Physical activity of children and youth with disabilities and the effect on participation in meaningful leisure-time activities

Anne Züll¹, Vera Tillmann¹*, Ingo Froböse² and Volker Anneken¹

Abstract: Purpose: The purpose of this study was to collect data of the physical activity of children and youth with a disability as well as their frequency of participation in meaningful leisure-time activities. For the first time in Germany, the potential of physical activity and of joining a sports club to influence participation in other areas of life is evaluated. Methods: 408 pupils (10–19y.) with intellectual, physical or visual disability participated, wearing an accelerometer and answering questions. Parents filled out a questionnaire on the frequency of participation and the severity of the disability. Differences in the participation according to age, gender, severity of disability, sports club membership, and the activity levels were analyzed using nonparametric tests and bivariate correlations. Results: Frequency of participation differs between gender and age groups and is in part influenced by the disability. Participants seldom belong to sports clubs and their activity level is rather low. Attending a sports club has many positive effects on participation and supports physical activity. Conclusion: Sports programs that include all children and youth need to be expanded. Physicians and well-trained coaches may allay parents' doubts of whether their child is able to participate in a sports club.

Subjects: Disability Sport; Leisure Studies; Youth Sport

ABOUT THE AUTHOR
Vera Tillmann At the Research Institute for Inclusion by Physical Activity and Sport, participation of people with disability in and by sports is the key research area. Our research is focused on an interdisciplinary and holistic perspective on movement and sport of people with disabilities. We intend to sustainably support the participation and inclusion through applied research. The research presented in this paper was essential to gain more information about the physical activity of children and youth with disabilities, since little has been known. They are less active than children and youth without disability and experience multiple barriers. Due to the findings, further steps can be taken to develop an inclusive environment in sports and provide children and youth with disability with needed information and assistance.

PUBLIC INTEREST STATEMENT
Children and young adults with disability are less active than children and youth without disability and experience different barriers. Even though they want to be more active, they sometimes do not know, where accessible sports clubs are or they depend on assistance. Therefore, they cannot profit from the physical, psychological or social benefits, sport can provide. The results from about 400 questionnaires with children and youth with disability as well as their parents, indicate, that most of all sports programs that include all children and youth need to be expanded and advertised. Also, Physicians and well-trained coaches may allay parents’ doubts of whether their child is able to participate in asports club or certain groups. Since children and youth mostly want to do more sports, barriers need to be reduced, adequate sports groups need to be implemented and cooperations with (special) schools should be initiated.
Keywords: participation; children and youth; disability; physical activity; sport; inclusion; leisure time; steps

1. Introduction
Continuous physical activity is one of the essentials for a healthy lifestyle: Health-enhancing processes, such as the training of muscles and endurance, are activated with positive effects on cardiovascular diseases and body composition. In addition, for people with disabilities, sports, and physical activity can have a positive effect on their ability to perform daily living activities (WHO, 2003).

For children and youth, a special emphasis should be placed on sports programs after school, as it is supposed that participation in such is driven by internal motivation and involves freedom of choice and self-determination, a prerequisite for optimal participation (Shikako-Thomas, Dahan-Oliel, & Shevell et al., 2012). Furthermore, organized sports in clubs could be shown to positively influence the self-concept of youth (Burrmann, 2004). They also rated themselves better in terms of being liked and less often bullied by others than those not taking part in clubs (Fussan, 2006). The German Olympic Sports Confederation also highlights the potential of sports to include people with disabilities. It supports social activities and meeting opportunities of people with and without disabilities and strengthens the idea of self-determined and equal participation for all in society (DOSB, 2017).

Thus, participation is believed to contribute to child health, development and quality of life has become a leading goal shared by parents, service providers and organizations involved in children’s rehabilitation (King et al., 2003; Law et al., 2006). However, reports have demonstrated that children with disabilities participate in a narrower variety of activities that involve less social interaction compared to able-bodied children (Michelsen et al., 2009; Schreuer, Sachs, & Rosenblum, 2014; Shikako-Thomas, Majnemer, Law, & Lach, 2008). Additionally, social opportunities outside the family have been reported to be limited for youth with physical disabilities (Brown & Gordon, 1987; Poulsen, Ziviani, & Cuskelly et al., 2007; Stevenson, Pharoah, & Stevenson, 1997). Besides other leisure activities, physical activity and sports provide opportunities for better self-confidence, social interaction as well as psychological well-being (Eime, Young, & Harvey et al., 2013; Kristén, Patriksson, & Fridlund, 2002; Merkel, 2013; U.S, 1996; WHO, 2003). However, participation in sportive activities is not without presuppositions. People with disability experience different barriers like missing opportunities for doing sports in a club, missing assistance or they cannot go to the sports club independently (Tillmann & Anneken, 2019).

Against this background, the greater goals of this study were to collect data about the physical activity of children and youth with different disabilities, which did not exist before. In order to provide necessary support or develop strategies which enable children and youth with disability to increase their physical activity, it is necessary to know, how physically active they already are. In addition to this, the impact of physical activity on participation in meaningful activities was to be evaluated as well as experienced barriers.

