

Sophie Hermann ,¹ Susanne Krug,¹ Olga Maria Domanska,¹ Juliane Wurm,¹ Johanna Romefort,² Susanne Kuger,² Julika Loss,¹ Susanne Jordan ,¹

To cite: Hermann S, Krug S, Domanska OM, *et al*. Physical activity promotion in daycare centres in Germany: study protocol for a cross-sectional survey within the BeweKi study. *BMJ Open* 2023;13:e070726. doi:10.1136/bmjopen-2022-070726

► Prepublication history and additional supplemental material for this paper are available online. To view these files, please visit the journal online (<http://dx.doi.org/10.1136/bmjopen-2022-070726>).

Received 03 December 2022
Accepted 31 May 2023

ABSTRACT

Introduction In Germany, a total of 92.2% of children between the age of 3 and school entry age attend daycare centres. Therefore, daycare centres are a suitable setting to promote physical activity among children. Yet, there is a lack of knowledge on the promotion of physical activity in daycare centres with regards to different structures and concepts, culture/policies/practices and the characteristics of directors and pedagogical staff of daycare centres in Germany. The aim of this study is to investigate (a) the status quo, as well as (b) the fostering and hindering conditions (barriers and facilitators) of physical activity promotion in daycare centres in Germany.

Methods and analysis The cross-sectional study will collect data from November 2022 to February 2023. For the sample, about 5500 daycare centres will be drawn from an address database available through the German Youth Institute (DJI) and invited to the survey. From each daycare centre a director and a pedagogical staff member will be asked to fill in a standardised self-administered questionnaire. The survey explores characteristics of the daycare centre and the implementation of physical activity promotion, for example, the extent and form of physical activity promotion, the use and size of indoor and outdoor area, structural conditions such as personal and financial resources, personal attitudes towards physical activity promotion, demographic characteristics of pedagogical staff, structural daycare centre's characteristics such as proportion of children from socioeconomic disadvantaged groups. In addition, micro-geographical data on socioeconomic and infrastructural environment of the daycare centres will be included in the data set.

Ethics and dissemination The study has been received and approved by the Commissioner for Data Protection of the Robert Koch Institute and by the Ethics Committee of Alice Salomon Hochschule Berlin, University of Applied Sciences. Results will be disseminated through publications and presentations to scientific community and stakeholders.

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ The nationwide representative survey will describe the status quo and conditions of physical activity promotion in German daycare.
- ⇒ Apart from self-reported data, physical environment characteristics on the socioeconomic situation and physical surroundings of the daycare centres will be considered.
- ⇒ The study will not assess children's physical activity levels, nor the effectiveness of different measures meant to foster physical activity in daycare.

children. Children who engage in a physically active lifestyle from an early age on are also more likely to maintain high levels of physical activity throughout their lives.^{4,5} However, in Germany, only 42.5% of girls and 48.9% of boys aged 3–6 years were reported to meet the physical activity levels that are recommended for their respective age groups.⁶ These rates have even decreased during the COVID-19 pandemic in Germany: while 30.6% of 4 years old to 5 years old and 25.3% of 6 years old to 10 years old met the physical activity recommendations of the WHO before the pandemic,⁷ only 26.7% did so during the pandemic.⁷ This decline, particularly related to high-intensity physical activity, is also shown in international reviews.⁸ Low levels of physical activity are more often found among children from socially disadvantaged groups.⁹

International as well as national recommendations for physical activity promotion^{10,11} unanimously emphasise that promotion of physical activity should already start in early childhood.^{12,13} In Germany, daycare is a suitable setting for interventions among young children, since a total of 92.2% of children between the age of 3 and school entry age attend daycare centres. Among children under the age of 3, 34.4% are enrolled in



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¹Department of Epidemiology and Health Monitoring, Robert Koch Institute, Berlin, Germany

²Department of Social Monitoring and Methodology, German Youth Institute, Munich, Germany

