89)	-3.06* (1.32)	-3.48** (1.33)

High vs. low Overall Physical Exposure Index (OPI) in t1 Controlling for facilitators				
	M3.1	M3.2	M3.4	M3.5
<i>N</i>	1,479	1,666	1,479	1,666

Table shows β -coefficients and standard errors in parentheses.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Logit models with clustered standard errors.

Table A9 Physical leisure and type of occupation – Including squared term of daily hours of physical leisure – Full table

	High vs. low Overall Physical Exposure Index (OPI) in t1 Controlling for facilitators	
	M3.3	M3.6
Daily hours in sports in t ₀	0.44 [*] (0.19)	0.48 [*] (0.19)
Squared term of daily hours in sports in t ₀	-0.11 (0.06)	-0.13 [*] (0.06)
Gender		
Female	reference	reference
Male	1.71 ^{***} (0.45)	1.73 ^{***} (0.49)
Education at immigration		
Compulsory, no degree	0.51 [*] (0.20)	0.40 (0.21)
Compulsory, degree	0.32 (0.20)	0.25 (0.21)
Secondary school degree	reference	reference
Other school degree	0.08 (0.35)	0.13 (0.37)
Information on education missing	0.20 (0.25)	0.15 (0.26)
Number of children in HH in t ₀	-0.01 (0.06)	-0.004 (0.06)
Marital status in t0		
Not married	reference	reference
Married	0.06 (0.20)	0.05 (0.21)
Legal status in t0		
Secure	reference	reference
Non-secure	-0.002 (0.23)	-0.02 (0.23)
Country of origin		
Eastern Europe	0.79 [*] (0.34)	0.85 [*] (0.35)
MENA	reference	reference
Asia	0.15 (0.25)	0.11 (0.24)
Africa	-0.04 (0.27)	-0.02 (0.27)
Years since migration	-0.13 (0.11)	-0.11 (0.11)
Age	0.02 (0.01)	0.01 (0.01)
Overall Physical Exposure (OPI)/Heavy Work Index in t0		
Low	reference	reference
High	3.06 ^{***} (0.17)	3.08 ^{***} (0.18)
Daily hours in other leisure in t ₀	-0.14 (0.08)	-0.14 (0.08)
Rural area of living in t0		
No	reference	reference
Yes	0.23 (0.16)	0.23 (0.16)
Number of traumatic experiences during flight		
0	reference	reference
1	0.02 (0.21)	0.02 (0.21)
2	-0.33	-0.31

	High vs. low Overall Physical Exposure Index (OPI) in t1 Controlling for facilitators	
	M3.3	M3.6
	(0.26)	(0.26)
3	-0.03	0.01
	(0.30)	(0.30)
4	0.21	0.27
	(0.37)	(0.36)
5	-0.14	-0.12
	(0.81)	(0.75)
6	1.55	1.59*
	(0.84)	(0.80)
7	-	-
	-	-
Information missing on traumatic experiences	-0.32	-0.32
	(0.20)	(0.20)
Work experience before migration		
No work experience	reference	reference
Yes, work experience	0.05	0.04
	(0.23)	(0.23)
Survey year		
2017	-0.58	-0.58
	(0.53)	(0.54)
2018	-0.45	-0.40
	(0.38)	(0.38)
2019	-0.50	-0.47
	(0.28)	(0.29)
2020	-0.36	-0.28
	(0.22)	(0.23)
2021	-	-
	-	-
Mental health index	-	0.01
	-	(0.01)
Physical health index	-	0.001
	-	(0.01)
Contact with persons of same origin		
Never	-	reference
1	-	-0.25
	-	(0.30)
2	-	-0.09
	-	(0.28)
3	-	-0.12
	-	(0.25)
4	-	0.01
	-	(0.28)
Daily	-	-0.35
	-	(0.31)
Contact with Germans		
Never	-	reference
1	-	-0.40
	-	(0.37)
2	-	-0.45
	-	(0.47)
3	-	0.25
	-	(0.36)
4	-	-0.07
	-	(0.35)
Daily	-	0.32
	-	(0.28)
Additive index of German language proficiency	-	-0.06
	-	(0.04)
_cons	-3.66***	-3.55**
	(0.91)	(1.33)

	High vs. low Overall Physical Exposure Index (OPI) in t1 Controlling for facilitators	
	M3.3	M3.6
<i>N</i>	1,666	1,666

Table shows β -coefficients and standard errors in parentheses.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Logit models with clustered standard errors.

Table A10 Structural Equation Models (SEM) – Weekly engagement in physical leisure

	Employed vs. not in t1	ISEI in t1	High vs. low Overall Physical Exposure Index (OPI) in t1
	SEM1.1	SEM2.1	SEM3.1
Outcome: Labor market outcome			
Engaging in sports (weekly) in t ₀	0.08 (0.07)	0.08 (0.49)	0.05 (0.18)
Gender			
Female	reference	reference	reference
Male	1.16*** (0.09)	0.24 (0.94)	1.50** (0.47)
Education at immigration			
Compulsory, no degree	-0.12 (0.09)	-1.48* (0.58)	0.34 (0.21)
Compulsory, degree	0.04 (0.09)	-1.77* (0.69)	0.13 (0.21)
Secondary school degree	reference	reference	reference
Other school degree	-0.23 (0.20)	0.05 (1.90)	0.17 (0.40)
Information on education missing	-0.29* (0.11)	1.57 (0.83)	0.07 (0.28)
Number of children in HH in t ₀	-0.14*** (0.03)	-0.20 (0.20)	0.001 (0.06)
Marital status in t0			
Not married	reference	reference	reference
Married	0.01 (0.09)	0.45 (0.70)	0.07 (0.22)
Legal status in t0			
Secure	reference	reference	reference
Non-secure	-0.33*** (0.09)	1.72* (0.75)	0.02 (0.25)
Country of origin			
Eastern Europe	0.56* (0.23)	-5.40*** (1.35)	0.72 (0.38)
MENA	reference	reference	reference
Asia	0.16 (0.11)	-2.24** (0.80)	0.04 (0.25)
Africa	0.47*** (0.12)	-2.64*** (0.71)	0.12 (0.29)
Years since migration	0.14** (0.05)	0.38 (0.32)	-0.12 (0.11)
Age	-0.003 (0.01)	0.04 (0.05)	0.01 (0.02)
Employment status in t0			
Not employed	reference	-	-
Employed	2.08*** (0.08)	-	-
ISEI in t ₀	-	0.64*** (0.03)	-
Overall Physical Exposure (OPI) in t0			
Low	-	-	reference
High	-	-	3.09*** (0.19)
Rural area of living in t0			
No	reference	reference	reference
Yes	-0.01 (0.07)	-0.88 (0.51)	0.23 (0.17)
Number of traumatic experiences during flight			
0	reference	reference	reference
1	-0.08 (0.10)	-0.13 (0.65)	0.08 (0.21)
2	-0.19 (0.13)	0.31 (0.94)	-0.32 (0.28)