2. Material and methods
However, for this article the following sub-questions were selected, in order to the contentual focus:

(1) Is the frequency of participation in meaningful activities dependent on age, gender, and severity of the motor functional, intellectual or visual impairment?
(2) Does the sportive behavior, evaluated by the physical activity level and a membership in a sports club, influence participation in the analyzed activities?
(3) What are the perceived barriers for children and youth with disability and their parents impeding equal participation in sports?
Participants and data examined in this article are part of the study AktiveKIDS of the Research Institute for Inclusion by Physical Activity and Sport, Frechen (Germany), funded by the Gold-Kraemer-Foundation. Ethical approval for the cross-sectional study was granted from the Research Ethics Committee of the German Sports University of Cologne.

2.1. Participants and procedure
Over 3 years (2013–2016) data from pupils aged 10–19 years with different disabilities were collected, mainly from special schools in North-Rhine-Westphalia (Germany). Within this group, children and youth with motor functional, intellectual, or visual disability were focused on, since they were expected to experience most difficulties and no data existed yet about their physical activity. Two preconditions were essential to take part in the study:

1. to be able to walk so relevant data can be measured with the SenseWear Accelerometer (SWA) (by BodyMedia),
2. to be able to communicate understandable for foreign people and therefore being able to answer questions or fulfill a questionnaire independently.

Headteachers were first contacted and informed by mail and secondly by phone calls. Twenty-four schools agreed to participate. After participants and their parents agreed to take part in the study, research assistants visited the schools, to explain the main intentions of the study to the pupils. Questionnaires were distributed to the participants and in case of reading or comprehension problems support was given. In case of pupils with intellectual disability a 1:1 situation in an extra room was provided. Afterward the use of SenseWear Accelerometers was explained and participants were instructed to wear the accelerometer continuously for 7 days, removing them only for water-based activities. Furthermore, they were asked to follow their normal daily routine on school days and during the weekend. Additionally, questionnaires for the parents were distributed. One week later the school was visited again, to collect the SWAs and the parents’ questionnaires.

2.2. Instruments
The main study is focused on two different constructs—the participation of children and youth and their physical activity. To assess participation, both parents and participants were asked to fill out different questionnaires. Physical activity was objectively measured using accelerometers.

In addition to this and for further information pupils were asked about their habitual physical activity and preferences for sports. Also, similar questions on sportive behavior were answered by both parents and participants.

2.2.1. The parents’ questionnaire
The parents’ questionnaire comprises two sections. In the first section data of their child’s participation are collected, using the Frequency of Participation Questionnaire (FPQ). This questionnaire had been developed for the “Study of Participation of Children with Cerebral Palsy Living in Europe” (SPARCLE), and also exists in German (Meine, 2009). It consists of 14 items, each with six response options to rank the child’s frequency of participating in the relevant activity (from “never” to “a few times a week”, valued 0 to 5) (see also (Michelsen et al., 2009)).

In the second section the parents gave additional information about the severity of the child’s limitations and of pain, subjectively ranked as the influence on daily life being “very strong,” “strong,” “mild,” or “not apparent.” Furthermore, they answered in-depth questions on the participation in physical activity and sports, partly in open-ended questions. Within this format, parents were able to respond in their own words without previous restrictions. In this context, the question of whether the child attends a sports club is taken into account, as well as a question for those...
who do not, asking for the reasons what barriers they experience and therefore do not attend a sports club. The additional questions were self-developed.

### 2.2.2. The children’s questionnaire

The children’s questionnaire also is divided into two sections. The first part starts with questions concerning the intrinsic need satisfaction, which is based on the “Children’s Intrinsic Need Satisfaction Scale” (CINSS) by Véronneau et al. (Véronneau, Koestner, & Abela, 2005). Since this questionnaire is for abled-bodied children it needed to be modified, especially in terms of the complexity of the questions. The results from this section are not considered in this article, due to a different contentual focus. In the second part, the participants answered self-developed questions regarding their preferences for sports. In this article, the answers on the following questions are taken into account: “How much do you like doing sports?” , “Would you like to do more sports?” and “Why don’t you do more sports?”

### 2.2.3. The sensewear accelerometer

The SenseWear Accelerometers incorporates a variety of measured parameters (accelerometry, heat flux, galvanic skin response, skin temperature, near-body temperature) and demographic characteristics (gender, age, height, weight) into proprietary algorithms to estimate energy expenditure and step count. A preliminary study could show that the validity of the SenseWear Accelerometer does not appear to be negatively affected by physical disabilities during treadmill exercise in adolescents (Koehler, Abel, & Wallmann-Sperlich et al., 2014). However, the data of energy expenditure were difficult to interpret, since the accelerometer counted and added every single minute of higher energy expenditure. Guidelines though recommend at least 10 min in a row of higher energy expenditure to be counted as moderately active or more. In previous studies, this has not been discussed and therefore only step data are used to describe the physical activity.

The World Health Organization recommends for children and youth at least 10,000 steps per day to maintain a healthy life (WHO, 2010). National guidelines even claim that this age group should accumulate at least 12,000 steps per day (Rütten et al., 2016). Since the school systems and therefore the structure of daily life vary in international comparison, national guidelines were chosen for the categorization and assessment of steps per day. According to these recommendations, participants are classified as being less active when taking less than 10000 steps per workday, moderately active when taking 10000–11999 steps/workday or highly active taking 12000 and more steps/workday.