Correspondence to
Dr Susanne Jordan;
JordanS@rki.de

INTRODUCTION

Background

Regular physical activity is beneficial for both physical and mental health,^{1–3} and is also crucial for a healthy development of

daycare centres.¹⁴ In order to help infants and children get a healthy amount of exercise and physical activity each day, daycare staff may initiate time for active play indoors and outdoors, or visit local facilities such as parks or gyms that provide ample opportunities for children to get active. Activities and interventions in daycare centres can reach children across different socioeconomic and migration backgrounds as well as children with or without disabilities and chronic conditions.

Several authors have published studies on projects that promote physical activity in German daycare centres, most of them locally or in a limited number of daycare centres.¹⁵⁻¹⁸ In addition to these specific projects, some German agencies or institutions offer advice, recommendation and/or coaching on how to implement measures in the daily routine of daycare centres in order to increase physical activity and exercise among the enrolled children,^{10 19} mostly without tracking how many daycare centres take up this advice. Daycare centres have a great potential as effective venues for physical activity promotion, and guidance on the implementation of suitable measures is available.

There is some evidence on the frequency with which prevention and health promotion programmes are taken up by daycare centres, across a range of topics, with physical activity being one of them, along with nutrition or mental health.²⁰⁻²² The study of Kliche *et al* which was carried out in 2006 examined health promotion in 643 daycare centres and showed that physical activity was the second most common topic, after nutrition.²³ A recent report of the National Association of Statutory Health Insurance Funds in Germany (in German: Medizinischer Dienst des Spitzenverbandes Bund der Krankenkassen e. V. (MDS)) also indicates that physical activity is the most common topic among prevention activities identified in daycare centres.²⁴ However, the report only quantifies the measures of daycare centres together with schools and only includes daycare centres, which are financed by the statutory health insurance and does not include those financed by other types of organisations. No study has analysed in a comprehensive way the practices with regard to different elements of physical activity promotion, the prevalence of structural preconditions (eg, existence of indoor or outdoor play areas) or barriers to implementing measures of physical activity promotion yet. This information is important to understand how daycare centres can be supported in delivering measures to promote the physical activity of their children.

There is also a lack of knowledge about barriers and facilitators on the implementation of physical activity promotion in daycare centres. In general, prevention measures in daycare can depend on the type of organisation that operates the daycare centre (carrier), that is, private, public (municipal or regional) or faith-based organisations.²⁵ Other factors may include (a) structural and conceptual characteristics, (b) culture, policies, practices and (c) characteristics of directors and pedagogical staff.²⁶⁻²⁹ Some of these factors have been implied

to be associated with higher levels of physical activity in daycare. For example, the size of the playground, the available space per child and certain outdoor equipment characteristics such as specific playground features (as structural characteristics) are positively correlated with physical activity levels of children.^{30 31} In addition, a culture or policy of structured outdoor play time and of offering time slots and opportunities for children to practice fundamental motor skills, are also beneficial to children's physical activity levels.^{32 33} It is also known that, for example, active participation in physical activities with the children in the sense of the pedagogical staff acting as role models is conducive to children's activity.^{18 34}

Evidence is still insufficient on the range of activities and measures that daycare centres use to get children active and moving, the infrastructural conditions that are available to them, and the factors influencing whether or not measures are implemented in daycare routine.

Objectives

The aim of our study is to investigate (a) the status quo, as well as (b) the fostering and hindering conditions (barriers and facilitators) of physical activity promotion in daycare centres in Germany. Our results can identify the need for support prevalent in daycare centres, and can contribute to designing suitable prevention measures. Ultimately, the results may thereby help foster physical activity promotion for children. We will also consider on daycare centres with a high proportion of vulnerable children, that is, children from disadvantaged socioeconomic backgrounds or with disabilities. By performing a nationwide survey of daycare centres the study aims at yielding results representative for Germany.