	Employed vs. not in t1	ISEI in t1	High vs. low Overall Physical Exposure Index (OPI) in t1
	SEM1.1	SEM2.1	SEM3.1
3	0.05 (0.16)	-1.21 (0.88)	0.03 (0.32)
4	0.21 (0.17)	0.62 (1.33)	0.17 (0.37)
5	-0.03 (0.29)	0.17 (1.10)	-0.29 (0.87)
6	0.62 (0.72)	-2.63 (2.21)	1.68* (0.79)
7	0.02 (0.78)	-3.48** (1.07)	13.74*** (1.08)
Information missing on traumatic experiences	-0.16* (0.08)	-0.21 (0.64)	-0.25 (0.21)
Work experience before migration			
No work experience	reference	reference	reference
Yes, work experience	0.42*** (0.09)	-1.42* (0.72)	0.15 (0.25)
Survey year			
2017	- -	- -	- -
2018	-0.26 (0.17)	1.99 (1.19)	-0.42 (0.39)
2019	-0.24 (0.14)	1.80 (0.92)	-0.45 (0.30)
2020	-0.35** (0.11)	1.07 (0.75)	-0.22 (0.24)
2021	reference	reference	reference
Mental health index	0.01* (0.00)	-0.02 (0.02)	0.004 (0.01)
Physical health index	0.02*** (0.00)	-0.01 (0.03)	0.001 (0.01)
Contact with persons of same origin			
Never	reference	reference	reference
1	0.13 (0.14)	-2.00 (1.03)	-0.05 (0.32)
2	0.38** (0.14)	-1.48 (1.00)	-0.06 (0.29)
3	0.10 (0.13)	-1.55 (0.92)	-0.04 (0.28)
4	-0.12 (0.14)	-2.39* (1.04)	0.12 (0.31)
Daily	-0.18 (0.14)	-3.09** (1.04)	-0.28 (0.34)
Contact with Germans			
Never	reference	reference	reference
1	-0.09 (0.12)	-0.27 (1.07)	-0.37 (0.39)
2	-0.01 (0.14)	1.56 (1.25)	-0.32 (0.47)
3	0.18 (0.12)	0.62 (0.97)	0.28 (0.37)
4	0.43*** (0.12)	1.74 (1.07)	0.03 (0.36)
Daily	1.52*** (0.10)	0.64 (0.82)	0.39 (0.29)
Additive index of German language proficiency	0.06*** (0.01)	0.86*** (0.14)	-0.08* (0.04)
_cons	-4.44*** (0.48)	4.49 (4.37)	-3.06* (1.32)
Outcome: Contact with persons of same origin			
Engaging in sports (weekly) in t ₀ (vs. not)	0.15** (0.05)	-0.02 (0.09)	0.03 (0.10)
Outcome: Contact with Germans			
Engaging in sports (weekly) in t ₀ (vs. not)	0.56*** (0.05)	0.34*** (0.10)	0.36*** (0.11)
Outcome: Additive index of German language proficiency			

	Employed vs. not in t1	ISEI in t1	High vs. low Overall Physical Exposure Index (OPI) in t1
	SEM1.1	SEM2.1	SEM3.1
Engaging in sports (weekly) in t ₀ (vs. not)	1.07*** (0.07)	0.65*** (0.13)	0.63*** (0.14)
_cons	6.74*** (0.06)	8.00*** (0.10)	8.03*** (0.11)
Outcome: Mental health index			
Engaging in sports (weekly) in t ₀ (vs. not)	0.96** (0.30)	1.00 (0.53)	0.62 (0.58)
_cons	49.52*** (0.20)	51.04*** (0.38)	51.45*** (0.41)
Outcome: Physical health index			
Engaging in sports (weekly) in t ₀ (vs. not)	2.49*** (0.26)	1.62*** (0.40)	1.84*** (0.42)
_cons	52.68*** (0.19)	54.83*** (0.31)	54.89*** (0.34)
Outcome: Engaging in sports (weekly) in t0			
Gender			
Female	reference	reference	reference
Male	0.97*** (0.08)	0.83*** (0.23)	0.96*** (0.26)
Education at immigration			
Compulsory, no degree	-0.18* (0.08)	-0.18 (0.17)	-0.27 (0.18)
Compulsory, degree	-0.08 (0.09)	0.06 (0.17)	0.002 (0.18)
Secondary school degree	reference	reference	reference
Other school degree	0.04 (0.20)	-0.14 (0.43)	-0.26 (0.46)
Information on education missing	-0.45*** (0.11)	-0.28 (0.23)	-0.35 (0.26)
Number of children in HH in t ₀	-0.06** (0.02)	-0.06 (0.05)	-0.06 (0.06)
Marital status in t0			
Not married	reference	reference	reference
Married	-0.28*** (0.08)	-0.26 (0.17)	-0.27 (0.18)
Legal status in t0			
Secure	reference	reference	reference
Non-secure	0.15 (0.08)	0.29 (0.17)	0.25 (0.19)
Country of origin			
Eastern Europe	-0.38 (0.23)	-0.24 (0.35)	-0.43 (0.37)
MENA	reference	reference	reference
Asia	0.34*** (0.10)	0.29 (0.20)	0.15 (0.21)
Africa	0.32** (0.11)	0.57** (0.22)	0.49* (0.24)
Years since migration	0.01 (0.05)	0.01 (0.09)	0.05 (0.10)
Age	-0.03*** (0.01)	-0.04*** (0.01)	-0.04** (0.01)
Employment status in t0			
Not employed	reference	-	-
Employed	-0.10 (0.07)	-	-
ISEI in t ₀	-	0.01** (0.00)	-
Overall Physical Exposure (OPI) in t0			
Low	-	-	reference
High	-	-	-0.15 (0.15)
Rural area of living in t0			
No	reference	reference	reference