### 2.3. Data analysis

As the analyzed questions of the Frequency of Participation Questionnaire are ordinal variables and the step data did not show a normal distribution by the Kolmogorov–Smirnov test, nonparametric tests were used for additional analyses. The Mann–Whitney U (for two independent samples) tests effects of age group and gender on the participation in each activity of the Frequency of Participation Questionnaire, as well as the effects of being a member of a sports club. Spearman’s rho correlations are used to test whether a relationship between the severity of the different restrictions and the items of the Frequency of Participation Questionnaire exists and whether the activity level influences the participation in the analyzed activities. All of the statistical analyses were performed using SPSS, version 22.

### 3. Results

The presentation of the results starts with the description of the study sample according to age and gender. In the following the results concerning the relevant research questions, within this article, are presented: (1) Subsequently, the results of the Frequency of Participation Questionnaire are analyzed regarding the influence of age, gender and the severity of the disability. (2) This is followed by an analysis of whether the activity level as well as being a member of a sports club influences participation in the analyzed activities or vice versa. (3) Barriers impeding the
participation in a sports club or experienced barriers given by the parents and the children and youth end this section as well as answers about their sports preferences.

### 3.1. Study population

Four-hundred and eight pupils participated in this study with 152 females (37%), 256 males (63%), which mirrors the typical gender distribution in special schools in Germany (Malecki, Schneider, Vogel, & Wolters, 2014). Participants were divided into two similar-sized age groups: the younger group included pupils from the ages of 10 to 14 years (n = 213, 52.2%), and the older pupils ranged in age from 15 to 19 years (n = 195, 47.8%). In the younger group, 72 (33.8%) were female, in the older group 80 (41.0%). As not all participants wore the SenseWear Accelerometers for sufficient time (at least 90% of the required time or at least four full workdays and one full weekend day), and in some cases, the data could not be uploaded due to technical problems, accelerometer data of 366 participants (89.7%) could be used. In Table 1 basic data of the SWA is shown divided by weekday and weekend. This differentiation is necessary, since the structure of these days varies fundamentally, due to going to school on the weekdays and being off on the weekend.

Questionnaires of 378 parents (92.6%) were returned and as the subjectively ranked severity of the disabilities was not influenced by gender or age, all participants were analyzed together. Figure 1 shows how the participants are affected.

The parents rating of the physical impairment illustrates that most participants are slightly (40%) or not at all (36%) restricted in motor abilities, while strong or very strong limitations affected only 14% and 1% of the sample. The majority has slight (36%) or strong restrictions (23%) in cognitive functioning; only 4% have very strong limitations. Pain and visual impairments play a minor role in the sample as most participants are rated by their parents as not affected (70% and 59%).

Regarding the sportive behavior, the parents’ answers indicate that only one third (33.3%) of the participants attend a sports club, with the younger boys going most often to sports clubs (38%) and adolescent girls the least often (29%). Additionally, objectively measured step data show that nearly half of the participants are classified as low active (49.5%), taking less than 10,000 steps per day. Divided by age and gender the male participants are more often highly active than the females and the older participants are more often classified as low active than the younger ones.

Table 2 summarizes the data of the sportive behavior divided by age group and gender.

#### (1) Dependency of the participation in meaningful activities on age, gender, and severity of disability

All questions of the Frequency of Participation Questionnaire were analyzed separately and the effects of age group and gender were tested with the Mann-Whitney-U Test. Only significant group differences are specified and indicated in the following.

### Table 1. Steps per day and physical activity (PA) (>3 MET) in minutes on weekdays and on the weekend

|                | Steps per day (weekday) | Steps per day (weekend) | PA in minutes per day (weekday) | PA in minutes per day (weekend) |
|----------------|-------------------------|-------------------------|--------------------------------|----------------------------------|
| **Mean**       | 10104                   | 6721                    | 181                            | 130                              |
| **SD**         | 3558                    | 4078                    | 93                             | 102                              |
| **Min**        | 1271                    | 357                     | 20                             | 3                                |
| **Max**        | 21610                   | 22358                   | 500                            | 595                              |
The parents’ answers on the participation in the activities of the FPQ indicate that boys and young men may have different interests than girls and young women, reflected by the gender differences. Ten to fourteen-year-old boys participate more often in sports and visit sporting events more frequently than girls in this age. However, the girls participate more often in art, craft and/or music activities. Young women from 15 to 19 years participate more often in art, craft and/or music activities than young men (see Table 3).