The objectives of the survey are:

Objective 1: To assess types, methods and elements of physical activity promotion in a nationwide sample of German daycare centres.

Objective 2: To identify barriers and facilitators on the implementation of physical activity promotion in German daycare centres.

Objective 3: To analyse whether findings differ between daycare centres with a high versus low proportion of enrolled children from vulnerable groups, for example, children from socially disadvantaged backgrounds, with a migration background/refugees or children with disabilities.

The detailed research questions considering the study objectives to be examined are as follows:

- To what extent (frequencies, timeframe) and in what forms is physical activity promotion for children incorporated into daily routines in daycare centres, for example, unorganised and guided physical activities, walks, using of external gyms and swimming pools, targeted offers for girls, boys, children with special need?
- How much time do children spend sitting in daycare centres each day?

- How many daycare centres have their own outdoor areas and what is the average size of outdoor area (per child)?
- What is the average size of indoor area (per child) of the daycare centres examined?
- Which structural conditions (personal and financial resources, spatial condition and material equipment, network with sport clubs, etc) are experienced by daycare directors as 'barriers' and which as 'facilitators' for physical activity promotion?
- To what extent is physical activity culture/policies at the daycare centres associated with the extension of physical activity promotion?
- To what extent are structural conditions (eg, spatial conditions and material equipment) associated with physical activity promotion in the daycare centres?
- To what extent are personal attitudes towards physical activity and demographic characteristics of facility's staff associated with physical activity promotion of daycare centres?
- To what extent are environmental infrastructure (eg, green spaces nearby) and location (urban vs rural region) associated with physical activity promotion of daycare centres?
- To what extent are structural daycare centre's characteristics (eg, proportion of children from socioeconomic disadvantaged backgrounds, child-staff-ratio, provider type, size of daycare centre) associated with physical activity promotion of daycare centres?
- Do daycare centres with a high proportion of children from socioeconomic disadvantaged backgrounds differ from those with a lower proportion of such children regarding physical activity practices, spatial conditions, location, etc?

METHODS AND ANALYSIS

The study is part of the project 'Investigation of physical activity promotion in daycare centres, schools and sports clubs—taking into account the COVID-19 pandemic' (short BeweKi), which is conducted by the Robert Koch Institute (RKI) in cooperation with the German Youth Institute (DJI).

Study design

The survey employs a cross-sectional study design. Daycare centres in Germany are surveyed with standardised questionnaires on their physical activity promotion activities and conditions (see online supplemental material—Questionnaires). To ensure that all relevant information and variables are adequately considered in the study, we followed the Strengthening the Reporting of Observational Studies in Epidemiology guidelines for cross-sectional studies.³⁵