	Employed vs. not in t1	ISEI in t1	High vs. low Overall Physical Exposure Index (OPI) in t1
	SEM1.1	SEM2.1	SEM3.1
Yes	-0.08 (0.07)	0.08 (0.14)	0.08 (0.15)
Number of traumatic experiences during flight			
0	reference	reference	reference
1	-0.16 (0.10)	-0.01 (0.19)	0.09 (0.20)
2	-0.10 (0.13)	-0.28 (0.25)	-0.47 (0.29)
3	-0.36* (0.14)	-0.52* (0.24)	-0.50 (0.26)
4	-0.26 (0.18)	-0.13 (0.26)	-0.08 (0.28)
5	-0.11 (0.28)	0.48 (0.55)	0.43 (0.72)
6	-0.53 (0.45)	-0.62 (0.68)	-0.65 (0.69)
7	0.85 (0.98)	12.60*** (1.04)	14.73*** (1.05)
Information missing on traumatic experiences	-0.22** (0.08)	-0.09 (0.17)	-0.04 (0.18)
Work experience before migration			
No work experience	reference	reference	reference
Yes, work experience	0.05 (0.08)	0.07 (0.18)	-0.06 (0.21)
Survey year			
2017	- -	- -	- -
2018	-0.42** (0.16)	-0.47 (0.30)	-0.39 (0.33)
2019	-0.51*** (0.12)	-0.59** (0.22)	-0.56* (0.24)
2020	0.01 (0.07)	-0.07 (0.13)	-0.03 (0.15)
2021	reference	reference	reference
_cons	0.53 (0.32)	0.62 (0.71)	0.69 (0.77)
Contact with persons of same origin			
Cut1	-2.20*** (0.05)	-2.43*** (0.11)	-2.38*** (0.12)
Cut2	-1.13*** (0.04)	-1.24*** (0.08)	-1.18*** (0.08)
Cut3	-0.42*** (0.03)	-0.46*** (0.07)	-0.39*** (0.08)
Cut4	0.74*** (0.03)	0.84*** (0.08)	0.89*** (0.08)
Cut5	1.82*** (0.04)	1.76*** (0.09)	1.83*** (0.10)
Contact with Germans			
Cut1	-1.27*** (0.04)	-2.19*** (0.10)	-2.18*** (0.11)
Cut2	-0.44*** (0.03)	-1.38*** (0.08)	-1.43*** (0.09)
Cut3	-0.11** (0.03)	-1.02*** (0.08)	-1.05*** (0.09)
Cut4	0.51*** (0.03)	-0.46*** (0.07)	-0.47*** (0.08)
Cut5	1.11*** (0.04)	0.01 (0.07)	-0.003 (0.07)
var(ISEI)	- -	103.00*** (7.12)	- -
var(Additive index of German language proficiency)	7.23*** (0.14)	5.10*** (0.19)	5.17*** (0.21)
var(Mental health index)	112.10*** (2.56)	92.89*** (3.83)	92.26*** (4.36)
Var(Physical health index)	83.74***	54.36***	51.75***

	Employed vs. not in t1	ISEI in t1	High vs. low Overall Physical Exposure Index (OPI) in t1
	SEM1.1	SEM2.1	SEM3.1
<i>N</i>	(2.39)	(3.30)	(3.52)
	7,374	1,822	1,482

Table shows β -coefficients and standard errors in parentheses.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Structural Equation Models with maximum likelihood estimation. Dependent variables of employment status and OPI modeled as binomial, logit and dependent variable of ISEI modeled as Gaussian, identity. Models with clustered standard errors.

Table A11 SEM – Daily hours in physical leisure

	Employed vs. not in t1	ISEI in t1	High vs. low Overall Physical Exposure Index (OPI) in t1
	SEM1.2	SEM2.2	SEM3.2
Outcome: Labor market outcome			
Daily hours in sports in t ₀	0.04 (0.04)	-0.21 (0.32)	0.15 (0.09)
Gender			
Female	reference	reference	reference
Male	1.19*** (0.08)	0.84 (0.94)	1.77*** (0.49)
Education at immigration			
Compulsory, no degree	-0.17* (0.08)	-1.89** (0.58)	0.37 (0.20)
Compulsory, degree	-0.03 (0.08)	-1.95** (0.68)	0.24 (0.20)
Secondary school degree	reference	reference	reference
Other school degree	-0.34* (0.17)	-1.03 (1.74)	0.13 (0.37)
Information on education missing	-0.34*** (0.10)	1.01 (0.81)	0.13 (0.26)
Number of children in HH in t ₀	-0.14*** (0.02)	-0.30 (0.18)	-0.01 (0.06)
Marital status in t0			
Not married	reference	reference	reference
Married	-0.06 (0.08)	0.41 (0.66)	0.03 (0.21)
Legal status in t0			
Secure	reference	reference	reference
Non-secure	-0.35*** (0.08)	1.66* (0.75)	-0.04 (0.23)
Country of origin			
Eastern Europe	0.73*** (0.20)	-6.09*** (1.45)	0.87* (0.35)
MENA	reference	reference	reference
Asia	0.12 (0.10)	-2.21** (0.78)	0.11 (0.24)
Africa	0.51*** (0.10)	-2.85*** (0.76)	-0.01 (0.27)
Years since migration	0.18*** (0.04)	0.52 (0.32)	-0.12 (0.11)
Age	-0.003 (0.01)	0.05 (0.05)	0.01 (0.01)
Employment status in t0			
Not employed	reference	-	-
Employed	1.99*** (0.07)	-	-
ISEI in t ₀	-	0.62*** (0.03)	-
Overall Physical Exposure (OPI) in t0			
Low	-	-	reference
High	-	-	3.07*** (0.18)
Daily hours in other leisure in t ₀	-0.02 (0.03)	-0.10 (0.21)	-0.15 (0.08)
Rural area of living in t0			
No	reference	reference	reference
Yes	-0.002 (0.06)	-0.67 (0.50)	0.23 (0.16)
Number of traumatic experiences during flight			
0	reference	reference	reference
1	-0.02 (0.09)	-0.17 (0.67)	-0.001 (0.21)
2	-0.11	0.13	-0.33