The 10–14-year-old girls compared to the 15–19-year-old young women use a bike or wheelchair for fun more often, take part in organized group-activities and tourist pursuits more frequently and participate more often in nonsporting games (see Table 4).

| Table 2. Participants attending a sports club and classification of participants to activity levels divided by age group and gender (ag1 = 10–14 years; ag2 = 15–19 years) |
|-----------------|-----------------|-----------------|-----------------|-----------------|
|                | In a sports club | Low active | Moderately active | Highly active |
| 10–14 (n = 213) | Male (n = 141)  | 53 (38%) | 50 (36%) | 37 (26%) | 35 (25%) |
|                 | Female (n = 72) | 25 (35%) | 35 (49%) | 16 (23%) | 11 (16%) |
| 15–19 (n = 195) | Male (n = 115)  | 35 (30%) | 47 (41%) | 21 (18%) | 38 (33%) |
|                 | Female (n = 80) | 23 (29%) | 49 (61%) | 7 (9%) | 20 (25%) |

Table 3. Significant differences of mean ranges of participation in activities divided by age groups and gender (p ≤ .05 = *, p ≤ .01 = **, p ≤ .001 = ***)

| Activities                          | 10–14 years | 15–19 years |
|-------------------------------------|-------------|-------------|
| **Female**                          | **Male**    |             |
| Sports or active outdoor activities*| 86.31       | 105.54      |
| Visiting sports events*             | 86.72       | 105.33      |
| Art, craft and/or music*            | 110.13      | 93.27       |
| **15–19 years**                     |             |             |
| Art, craft and/or music***          | 110.81      | 76.34       |
Likewise, boys of age 10 to 14 years are more active in several activities than the young men from 15 to 19 years. They help more often in household activities, use a bike or wheelchair for fun more often and do more sports. They participate more often in art and craft activities, nonsporting games and take part in tourist pursuits more frequently (see Table 5).

Subsequently, an analysis of whether and how the diverse severity of the impairment (subjectively rated by the parents) affects participation in the activities of the FPQ was made, using Spearman’s bivariate correlations (see Table 6). The most pronounced effects can be seen for physical limitations. The results show that people with a higher severity of a physical impairment have a higher participation in doing relaxing pursuits, using a computer and playing nonsporting games. Watching cultural events, although, is done less frequently, the higher the severity is. The results indicate that those with higher severity of physical impairment prefer more sedentary activities, which can be done at home. Less obvious are the effects of people with an intellectual impairment. However, the data shows that the higher the severity of the intellectual disability is, the least often people go out to eat or use a computer.

(2) Influence of sportive behavior and membership in a sports club on participation in meaningful leisure-time activities

To evaluate an effect of the sportive behavior on the items of the FPQ, an analysis was first made of whether the steps per day correlate with the participation frequency in the leisure-time activities. The results show that pupils who do more steps per day are less likely to use the computer or to play nonsporting games. However, they do use the bike/wheelchair more often for fun, do sports or active outdoor activities more frequently and visit sporting events more often (see Table 7).

Effects of a sports club membership were analyzed using the Mann-Whitney-U Test: Those attending a sports club more often use bicycles or similar wheeled devices for fun, participate more often in group-activities outside school, play sport or outdoor games more often and visit

| Activities                      | Female 10–14 years | Female 15–19 years |
|--------------------------------|---------------------|---------------------|
| Using a bike or wheelchair for fun** | 82.9                | 62.45               |
| Group activities**              | 81.76               | 64.44               |
| Tourist pursuits***             | 84.31               | 62.23               |
| Nonsporting games***            | 84.57               | 62.00               |

| Activities                      | Male 10–14 years | Male 15–19 years |
|--------------------------------|------------------|------------------|
| Household activities*           | 125.31           | 107.72           |
| Using a bike or wheelchair for fun*** | 137.33           | 92.71            |
| Sports or active outdoor activities* | 125.97           | 106.92           |
| Art, craft and/or music***      | 131.61           | 99.86            |
| Playing nonsporting games***    | 134.25           | 96.56            |
| Tourist pursuits***             | 129.49           | 102.51           |
sporting events or cultural events such as the theater, cinema or concerts more frequently than those not attending a sports club. Those not in a sports club participate more often in activities organized by the school, as shown in Table 8.

Summarizing the results, it can be seen that sportive behavior, especially being a member of a sports club, has many positive effects on the participation in the activities of the Frequency of Participation Questionnaire. Additionally, Spearman’s rho correlation can show that the activity level was influenced by physical limitations and a sports club membership. Physical limitations correlate significantly negatively with the activity level (Spearman’s rho $r = -0.176^{**}$), being in a sports club does so positively ($r = 0.117^{*}$).

(3) Perceived barriers impending equal participation in sports

**Table 6. Significant correlations of participation in activities and severity of impairment (Spearman’s bivariate correlations; $p \leq .05 = ^{*}$, $p \leq .01 = ^{**}$, $p \leq .001 = ^{***}$)**

| Activities                     | Severity of impairment |
|--------------------------------|------------------------|
|                                | Physical impairment    | Visual impairment   | Intellectual impairment |
| Relaxing pursuits              | 0.122^{*}              | -                   | -                       |
| Using a computer               | 0.162^{**}             | -                   | -0.112^{*}              |
| Playing nonsporting games      | 0.109^{*}              | -                   | -                       |
| Watching cultural events       | -0.150^{**}            | -                   | -                       |
| Eating out                     | -                     | -                   | -0.120^{*}              |

**Table 7. Significant correlations of participation in activities and steps per day (Spearman’s bivariate correlations; $p \leq .05 = ^{*}$, $p \leq .01 = ^{**}$, $p \leq .001 = ^{***}$)**

| Activities                     | Steps per day |
|--------------------------------|---------------|
| Using a computer               | -0.204^{***}  |
| Playing nonsporting games      | -0.163^{**}   |
| Using a bike or wheelchair for fun | 0.172^{**}   |
| Sports or active outdoor activities | 0.263^{**}   |
| Sporting events                | 0.146^{**}    |