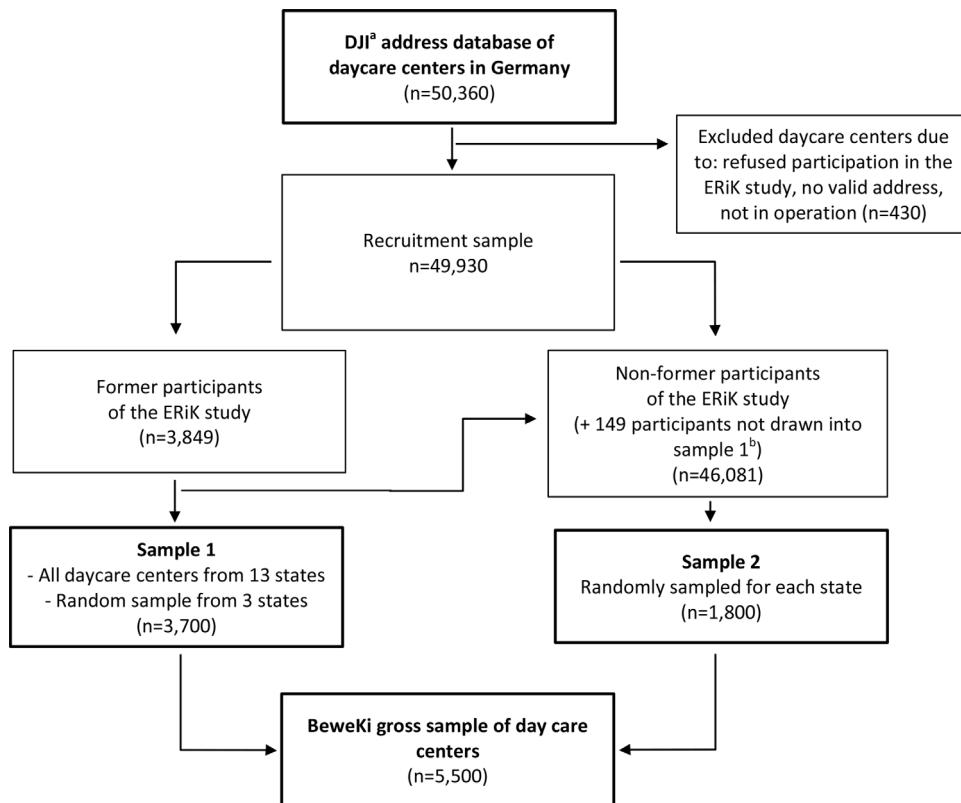
Study population and sampling strategies

The study focuses on daycare centres for preschool children. Daycare centres for school-age children are not surveyed. For each included daycare centre, information

is obtained from two individuals, that is, both the director of the daycare centre and one representative of the pedagogical staff. Understanding daycare practices and barriers related to physical activity promotion may require the views and knowledge of two groups: the directors of daycare centres, who may be experts on policies, funding and related barriers, as well as of staff members who are familiar with day-to-day practices. The definition of those two different target populations follows the definition used in the study 'An Indicator-based Monitoring of Structural Quality in the German Early Childhood Education and Care System' (ERiK). Directors were defined as individuals who carry out most of the management tasks in the daycare centre. On the other hand, pedagogical staff were defined as individuals who provide early childhood education and care, do not perform management tasks, and do not work as volunteers.³⁶

Five thousand five hundred daycare centres from all over Germany are contacted, in each of which one director as well as one person of the pedagogical staff are interviewed. The operational sample thus comprises 11 000 directors and pedagogical staff. The sample is drawn from the address database of the 'ERiK-Surveys' 2020 (as of 2020) available through the German Youth Institute (DJI). It contains 50 360 addresses of daycare centres from all over Germany and thus a large majority of the 54 627 daycare centres for children not yet attending school at this time.³⁷ Four hundred and thirty cases are excluded based on information gathered in the course of two previous studies of the DJI,^{38 39} for example, the daycare centre has generally refused to participate in studies, or is no longer in operation. The size of the gross sample was primarily determined by budget restraints as well as experience values of sample size estimation from previous ERiK-Surveys. Based on this experience, an overall response rate of approximately 26% on average is expected for directors and approximately 17% for pedagogical staff. In order to maximise the response rate, two different sampling approaches were employed. First 3700 daycare centres (sample 1) were selected based on having conducted a valid questionnaire in the ERiK-Surveys 2020 of directors. Daycare centres from the states Baden-Wuerttemberg, Bavaria and North Rhine-Westphalia were randomly sampled in each state independently, since those are over-represented in the ERiK-Surveys 2020. Daycare centres in the remaining 13 federal states were all selected into the sample. Another 1800 daycare centres (sample 2) were randomly selected from the DJI's address file, independently in each state. Figure 1 shows the sampling procedure of daycare centres.