	Employed vs. not in t1	ISEI in t1	High vs. low Overall Physical Exposure Index (OPI) in t1
	SEM1.2	SEM2.2	SEM3.2
3	(0.11) 0.09 (0.14)	(0.90) -1.22 (0.84)	(0.26) 0.01 (0.30)
4	0.19 (0.16)	0.64 (1.34)	0.23 (0.36)
5	-0.11 (0.24)	0.30 (1.09)	-0.12 (0.77)
6	0.93 (0.48)	-2.74 (2.22)	1.52 (0.81)
7	0.08 (0.77)	-3.44** (1.05)	12.87*** (1.07)
Information missing on traumatic experiences	-0.12 (0.07)	-0.12 (0.63)	-0.32 (0.20)
Work experience before migration			
No work experience	reference	reference	reference
Yes, work experience	0.42*** (0.08)	-1.41 (0.72)	0.04 (0.23)
Survey year			
2017	-0.18 (0.18)	2.91 (1.73)	-0.61 (0.54)
2018	-0.05 (0.15)	2.58* (1.13)	-0.43 (0.38)
2019	-0.08 (0.12)	2.25* (0.88)	-0.48 (0.29)
2020	-0.22* (0.10)	1.28 (0.72)	-0.28 (0.22)
2021	reference	reference	reference
Mental health index	0.01* (0.00)	-0.03 (0.02)	0.01 (0.01)
Physical health index	-	-	-
Contact with persons of same origin			
Never	reference	reference	reference
1	0.18 (0.13)	-2.01* (1.00)	-0.23 (0.30)
2	0.36** (0.13)	-1.69 (0.96)	-0.11 (0.28)
3	0.17 (0.11)	-1.58 (0.86)	-0.12 (0.25)
4	-0.10 (0.12)	-2.54** (0.96)	0.01 (0.28)
Daily	-0.21 (0.13)	-3.32*** (0.96)	-0.34 (0.31)
Contact with Germans			
Never	reference	reference	reference
1	-0.07 (0.11)	0.48 (1.04)	-0.37 (0.37)
2	-0.01 (0.13)	1.92 (1.24)	-0.40 (0.46)
3	0.16 (0.11)	1.67 (1.02)	0.28 (0.36)
4	0.40*** (0.10)	1.62 (1.00)	-0.06 (0.35)
Daily	1.55*** (0.09)	1.04 (0.77)	0.34 (0.28)
Additive index of German language proficiency	0.06*** (0.01)	0.93*** (0.14)	-0.06 (0.04)
_cons	-3.86*** (0.35)	2.90 (3.55)	-3.41*** (1.14)
Outcome: Contact with persons of same origin			
Daily hours in sports in t ₀	0.13*** (0.02)	0.07 (0.05)	0.06 (0.06)
Outcome: Contact with Germans			
Daily hours in sports in t ₀	0.26*** (0.03)	0.09 (0.06)	0.09 (0.07)
Outcome: Additive index of German language proficiency			

	Employed vs. not in t1	ISEI in t1	High vs. low Overall Physical Exposure Index (OPI) in t1
	SEM1.2	SEM2.2	SEM3.2
Daily hours in sports in t ₀	0.59*** (0.06)	0.30*** (0.07)	0.29*** (0.09)
_cons	6.63*** (0.06)	8.06*** (0.09)	8.08*** (0.10)
Outcome: Mental health index			
Daily hours in sports in t ₀	0.43* (0.19)	0.09 (0.30)	-0.21 (0.31)
_cons	49.31*** (0.19)	51.33*** (0.34)	51.75*** (0.36)
Outcome: Physical health index			
Daily hours in sports in t ₀	-	-	-
_cons	-	-	-
Outcome: Daily hours in sports in t₀			
Gender			
Female	reference	reference	reference
Male	0.32*** (0.02)	0.25*** (0.07)	0.22** (0.07)
Education at immigration			
Compulsory, no degree	-0.01 (0.02)	0.07 (0.05)	0.04 (0.06)
Compulsory, degree	0.001 (0.03)	0.07 (0.05)	0.06 (0.05)
Secondary school degree	reference	reference	reference
Other school degree	0.07 (0.06)	0.10 (0.09)	0.08 (0.10)
Information on education missing	-0.06* (0.03)	0.003 (0.06)	-0.01 (0.07)
Number of children in HH in t ₀	-0.02** (0.01)	-0.02 (0.02)	-0.02 (0.02)
Marital status in t₀			
Not married	reference	reference	reference
Married	-0.15*** (0.03)	-0.15** (0.05)	-0.15* (0.06)
Legal status in t₀			
Secure	reference	reference	reference
Non-secure	-0.001 (0.02)	0.05 (0.06)	0.02 (0.06)
Country of origin			
Eastern Europe	-0.07 (0.05)	-0.03 (0.09)	-0.03 (0.09)
MENA	reference	reference	reference
Asia	0.05 (0.03)	0.02 (0.06)	-0.09 (0.06)
Africa	0.03 (0.03)	0.11 (0.07)	0.06 (0.08)
Years since migration	-0.003 (0.01)	0.004 (0.02)	0.02 (0.03)
Age	-0.01*** (0.00)	-0.01*** (0.00)	-0.01** (0.00)
Employment status in t₀			
Not employed	reference	-	-
Employed	-0.08*** (0.02)	-	-
ISEI in t ₀	-	0.003* (0.00)	-
Overall Physical Exposure (OPI) in t₀			
Low	-	-	reference
High	-	-	0.0001 (0.04)
Daily hours in other leisure in t ₀	0.13*** (0.01)	0.18*** (0.02)	0.21*** (0.03)
Rural area of living in t₀			
No	reference	reference	reference
Yes	-0.05* (0.02)	-0.01 (0.02)	-0.01 (0.02)