**Table 8. Significant differences of mean ranges of participation in activities between members and non-members of sports-clubs ($p \leq .05 = ^{*}$, $p \leq .01 = ^{**}$, $p \leq .001 = ^{***}$)**

| Activities                              | Member sports club | Non-member sports club |
|-----------------------------------------|--------------------|------------------------|
| Using a bike or wheelchair for fun*     | 201.26             | 178.91                 |
| Group-activities outside school***      | 223.96             | 166.03                 |
| Sports or active outdoor activities***  | 225.04             | 165.42                 |
| Sporting events***                      | 239.2              | 157.39                 |
| Cultural events (e.g. theater or cinema)*| 200.98             | 179.07                 |
| Activities organized by school*         | 170.97             | 196.09                 |
The majority of the pupils are not members in a sports club and the parents of these could answer the following question: “If your child does not attend a sports club, what are the reasons?” Seven responses are predetermined with the options to answer with “true,” “somewhat true,” “not really true” or “not true.” The response options were dichotomized into “true” or “not true” and Figure 2 shows the percentages of parents affirming the given response options.

Most often affirmed was the statement, not knowing of an adequate sports club for the child (44%), followed by the assumption that the child does not want to attend a sports club (39%) and that the school offers enough sports (32%). The organization of transport is a problem for 22% of the parents, 21% of them do not dare let their child attend a sports club. Financial reasons and that sport is not so important accounts for 19% and 12%, respectively.

Of all participants, 30% like to do sports, 62% even answered that they like sports very much. Only 6% do not like to do sports so much and 2% do not like it at all (n = 399, 9 data missing, no significant differences between age groups and gender). The question: “Would you like to do more sports?” was affirmed by 74% of the younger girls (n = 72, 7 are missing) and by 79% of the younger boys (n = 141, 13 are missing). Of the 15-19-year-olds, 66% (n = 80, 13 are missing) of the female participants and 73% (n = 115, 11 are missing) of the male participants answered with “yes”. For the following question “Why don’t you do more sports?” eight predetermined answers were given with the note to check all that apply. Figure 3 shows the answers to that question.
Most frequently marked was “I don’t have the time” (51%). The next three answers indicate that there is either a lack of appropriate sports programs or they are not known about: nearly one third affirmed not knowing where to do more sports (31%), 24% do not know what kind of sports they could do and 21% checked “I don’t know a sports group for me.” Least often marked were “I don’t know how to get there” (15%), “It is too costly” (10%), “My parents don’t want it” (5%) and “I don’t dare to” (1%).

4. Discussion

This paper focuses on the physical activity as well as the participation of children and youth in meaningful activities. For the first time, objectively measured data are presented of physical activity in children and youth with disability living in Germany. Furthermore, it is the first study to provide data about the effects physical activity can have on selected activities in the daily life of children and youth with a disability.

The results concerning the first research question are in line with some international studies. Comparing data of male and female participants, the results confirm those of Law et al. (Law et al., 2006) and Michelsen et al. (Michelsen et al., 2009) whereby boys with physical disabilities and cerebral palsy, respectively, tend to prefer activities of a more sportive character and girls more skill-based activities. As could be expected from earlier studies (Orlin, Palisano, & Chiarello et al., 2010), the younger participants take part more frequently in several activities than the 15–19-year-old participants. Orlin et al. (Orlin et al., 2010) report that youth with cerebral palsy experience less diversity and a lower intensity of participation than do children with cerebral palsy, but engage in a higher proportion of activities with friends or others than do children. As the Frequency of Participation Questionnaire was developed for 8–12-year-old children, the items may not cover significant activities of adolescents, such as meeting friends in less formal ways or online communication (Longo, Badia, & Orgaz, 2013). Nevertheless, other studies indicate that adolescents with cerebral palsy have a lower frequency of participation in many areas of daily life than adolescents without disability (Engel-Yeger, Jarus, Anaby, & Law, 2009; Longo et al., 2013, Michelsen et al., 2014).

Regarding the question of whether and how the motor functional, intellectual and visual impairment affect participation, analyses indicate a positive correlation of sitting activities (e.g. relaxing pursuits, using a computer, nonsporting games) in those with motor impairments. Imms et al. (Imms, Reilly, Carlin, & Dodd, 2008) found no variation in the participation of children classified at Levels I to IV of the Gross Motor Function Classification System. They suggest that motor ability may not be a limiting factor until the children have very severe limitations (i.e., Level V). As the majority of the affected participants in the analyzed sample have only mild to moderate restrictions in motor abilities, the results may not cover the whole spectrum of the effects on participation.

Although most of the participants had at least mild cognitive impairments, only a few effects on participation were found—it negatively affected the frequency of eating out and using a computer. However, results of the SPARCLE study showed that children with mild to moderate cognitive impairment used a computer and ate out even more often than children in the general population (Michelsen et al., 2009).