Directors and pedagogical staff of the sampled daycare centres will be invited to participate via email. The study documents for directors contain an additional sealed envelope with study documents for one pedagogical staff member. The study documents include invitation letters, the printed version of the questionnaire (PAPI: paper assisted personal interview) (see online supplemental material—Questionnaires), data protection information,



^a DJI = German Youth Institute; ^b overrepresented cases from the 3 federal states Baden-Wuerttemberg, Bavaria and North Rhine-Westphalia

Figure 1 The sampling procedure of daycare centres.

a preincentive (sticky note pad) and a stamped return envelope, which should be used to return the completed questionnaire. Members of the pedagogical staff will be invited via the directors. The directors will be asked to hand over the envelope with the questionnaire to the staff member using the last birthday method⁴⁰ as a quick and easy way to avoid selectivity by directors (such as selecting staff members with the most working hours). A personalised link or quick response (QR) code to the online questionnaire (CAWI: computer assisted web interview) is printed onto each of the invitation letters for directors and pedagogical staff, as respondents can choose whether to answer the questionnaire on paper (PAPI) or web-based (CAWI). Respondents can independently return the completed, pseudonymised questionnaires by email or via online form.

Data collection and data handling

The recruitment of daycare centres and data collection will be conducted by the infas Institute for Applied Social Science GmbH (infas). Data will be gathered with two different standardised questionnaires tailored for directors and for pedagogical staff, covering structural and organisational aspects as well as information of daily routine with regard to physical activity promotion. The self-administered questionnaires will be available in two variants: as paper-pencil (PAPI) as well as online (CAWI), for the participant to choose the preferred format.

Data will be collected from the end of November 2022 until February 2023. Filling in the questionnaire takes 20–30 min. No later than 2 weeks after the invitation, an email reminder will be sent to the daycare centres that have not yet started or completed the online questionnaire, and from whom no paper questionnaire has been returned. Daycare centres that do not respond or only partially respond 4 weeks (holidays included) after the previous reminder, will be contacted by telephone and reminded to complete the questionnaire. See **figure 2** for an overview of the recruiting flow.

Data protection

The study design ensures separate collection, processing and retention of daycare centre contact information and survey data. No contact details of the daycare centres (eg, addresses) are available at the RKI. An agreement concluded between the RKI and the DJI on cooperation as joint controllers within the meaning of Article 26 of the General Data Protection Regulation regulates that the survey data can be linked with the daycare centre contact information which is stored exclusively at the DJI's subservice provider (infas) in order to be able to contact the daycare centres and send out reminders. For this purpose, the DJI has concluded an order processing contract with infas, under which infas is contractually obligated to comply with technical and organisational measures for data protection and data security. All participants will