	Employed vs. not in t1	ISEI in t1	High vs. low Overall Physical Exposure Index (OPI) in t1
	SEM1.2	SEM2.2	SEM3.2
	(0.02)	(0.04)	(0.04)
<i>Number of traumatic experiences during flight</i>			
0	reference	reference	reference
1	-0.01 (0.03)	0.01 (0.06)	-0.002 (0.06)
2	0.05 (0.04)	0.06 (0.08)	0.004 (0.09)
3	-0.04 (0.04)	-0.09 (0.07)	-0.06 (0.07)
4	-0.0001 (0.06)	-0.01 (0.10)	-0.02 (0.11)
5	-0.03 (0.08)	0.14 (0.16)	0.18 (0.28)
6	0.37 (0.21)	0.62 (0.34)	0.60 (0.34)
7	-0.17 (0.27)	0.18* (0.09)	0.24* (0.10)
Information missing on traumatic experiences	-0.003 (0.02)	-0.01 (0.05)	-0.003 (0.05)
<i>Work experience before migration</i>			
No work experience	reference	reference	reference
Yes, work experience	0.03 (0.02)	0.02 (0.06)	0.04 (0.06)
<i>Survey year</i>			
2017	-0.03 (0.05)	0.09 (0.11)	0.18 (0.12)
2018	0.02 (0.04)	0.01 (0.09)	0.08 (0.09)
2019	0.03 (0.03)	0.07 (0.07)	0.08 (0.07)
2020	0.04 (0.03)	0.05 (0.05)	0.07 (0.05)
2021	reference	reference	reference
_cons	0.73*** (0.08)	0.62** (0.20)	0.61** (0.20)
<i>Contact with persons of same origin</i>			
Cut1	-2.13*** (0.04)	-2.32*** (0.10)	-2.29*** (0.11)
Cut2	-1.09*** (0.03)	-1.16*** (0.07)	-1.14*** (0.08)
Cut3	-0.42*** (0.03)	-0.40*** (0.07)	-0.37*** (0.07)
Cut4	0.68*** (0.03)	0.88*** (0.07)	0.88*** (0.08)
Cut5	1.73*** (0.04)	1.81*** (0.08)	1.83*** (0.09)
<i>Contact with Germans</i>			
Cut1	-1.34*** (0.04)	-2.31*** (0.10)	-2.31*** (0.11)
Cut2	-0.54*** (0.03)	-1.49*** (0.08)	-1.55*** (0.09)
Cut3	-0.23*** (0.03)	-1.15** (0.07)	-1.19*** (0.08)
Cut4	0.39*** (0.03)	-0.59*** (0.07)	-0.61*** (0.07)
Cut5	1.05*** (0.03)	-0.11 (0.07)	-0.13 (0.07)
var(ISEI)	-	109.40*** (7.19)	-
var(Additive index of German language proficiency)	7.51*** (0.13)	5.18*** (0.19)	5.24*** (0.21)
var(Mental health index)	117.70*** (2.87)	95.50*** (3.70)	94.56*** (4.12)
Var(Daily hours in sport in t ₀)	0.55*** (0.02)	0.57*** (0.04)	0.55*** (0.04)

	Employed vs. not in t1	ISEI in t1	High vs. low Overall Physical Exposure Index (OPI) in t1
	SEM1.2	SEM2.2	SEM3.2
N	9,598	2,019	1,669

Table shows β -coefficients and standard errors in parentheses.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Structural Equation Models with maximum likelihood estimation. Dependent variables of employment status and OPI modeled as binomial, logit and dependent variable of ISEI modeled as Gaussian, identity. Models with clustered standard errors.

Additional note: Models including the facilitator of physical health did not converge, therefore additional models were estimated without controls (see Table A12).

Table A12 SEM – Daily hours in physical leisure – Without controls

	Employed vs. not in t1	ISEI in t1	High vs. low Overall Physical Exposure Index (OPI) in t1
	SEM1.3	SEM2.3	SEM3.3
Outcome: Labor market outcome			
Daily hours in sports in t ₀	0.11*** (0.03)	-0.20 (0.39)	0.10 (0.07)
Mental health index	0.01*** (0.00)	-0.05 (0.04)	0.02* (0.01)
Physical health index	0.03*** (0.00)	0.01 (0.05)	-0.003 (0.01)
Contact with persons of same origin			
Never	reference	reference	reference
1	0.23* (0.11)	-0.37 (1.44)	-0.32 (0.25)
2	0.36*** (0.11)	-0.04 (1.55)	-0.21 (0.24)
3	0.33*** (0.10)	-2.02 (1.34)	-0.06 (0.23)
4	0.002 (0.11)	-1.66 (1.45)	-0.06 (0.25)
Daily	-0.13 (0.11)	-4.37** (1.36)	-0.31 (0.26)
Contact with Germans			
Never	reference	reference	reference
1	0.09 (0.09)	0.71 (1.34)	-0.16 (0.28)
2	0.13 (0.12)	4.01* (1.85)	-0.31 (0.32)
3	0.24* (0.09)	3.19* (1.44)	0.04 (0.26)
4	0.44*** (0.09)	1.99 (1.31)	-0.18 (0.25)
Daily	1.67*** (0.08)	2.25* (1.08)	0.24 (0.21)
Additive index of German language proficiency	0.14*** (0.01)	2.46*** (0.20)	-0.11*** (0.03)
_cons	-4.79*** (0.26)	10.93** (4.20)	-0.80 (0.73)
Outcome: Contact with persons of same origin			
Daily hours in sports in t ₀	0.13*** (0.02)	0.07 (0.05)	0.06 (0.06)
Outcome: Contact with Germans			
Daily hours in sports in t ₀	0.26*** (0.03)	0.09 (0.06)	0.09 (0.07)
Outcome: Additive index of German language proficiency			
Daily hours in sports in t ₀	0.59*** (0.04)	0.30*** (0.07)	0.29*** (0.09)
_cons	6.63*** (0.05)	8.06*** (0.09)	8.08*** (0.09)
Outcome: Mental health index			
Daily hours in sports in t ₀	0.43** (0.16)	0.09 (0.30)	-0.21 (0.31)
_cons	49.31*** (0.18)	51.33*** (0.34)	51.75*** (0.36)
Outcome: Physical health index			
Daily hours in sports in t ₀	1.27*** (0.14)	0.66** (0.21)	0.85*** (0.22)
_cons	52.92*** (0.17)	55.15*** (0.26)	55.16*** (0.28)
Contact with persons of same origin			
Cut1	-2.13*** (0.04)	-2.32*** (0.10)	-2.29*** (0.11)
Cut2	-1.09*** (0.03)	-1.16*** (0.07)	-1.14*** (0.08)
Cut3	-0.42***	-0.40***	-0.37***