As shown in this study, a visual disability had no and pain only a few effects on participation, but subgroups of affected participants were quite small and further studies are needed to allow for the advanced interpretation.

Regarding the sportive behavior of the sample, it is obvious that physically more active pupils have higher frequencies in activities of a sportive nature and are less active in sitting activities. But the most pronounced differences in the items for participation were found between those being members of a sports club and those, who are not. Being in a sports club significantly
affected the participation in activities with a more social character, such as organized group activities outside school, visiting cultural events and doing tourist pursuits. The results may indicate that an organized, structured activity may have advantages over a high activity level of an informal nature, as was also found in other studies, focusing on children and youth with intellectual and learning disabilities (Anneken & Schliermann, 2012) and adolescents (Vilhjalmsson & Thorlindsson, 1992). Law et al., (2006) and Larson, (2000) highlight additional benefits of formal activities, these being of special importance for the development of skills and competencies, stimulating initiative and intrinsic motivation, creating an area for social relationships, and supporting long-term mental and physical health. They are even considered to be more enjoyable for children (Larson, 2000). The participants who are not in sports clubs participate more often in group-activities organized by the school. This might be due to the well-known and protected environment, but the possibility of experiencing the inclusive character of activities after school when meeting with peers without disabilities is missing. Michelsen et al., (2009) also found that children with cerebral palsy of all severities participated as much or more than children from the general population in pursuits organized by their school, while they took part less often in other social activities.

The mentioned positive effects of being a member of a sports club illustrate clearly that the low percentage of young people with disabilities attending sports clubs should be alarming. Only 33% of the present sample and 39% of a similar sample with 937 pupils (Anneken, 2015) visit sports clubs compared to 77% of male and 56% of female children and adolescents without disabilities, as specified by the German Olympic Sports Confederation in 2015 (DOSB, 2015). There is an urgent need to promote the participation in sports club activities, not only because of their positive effects on some aspects of participation. Regarding the activity level of the sample in this study, analyses show on the one hand a significant negative correlation of physical restrictions and on the other hand a positive correlation with a sports club membership—organized sport may counteract the negative effects of the restricted motor abilities.

The classification into activity levels was based on the objectively measured steps per workday and the national and international recommendations for physical activity in children and youth. Regarding the international recommendations for physical activity, 50% of the sample reaches 10,000 steps or more on workdays, which seems sufficient to maintain a healthy lifestyle (WHO, 2010). On the one hand, this is more than results from national studies on the physical activity of children without disability yielded (KiGGS-study (Finne, Bucksch, & Lampert et al., 2011)). But those rely on subjective ranking of moderate to vigorous activity per day and may not cover all activities of daily living. On the other hand, comparing the data with objective step data from the study of Tudor-Locke, Craig, & Beets et al., (2011) it becomes apparent that they are less active than children and youth without disabilities. According to their classification system, boys are low active when doing less than 12,579 steps/workday and girls when doing less than 9,500 steps, which applies to about 75% of our participants. As the present study could show a small but significant effect of physical limitations on the activity level while at the same time only a few participants are more than mildly affected, it becomes apparent how important it is to support the physical activity of children and youth with physical restrictions—one way might be to support them in getting membership in sports clubs, as this could be shown to enhance physical activity levels.

Based on previous studies (Anneken, 2015), it was already assumed that the participants comparably rarely use sports clubs and the parents were asked for possible reasons for this. Answers indicate that sports clubs offering appropriate or adapted sports programs for children and youth with disabilities are either not known about or are too far from the resident. The answers of children and youth point in the same direction—although the majority of the sample likes to do sports and most of them would like to do more sports, the ignorance of where to do it and what kind of sports they could do impede them. Though a cross-sectional study asking sports clubs in the region of North-Rhine Westphalia showed, most of them are willing to include children and youth with disabilities (Becker & Anneken, 2013). As several parents also indicated not daring
to let their child do club-sport, professionals in health care and sports should address the task of elucidating to parents the strengths of physical activity and how risks can be minimized (Merkel, 2013). Children and youth also claimed that they do not have the time to do more sports—courses in special schools last until approximately 3 pm and most pupils have a long way back home. Otherwise, the school provides many opportunities to be physically active, and data indicate that during the time in school the participants are quite active. It would be interesting to compare the effects of compulsory sports in school on participation with the effects of voluntary sport in leisure time, as several publications highlight the importance of an activity being self-determined and desired by the child and/or adolescent (Kang, Palisano, & King et al., 2014; King et al., 2007; Law et al., 2006; McConachie, Colver, Forsyth, Jarvis, & Parkinson, 2006).