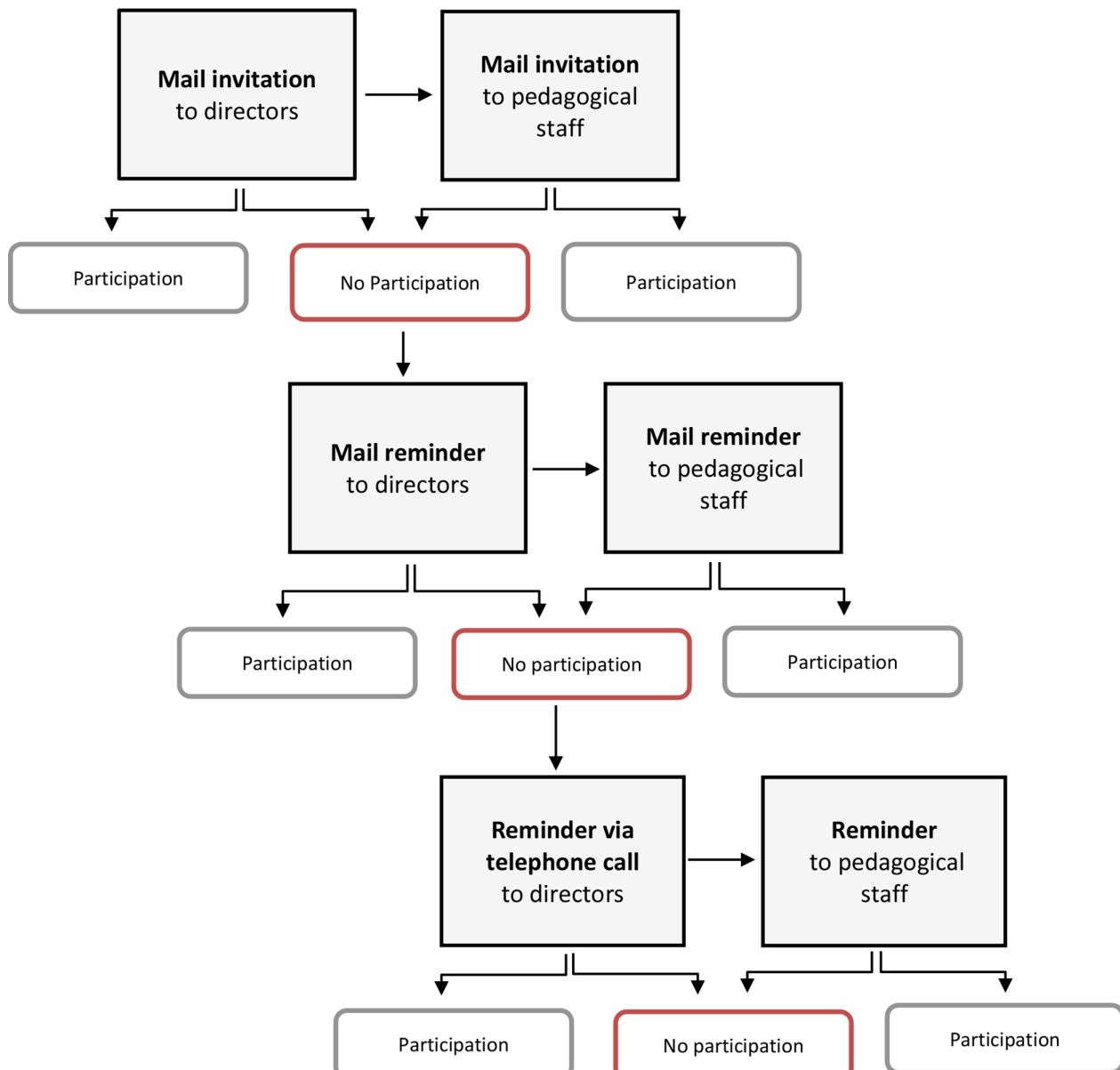


Figure 2 Overview of the recruiting flow.

receive detailed information materials about the study. Informational materials will include a cover letter with detailed survey information and a data protection declaration. The documents provided are intended to give a concrete idea of the aim, procedure and scope of the survey, as well as to provide information on the guarantee of data protection and the voluntary nature of participation. Participants will find further information about the BeweKi study on the project website www.rki.de/beweki-en, about the RKI at www.rki.de/en, about the DJI at www.dji.de/en and about infas at www.infas.de/?lang=en. Participants can contact infas by phone or email if they have any questions.

Patient and public involvement

We interview healthy individuals as representatives of their institution. These people or the public are not involved

in the design, or conduct, or reporting, or dissemination plans of our research.

Measurements

There is a lack of instruments measuring practices of physical activity promotion as well structural conditions in the daycare sector. Questionnaires and checklists for daycare staff (eg, ¹⁸⁻⁴¹) may serve as an orientation, but do not cover various domains of physical activity. For this reason, we newly developed items to collect data on types, methods and elements of physical activity promotion. Additionally, structural and conceptional characteristics are assessed with items from the standardised questionnaires for directors and pedagogical staff from the ERiK study 2022. ³⁸ The newly developed items, were tested with two cognitive tests among representatives of daycare staff, to make sure that the respondents interpreted the survey