	Employed vs. not in t1	ISEI in t1	High vs. low Overall Physical Exposure Index (OPI) in t1
	SEM1.3	SEM2.3	SEM3.3
Cut4	(0.03) 0.68***	(0.07) 0.88***	(0.07) 0.88***
Cut5	(0.03) 1.73***	(0.07) 1.81***	(0.08) 1.83***
	(0.04)	(0.08)	(0.09)
Contact with Germans			
Cut1	-1.34*** (0.04)	-2.31*** (0.10)	-2.31*** (0.11)
Cut2	-0.54*** (0.03)	-1.49*** (0.08)	-1.55*** (0.09)
Cut3	-0.23*** (0.03)	-1.15*** (0.07)	-1.19*** (0.08)
Cut4	0.39*** (0.03)	-0.59*** (0.07)	-0.62*** (0.07)
Cut5	1.05*** (0.03)	-0.11 (0.07)	-0.13 (0.07)
var(ISEI)	- -	204.60*** (12.79)	- -
var(Additive index of German language proficiency)	7.51*** (0.13)	5.18*** (0.19)	5.24*** (0.21)
var(Mental health index)	117.70*** (2.24)	95.50*** (3.70)	94.56*** (4.12)
var(Physical health index)	84.99*** (2.07)	54.42*** (3.14)	52.26*** (3.33)
N	9,598	2,019	1,669

Table shows β -coefficients and standard errors in parentheses.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Structural Equation Models with maximum likelihood estimation. Dependent variables of employment status and OPI modeled as binomial, logit and dependent variable of ISEI modeled as Gaussian, identity. Models with clustered standard errors.

Table A13 Physical leisure and labor market outcomes by gender

	Employed vs. not in t_1 AME in p.p.		ISEI in t_1 β -coefficients		High vs. low Overall Physical Exposure Index (OPI) in t_1 AME in p.p.	
	Men	Women	Men	Women	Men	Women
	S1.1	S1.4	S2.1	S2.4	S3.1	S3.4
Engaging in sports (weekly) in t_0	3.38** (0.01)	1.56 (0.01)	0.79 (0.52)	-4.07 (2.36)	0.87 (0.02)	15.3*** (0.05)
<i>N</i>	4,690	2,678	1,645	177	1,330	66
	S1.2	S1.5	S2.2	S2.5	S3.2	S3.5
Daily hours in sports in t_0	1.49* (0.01)	0.58 (0.01)	0.08 (0.35)	-1.59 (1.47)	1.81 (0.01)	8.42 (0.11)
<i>N</i>	6,073	3,518	1,823	196	1,499	67
	S1.3	S1.6	S2.3	S2.6	S3.3	S3.6
Daily hours in sports in t_0	0.47 (0.01)	2.22 (0.01)	0.99 (0.54)	-5.17 (2.83)	5.76* (0.02)	- -
Squared term of daily hours in sports in t_0	0.39 (0.00)	-0.76 (0.01)	-0.32* (0.16)	1.71 (1.00)	-1.47 (0.01)	- -
<i>N</i>	6,073	3,518	1,823	196	1,499	67

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

OLS and logit models with clustered standard errors. Separate models by gender. Controlling for: education at immigration, number of children in the household in t_0 , marital status in t_0 , legal status in t_0 , country of origin, years since migration, age, daily hours in other leisure in t_0 , rural area of living in t_0 , traumatic experiences during flight, survey year, work experience before migration, employment status in t_0 or ISEI in t_0 or high Overall Physical Exposure (OPI) in t_0 for the respective dependent variable of labor market outcomes in t_1 .

Table A14 Physical leisure and labor market outcomes by gender – Controlling for facilitators

	Employed vs. not in t1 AME in p.p.		ISEI in t1 β-coefficients		High vs. low Overall Physical Exposure Index (OPI) in t1 AME in p.p.	
	Men	Women	Men	Women	Men	Women
	S1.7	S1.10	S2.7	S2.10	S3.7	S3.10
Engaging in sports (weekly) in t ₀	0.99 (0.01)	0.79 (0.01)	0.47 (0.50)	-5.06* (2.47)	0.18 (0.02)	- -
<i>N</i>	4,690	2,678	1,645	177	1,330	32
	S1.8	S1.11	S2.8	S2.11	S3.8	S3.11
Daily hours in sports in t ₀	0.58 (0.01)	0.18 (0.01)	-0.10 (0.34)	-1.67 (1.44)	1.84 (0.01)	- -
<i>N</i>	6,073	3,518	1,823	196	1,499	32
	S1.9	S1.12	S2.9	S2.12	S3.9	S3.12
Daily hours in sports in t ₀	-1.18 (0.01)	2.04 (0.01)	0.63 (0.53)	-5.15 (2.93)	6.19* (0.02)	- -
Squared term of daily hours in sports in t ₀	0.66 (0.00)	-0.85 (0.01)	-0.26 (0.15)	1.65 (1.07)	-1.67* (0.01)	- -
<i>N</i>	6,073	3,518	1,823	196	1,499	32

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

OLS and logit models with clustered standard errors. Separate models by gender. Controlling for: education at immigration, number of children in the household in t₀, marital status in t₀, legal status in t₀, country of origin, years since migration, age, daily hours in other leisure in t₀, rural area of living in t₀, traumatic experiences during flight, work experience before migration, survey year, facilitators: physical health index, mental health index, additive index of German language proficiency, contact with Germans, contact with persons of same origin, and employment status in t₀ or ISEI in t₀ or high Overall Physical Exposure (OPI) in t₀ for the respective dependent variable of labor market outcomes in t₁.

Table A15 Low social desirability sample – Physical leisure and labor market outcomes

	Employed vs. not in t1 AME in p.p.	ISEI in t1 β-coefficients	High vs. low Overall Physical Exposure Index (OPI) in t1 AME in p.p.
	S1.13	S2.13	S3.13
Engaging in sports (weekly) in t ₀	2.87** (0.01)	0.33 (0.52)	1.13 (0.02)
N	7,225	1,772	1,443
	S1.14	S2.14	S3.14
Daily hours in sports in t ₀	1.32** (0.01)	-0.05 (0.34)	1.86 (0.01)
Daily hours in other leisure in t ₀	-0.35 (0.00)	-0.17 (0.23)	-1.97* (0.01)
N	9,213	1,910	1,579
	S1.15	S2.15	S3.15
Daily hours in sports in t ₀	1.40 (0.01)	0.71 (0.53)	5.56* (0.02)
Squared term of daily hours in sports in t ₀	-0.03 (0.00)	-0.27 (0.15)	-1.36 (0.01)
N	9,213	1,910	1,579
<i>Controlling for facilitators</i>			
	Employed vs. not in t1 AME in p.p.	ISEI in t1 β-coefficients	High vs. low Overall Physical Exposure Index (OPI) in t1 AME in p.p.
	S1.16	S2.16	S3.16
Engaging in sports (weekly) in t ₀	1.06 (0.01)	0.08 (0.51)	0.65 (0.02)
N	7,225	1,772	1,443
	S1.17	S2.17	S3.17
Daily hours in sports in t ₀	0.56 (0.00)	-0.22 (0.33)	1.96 (0.01)
Daily hours in other leisure in t ₀	-0.25 (0.00)	-0.09 (0.22)	-1.99* (0.01)
N	9,213	1,910	1,579
	S1.18	S2.18	S3.18
Daily hours in sports in t ₀	0.23 (0.01)	0.39 (0.52)	6.01** (0.02)
Squared term of daily hours in sports in t ₀	0.12 (0.00)	-0.22 (0.14)	-1.53* (0.01)
N	9,213	1,910	1,579