5. Limitations
When the project started, an adequate questionnaire to measure participation was missing. As the study was not only focused on participation, the translation and use of a complex questionnaire such as CAPE (King, 2004) or Life-H (Noreau et al., 2007) was not possible. Therefore, the Frequency of Participation Questionnaire, developed for the European SPARCLE study and already translated into German, was used. It is an easy and short measurement and the high percentage of returned questionnaires proves in part this choice. But some limiting factors occurred. The Frequency of Participation Questionnaire does not ask whether an activity was performed alone or with family and friends, and hence, it was not possible to assign the questions to categories of solitary or social activities. Yet children and youth with physical disabilities define as an important part of optimal participation being with others and feeling a sense of belonging (Hammel et al., 2008; Heah, Case, McGuire, & Law, 2007; King, Cathers, Polgar, MacKinnon, & Havens, 2000). To be able to appraise the subjectively perceived quality of participation, asking for the frequency of pursuing an activity seems to be insufficient (Kang et al., 2014). It remains unsaid whether the children themselves value a higher frequency as better participation (Kang et al., 2010). As individuals perceive optimal participation differently (Hammel et al., 2008), McConachie et al., (2006) claim that experiences of children with disabilities have to be taken into account when dealing with participation—feeling a sense of control and belonging in significant life situations might be indicators for “optimal” participation (McConachie et al., 2006). The present paper can only introduce the results from the parents’ questionnaire. The participants themselves answered a questionnaire regarding the satisfaction of the intrinsic needs of autonomy, competence, and relatedness according to a questionnaire by Véronneau et al. (Véronneau et al., 2005). The answers to this questionnaire may in the future give important hints about the requirements for self-determined participation in desired activities (McConachie et al., 2006).

6. Conclusion
This is the first study providing objective data about the physical activity of children and youth with disability in Germany. Data of international studies indicate that peers without a disability take more steps per day and are more active in their leisure time (Tudor-Locke et al., 2011). Physical activity in daily life is one of the main aspects of living a healthy life. Therefore, barriers, which prevent children and youth with disability from being more active, need to be reduced, so they can benefit from the physical and social advantages as well.

As this study could show, internal motivation is not the main barrier since most of the participants want to do (more) sports. It is rather necessary to provide the needed support from family, friends and the community to pursue this need. Sports clubs should expand their programs and make them more attractive for children and youth with disabilities. At the same time information about appropriate programs needs to reach parents and their children, e.g. by stimulating cooperation between special schools and sports clubs. Besides, health-care professionals and coaches should increase their efforts to enlighten the parents about the strengths and positive effects of sports and to diminish their worries about the participation of their child in organized sports.

Increasing the percentage of children and youth with disabilities actively involved in sports clubs may, as presented by the data of this study, enhance on the one hand the frequency of
participation in several meaningful activities, and on the other hand the physical activity level. This is crucial, especially in those with motor impairments as they are even less active than their peers with other disabilities. But further analysis is required to establish whether physical activity and taking part in sports clubs is also a chance for children and youth with disability to enhance their participation in other social activities.

Author details
Anne Züll
E-mail: zuell@fi-bs.de
Vera Tillmann
E-mail: tillmann@fi-bs.de
Ingo Froböse
E-mail: froboese@dshs-koeln.de
Volker Annken
E-mail: annkenen@fi-bs.de

1 Research Institute for Inclusion by Physical Activity and Sport, Frechen, Germany.
2 Section Science of Movement-Oriented Prevention and Rehabilitation, German Sport University Cologne, Köln, Germany.

Declaration of interest
The authors report no conflict of interest.

Citation information
Cite this article as: Physical activity of children and youth with disabilities and the effect on participation in meaningful leisure-time activities, Anne Züll, Vera Tillmann, Ingo Froböse & Volker Annken, Cogent Social Sciences (2019), 5: 1648176.
Sensewear armband and indirect calorimetry. *Journal of Physical Activity & Health*, 12(4), 540–545.

Kristén, L., Patrisskion, G., & Fridlund, B. (2002). Conceptions of children and adolescents with physical disabilities about their participation in a sports programme. *European Physical Education Review*, 8(2), 139–156. doi:10.1037/153636X020082003

Larson, R. W. (2000). Toward a psychology of positive youth development. *The American Psychologist*, 55(1), 170–183. doi:10.1037/0003-066X.55.1.170

Low, M., King, G., King, S., Kertoy, M., Hurley, P., Rosenbaum, P., & Hanna, S. (2006). Patterns of participation in recreational and leisure activities among children with complex physical disabilities. *Developmental Medicine and Child Neurology*, 48(5), 337–342. doi:10.1017/S0012162206000740

Longo, E., Badia, M., & Orgaz, B. M. (2013). Patterns and predictors of participation in leisure activities outside of school in children and adolescents with cerebral palsy. *Research in Developmental Disabilities*, 34(1), 266–275. doi:10.1016/j.ridd.2012.08.017

Malecki, A., Schneider, C., Vogel, S., & Wolters, M. (2014). Schulen auf einen Blick: Ausgabe 2014 [Internet]. Wiesbaden. Retrieved from https://www.destatis.de/DE/Publikationen/Thematisch/BildungForschungKultur/Schulen/BroschuerenSchulen8Zick0110018149004.pdf?__blob=publicationFile

McConachie, H., Colver, A. F., Forsyth, R. J., Jarvis, S. N., & Parkinson, K. N. (2008). Participation of disabled children: How should it be characterised and measured? *Disability and Rehabilitation*, 28(18), 1157–1164. doi:10.1080/096382808020534507

Meine, H. (2009). Teilhabe an alltäglichen und Freizeitaktivitäten bei Kindern mit Zerebralparese im Vergleich mit gesunden Kindern (Dissertation). Lübeck: Klinik für Kinder- und Jugendmedizin der Universität zu Lübeck.