Table 1 Overview of the topics and measures applied in the survey

Dimension	Measure	D or PS	Items (n)	Used for objective*
Structure and concept	Number of children	D	1	2
	Sociodemographic of the children	D	5	2, 3
	Child-staff ratio	D/PS	1/1	2
	Type of carrier	D	1	2
	Pedagogical care concept	D	3	2
	Indoor/outdoor spaces	D/PS	6/4	2
	Offers for further education and training in PA	D/PS	1/2	2
	Financial resources of the daycare centre	D	1	2
	Play and movement materials for indoor/outdoor spaces	D/PS	1/2	2
	Flexible furniture (eg, tables and cabinets with castors)	D/PS	1/1	2
Culture/policies/practices	PA opportunities in the local area	D	2	2
	Participation in PA programmes	D	2	1
	Cooperation with sports clubs	D	2	1
	PA rituals and rules	PS	10	1
	Commitment and support from guardians	D, PS	1/1	2
	Frequency/quantity of different PA opportunities for children	PS	9	1
	Unorganised PA time for children	PS	1	1
	Children sitting times	PS	1	1
Directors and pedagogical staff	PA support needs of children	PS	4	1, 3
	Position/function	D/PS	1/1	2
	PA competency	D	1	2
	Attitude towards PA promotion	D/PS	1/1	2
	PA behaviour	D/PS	1/2	2
	Educational level	D/PS	1/1	2
	Years of professional experience in childcare	D/PS	1/1	2
	Age	D/PS	1/1	2

*Objective 1: to assess types, methods and elements of physical activity promotion in a nationwide sample of German daycare centres; Objective 2: to identify barriers and facilitators on the implementation of physical activity promotion in German daycare centres; Objective 3: to analyse whether findings differ between daycare centres with a high versus low proportion of enrolled children from vulnerable groups, for example, children from socially disadvantaged backgrounds, with a migration background/refugees or children with disabilities.

D, director; PA, physical activity; PS, pedagogical staff.

questions in a required way. The items of the questionnaire are grouped into three dimensions based on the 'Quality Development for Good Healthy Daycare Centres' framework.²⁹ These are (a) structural and conceptual characteristics, (b) culture, policies, practices and (c) characteristics of directors and pedagogical staff. **Table 1** shows an overview of the factors to be analysed used.

Data management, data preparation and data analysis

On closure of the survey, the response rate will be calculated by infas according to American Association for Public Opinion Research (AAPOR) Outcome Rate Calculator.⁴² In order to maximise the response rate, we will offer PAPI and CAWI questionnaires.

When analysing the data, we will use a weighting factor to account for different sampling and participation probabilities and ensure that prevalence estimates for certain characteristics are representative for daycare centres in Germany. This will be achieved by adjusting the combination of design weights and non-response weights, based on the distribution of daycare centres across the different German federal states, the proportion of different types of providers that operate daycare centres and the proportion of different sizes of daycare centres, according to the information on German daycare centres provided by the Federal Statistics Office.³⁷

Information on daycare centres collected from both directors and pedagogical staff will be merged into one

data set per daycare centre, using a daycare centre identity number (ID number). Additionally, micro-geographic data on the socioeconomics situation of the daycare centre's environment (eg, the proportion of households with migration background, unemployment statistics in the local district or the predominate social class in the residential area) and data on infrastructure features of the daycare centre's environment (eg, the proportion of green spaces, or sports facilities in local district) are included into the data set. The definition of local district and residential area and categories of micro-geographic data are described elsewhere.⁴³ The micro-geographic data will be provided by infas and date from 2019.