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

OLS and logit models with clustered standard errors. Models controlling for: gender, education at immigration, number of children in the household in t₀, marital status in t₀, legal status in t₀, country of origin, years since migration, age, daily hours in other leisure in t₀, rural area of living in t₀, traumatic experiences during flight, work experience before migration, survey year, and employment status in t₀ or ISEI in t₀ or high Overall Physical Exposure (OPI) in t₀ for the respective dependent variable of labor market outcomes in t₁. Models with heading “Controlling for facilitators” additionally control for facilitators: physical health index, mental health index, additive index of German language proficiency, contact with Germans, contact with persons of same origin. The analyzed sample includes respondents who scored below a social desirability index of 0.8, calculated from other SOEP questions. The procedure follows the one adopted by Kosyakova, Yuliya & Kulic, Nevena (2022). Kinship, inter- and intraethnic social networks and refugees' division of housework. Journal of Family Research 34(2), 802-822. DOI: <https://doi.org/10.20377/jfr-783>.

Table A16 Interviewer-rated high closeness to reality of respondent's answers sample – Physical leisure and labor market outcomes

	Employed vs. not in t1 AME in p.p.	ISEI in t1 β-coefficients	High vs. low Overall Physical Exposure Index (OPI) in t1 AME in p.p.
	S1.19	S2.19	S3.19
Engaging in sports (weekly) in t ₀	4.00** (0.01)	-0.22 (0.81)	3.56 (0.03)
<i>N</i>	4,426	780	666
	S1.20	S2.20	S3.20
Daily hours in sports in t ₀	1.20* (0.01)	-0.31 (0.49)	1.90 (0.01)
Daily hours in other leisure in t ₀	-0.47 (0.00)	-0.17 (0.29)	-1.07 (0.01)
<i>N</i>	6,335	901	786
	S1.21	S2.21	S3.21
Daily hours in sports in t ₀	1.12 (0.01)	0.38 (0.73)	8.09* (0.03)
Squared term of daily hours in sports in t ₀	0.03 (0.00)	-0.22 (0.18)	-2.11* (0.01)
<i>N</i>	6,335	901	786
<i>Controlling for facilitators</i>			
	Employed vs. not in t1 AME in p.p.	ISEI in t1 β-coefficients	High vs. low Overall Physical Exposure Index (OPI) in t1 AME in p.p.
	S1.22	S2.22	S3.22
Engaging in sports (weekly) in t ₀	1.90 (0.01)	-0.54 (0.83)	2.81 (0.03)
<i>N</i>	4,426	780	666
	S1.23	S2.23	S3.23
Daily hours in sports in t ₀	0.41 (0.01)	-0.53 (0.48)	2.19 (0.01)
Daily hours in other leisure in t ₀	-0.38 (0.00)	-0.02 (0.28)	-1.24 (0.01)
<i>N</i>	6,335	901	786
	S1.24	S2.24	S3.24
Daily hours in sports in t ₀	-0.19 (0.01)	-0.07 (0.72)	8.64** (0.03)
Squared term of daily hours in sports in t ₀	0.21 (0.00)	-0.14 (0.17)	-2.30* (0.01)
<i>N</i>	6,335	901	786

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

OLS and logit models with clustered standard errors. Models controlling for: gender, education at immigration, number of children in the household in t₀, marital status in t₀, legal status in t₀, country of origin, years since migration, age, daily hours in other leisure in t₀, rural area of living in t₀, traumatic experiences during flight, work experience before migration, survey year, and employment status in t₀ or ISEI in t₀ or high Overall Physical Exposure (OPI) in t₀ for the respective dependent variable of labor market outcomes in t₁. Models with heading “Controlling for facilitators” additionally control for facilitators: physical health index, mental health index, additive index of German language proficiency, contact with Germans, contact with persons of same origin. The analyzed sample only includes respondents whose answers were rated “Fairly close to reality” or “Very close to reality” by their interviewers.