Merkel, D. L. (2013). Youth sport: Positive and negative impact on young athletes. *Open Access Journal of Sports Medicine*, 4, 151–160.

Michelsen, S. I., Flachs, E. M., Damsgaard, M. T., Parkes, J., Parkinson, K. N., Rapp, M., & Udall, P. (2014). European study of frequency of participation of adolescents with and without cerebral palsy. *European Journal of Paediatric Neurology: EJPN: Official Journal of the European Paediatric Neurology Society*, 18(3), 282–294. doi:10.1016/j.ejpn.2013.12.003

Michelsen, S. I., Flachs, E. M., Udall, P., Eriksen, E. L., McManus, V., Parkes, J., & Colver, A. (2009). Frequency of participation of 8–12-year-old children with cerebral palsy: A multi-centre cross-sectional European study. *European Journal of Paediatric Neurology*, 13(2), 165–177. doi:10.1016/j.ejpn.2008.02.005

Noreau, L., Lepage, C., Boissiere, L., Picard, R., Fougeyrollas, P., Mathieu, J., & Nadeau, L. (2007). Measuring participation in children with disabilities using the assessment of life habits. *Developmental Medicine & Child Neurology*, 49(9), 666–671. doi:10.1111/dmnc.2007.49.issue-9

Orlin, M. N., Palisano, R. J., Chiarello, L. A., Kang, L. J., Polansky, M., Almasri, N., & Moggs, J. (2010). Participation in home, extracurricular, and community activities among children and young people with cerebral palsy. *Developmental Medicine and Child Neurology*, 52(2), 160–166. doi:10.1111/j.1469-8749.2009.03586.x

Poulsen, A. A., Ziviani, J. M., Cuskelly, M., & Smith, R. (2007). Boys with developmental coordination disorder: Loneliness and team sports participation. *The American Journal of Occupational Therapy: Official Publication of the American Occupational Therapy Association*, 61(4), 451–462. doi:10.5014/ajot.61.3.321

Rütten, A., Pfeifer, K., Banzer, W., Ferrari, N., Füzéki, E., Geidl, W., … Ungerer-Röhrich, U. (2016). Nationale Empfehlungen für Bewegung und Bewegungsförderung. Erlangen: FAU Erlangen-Nürnberg. Online-Ressource.

Schreuer, N., Sachs, D., & Rosenblum, S. (2014). Participation in leisure activities: Differences between children with and without physical disabilities. *Research in Developmental Disabilities*, 35(1), 223–233. doi:10.1016/j.ridd.2013.10.001

Shikako-Thomas, K., Dahan-Delé, N., Shevell, M., Law, M., Birnbaum, R., Rosenbaum, P., … & Majnemer, A. (2012). Play and be happy? Leisure participation and quality of life in school-aged children with cerebral palsy. *International Journal of Pediatrics*, 2012, 387280.

Shikako-Thomas, K., Majnemer, A., Law, M., & Loh, L. (2008). Determinants of participation in leisure activities in children and youth with cerebral palsy: Systematic review. *Physical & Occupational Therapy in Pediatrics*, 28(2), 155–169. doi:10.1080/09638280802053185

Stevenson, C. J., Pharoah, P. O., & Stevenson, R. (1997). Cerebral palsy–The transition from youth to adulthood. *Developmental Medicine and Child Neurology*, 39(5), 336–342.

Tillmann, V., & Annek, V. (2019). Teilhabe an gesundheitsförderlichen Potenzialen von Sport und Bewegung. In K., … Wolther & K. Römisch (Eds.), Gesundheit inclusive. Gesundheitsförderung in der Behindertenerarbeit (pp. 229–245). Wiesbaden: VS Verlag für Sozialwissenschaft.

Tudor-Locke, C., Craig, C. L., Beets, M. W., Belton, S., Cardon, G. M., Duncan, S., … & Rowe, D. A. (2011). How many steps/day are enough? For children and adolescents. *The International Journal of Behavioral Nutrition and Physical Activity*, 8, 788–892.

U.S. (1996). Department of health and human services. *Physical Activity and Health: A Report of the Surgeon General [Internet]. Atlanta. Retrieved from https://www.cdc.gov/nccdphp/sgr/pdf/sgrfull.pdf*

Veronmeau, N., Koestner, R. F., & Abel, J. R. (2005). Intrinsic need satisfaction and well-being in children and adolescents: An application of the self-determination theory. *Journal of Social and Clinical Psychology*, 24(2), 280–292. doi:10.1521/jscp.24.2.280.6227

Vilhjálmsson, R., & Thorlindsson, T. (1992). The integrative and physiological effects of the integrative and physiological effects of sport participation: A study of adolescents. *The Sociological Quarterly*, 33(4), 637–647.

WHO. (2003). Health and development through physical activity and sport [Internet]. Geneva, Switzerland. Retrieved from http://apps.who.int/iris/bitstream/10665/67796/1/WHO_NMH_NPHI_PAH_03.2.pdf

WHO. (2010). Global Recommendations on Physical Activity for Health [Internet]. Geneva, Switzerland. Retrieved from http://apps.who.int/iris/bitstream/10665/44399/1/9789241599979_eng.pdf