Quantitative analyses will only be conducted with anonymised survey data and survey process data, respectively. Data will be checked with regard to plausibility, consistency and completeness (proportion of missing values per item and per data set). Following, 'complete interviews' will be defined according to the adapted recommendations of AAPOR guidelines,⁴⁴ and incomplete interviews will be excluded. The handling of missing values will be defined after a missing value analysis (ie, the amount and type of missing values). After that, data will be prepared for statistical analysis by generating, recoding and categorisation of outcome variables that serve as indicators for implemented physical activity promotion (eg, average amount of unorganised physical activity per day, daily walks) and further variables of interest (size of facility based on the number of enrolled children, size of the facility based on indoor space, indoor space per child, outdoor space per child, etc). For example, the size of facility will determine on the one hand on the number of enrolled children and categorised into three categories: small (up to 25 children), medium (from 26 to 100 children) and large (more than 100 children) and on the other hand based on the indoor area. It will be divided into three categories—small, medium and large—using quartiles.

Most of the planned analyses have an exploratory character and aim to describe the status quo of physical activity promotion in daycare centres. The distribution (frequencies, timeframe) of physical activity promotion practices (objective 1) will be assessed using descriptive analyses. To describe the structural conditions in daycare centres, personal attitudes towards physical activity, physical activity promoting culture and perceived 'barriers' and 'facilitators' for promoting physical activity in the facilities (objective 2) we will also apply univariate analysis. Association analysis (bivariate and regression analyses) will be conducted to explore which factors (structural and conceptional characteristics, personal attitudes, culture, location and infrastructure factors) are statistically associated with indicators of physical activity promotion in daycare centres (objective 2). The further aim of the study is to examine accessibility of physical activity promotion for particularly vulnerable population groups, for example, children from socially disadvantaged families, with a migration background/refugees or children with

disabilities (objective 3). Specifically, we intend to use bivariate analysis (χ^2 , t-test, analysis of variance) to investigate whether daycare centres with a higher proportion of socioeconomically disadvantaged children differ from those with fewer of such children in terms of structural factors, for example, outdoor/indoor area size per child, urban versus rural location as well as adherence to child–staff ratio. For all analyses considering associations, the level of significance was set to p values <0.05 .

Data preparation and statistical analyses will be performed with the statistic software STATA V.17 (StataCorp LLC).

Ethics and dissemination

The consent form for the study is included on the first page of the written questionnaire and on the landing page of the online questionnaire. In the PAPI questionnaire, participants are informed that by answering the questionnaire and sending it to infas, they are consenting to participate in the study. In the CAWI questionnaire, participants are informed that they are consenting to participate by entering their personal password and then clicking on the button 'Start | continue survey' to start the survey.

The study has been received and approved by the Commissioner for Data Protection of the RKI, as well as by the Ethics Committee of Alice Salomon Hochschule Berlin, University of Applied Sciences (Number 09-2022/51).

The results will be disseminated through publications and presentations to the scientific community and stakeholders.

Acknowledgements We would like to thank all our colleagues at the Robert Koch Institute for their support. We would also like to thank our colleagues at the German Youth Institute (DJI) for supporting us in designing the study. We are also indebted to the project team at infas Institute for their excellent work in preparing the study documents. Special thanks go to the colleagues at the Federal Center for Health Education as well as at the Friedrich Alexander University for their helpful ideas in the development of the questionnaires.

Contributors SJ, SKrug and JL designed the study. SH, OMD, JW, JR and SKuger were involved in the development of the recruitment strategy. SH, SKrug, OMD, JW and SJ drafted the questionnaires. JL, JR and SKuger contributed to the finalisation of the questionnaire items. SH and SJ conceptualised and drafted the manuscript. SKrug, OMD, JW, JR and JL reviewed and edited the manuscript. All authors read and approved the final manuscript.

Funding This research was funded by the German Federal Ministry of Health, grant number ZMI1-2521KIG910.

Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not applicable.

Provenance and peer review Not commissioned; externally peer reviewed.

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ORCID iDs

Sophie Hermann <http://orcid.org/0000-0001-5309-4870>
Susanne Jordan <http://orcid.org/0000-0003-0721-1604>

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