Figure A2 DAG – unadjusted confounding variables

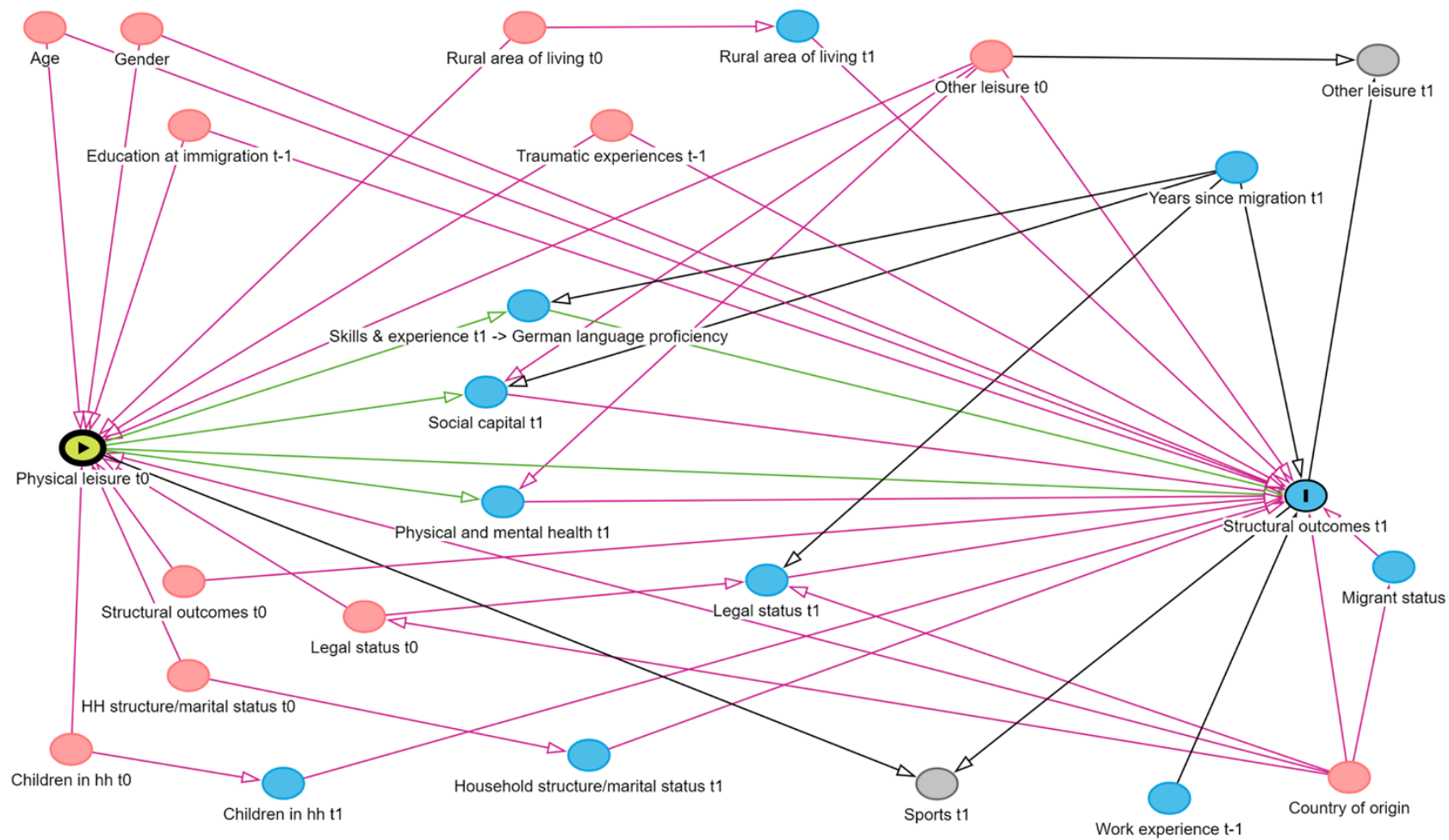
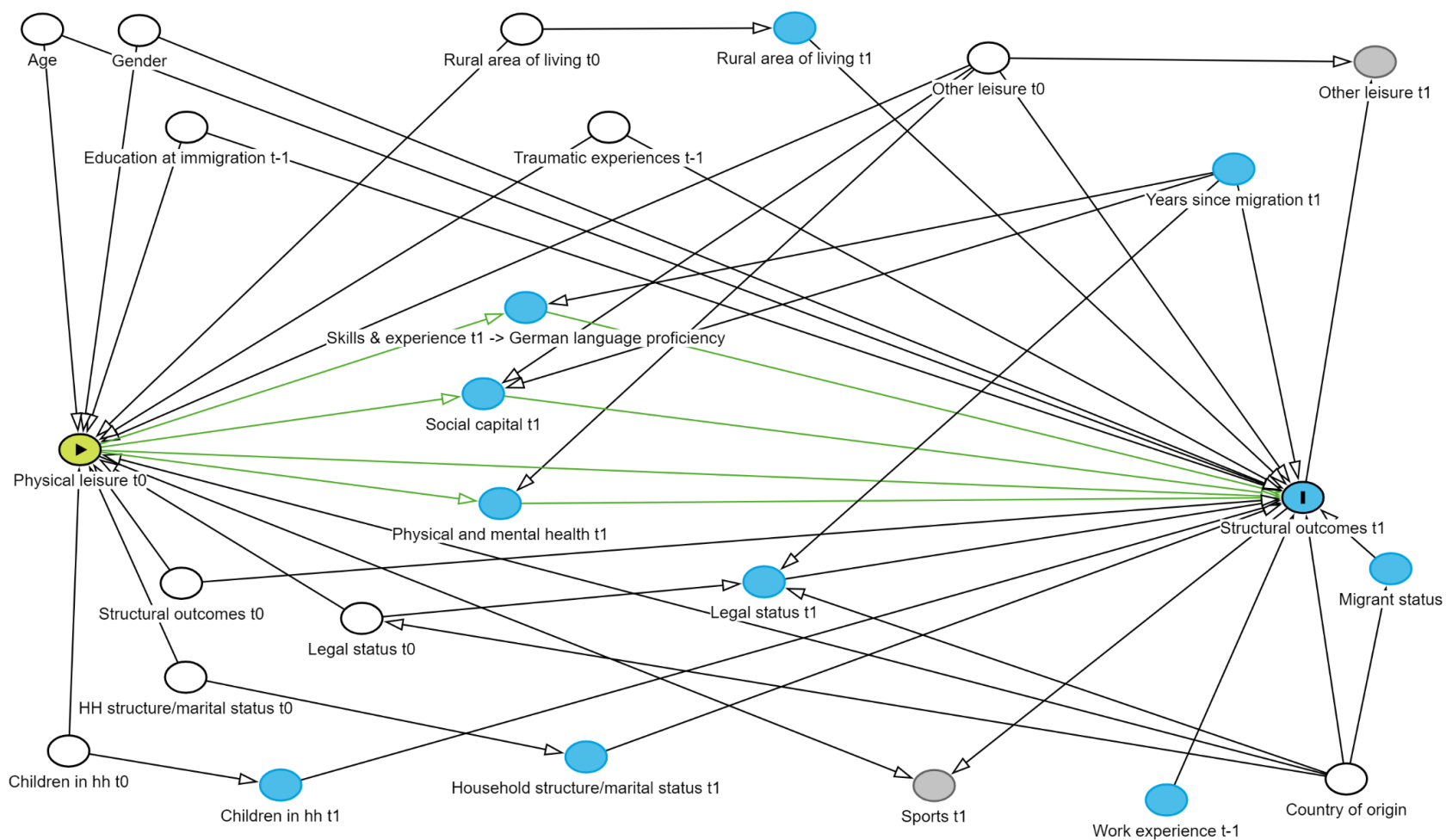


Figure A3 DAG – adjusted confounding variables



Imprint

IAB-Discussion Paper 15|2025

Date of publication

23 October, 2025

Publisher

Institute for Employment Research
of the Federal Employment Agency
Regensburger Str. 104
90478 Nürnberg Germany

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ISSN

2195-2663

DOI

[10.48720/IAB.DP.2515](https://doi.org/10.48720/IAB.DP.2515)

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