



## **Staying Physically Active in Berlin During COVID-19; Perceptions of Spatial Design by University Students of Different Gender Groups.**

Figure 1. Steinplatz, an open green space located within the research area of Campus Charlottenburg/  
City West.



### **Bachelor Thesis Human Geography & Urban and Regional Planning.**

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Student: Kiki Baetsen (s3207358)

Thesis Supervisor: Paul van Steen

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## Summary

The central research question, ‘How does, in Berlin, the spatial design of open public space and light sport facilities, contribute to physical activity of different gender groups?’, is answered with the help of a mixed method analysis of qualitative, quantitative and spatial data. Results suggest that the most important factor for physical activity behavior is a green environment and a large open space, for which there is no difference in gender. A comparison of the two research areas shows that the factor accessibility is shown to be of less importance for respondents from Campus Charlottenburg/ City West in comparison to respondents of Berlin- Adlershof Science City. Other findings show that light sport facilities are generally preferred and used more by male university students. This is explained by the presence of silent expectations of sport facilities. Nevertheless, there is no difference found in the perception of other environmental characteristics, visual cues, per gender group. In addition to this are all gender groups seen as equally fit.



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# 1. Introduction

## 1.1. Background

As a result of the COVID-19 pandemic, indoor and outdoor sport facilities have been temporarily closed since March 2020 in the whole of Germany including Berlin. In the summer and early autumn of 2020, slowly and partially facilities were reopened, however with limited access and limited capability. Nevertheless, in November 2020 as a result of new lockdown measurements in Germany they were closed again until further notice. In the literature on health policies, it is widely acknowledged that it is of importance to be physically active to prevent lifestyle diseases (non-communicable diseases) such as cardiovascular diseases (Lowe et al. 2017). In addition to this advice, it is recommended that during COVID-19, where possible ‘people should be encouraged to be active outdoors, preferably in green areas. As in all other situations, rules of social distancing (at least 1,5–2 m or six feet) are essential also outdoors’ (Fuzeki et al. 2020, p. 3).

The containment measurements, sudden changes and threatening news messages have a large impact on the physical and mental health of society, including university students (Lim et al. 2020). Although university students are generally not considered a risk group of COVID-19, it is estimated by UNESCO that “60% of all students globally are affected by school closures” (Dratva et al. 2020, p.1). Specifically, with increased stress, anxiety and depressive symptoms (Dratva et al. 2020; Sifat 2020). These mental health issues are considered “a serious public health issue of university students with a fifth of students affected worldwide” (Dratva 2020, p.2). Mental health issues predominate more for students living in urban areas and students with a lack of physical activity (Dratva 2020; Sifat 2020). In addition to this, gender is also found to be a significant factor among university students and their perceived mental health during the pandemic. Female gender is associated with high anxiety scores (Dratva 2020) and has on average higher levels of fear than males (Zolotov et al. 2020).

It is therefore of pressing concern to have sport facilities and open green space suitable for physical activity in urban environments for both the physical and mental health of university students. In many German cities, there is an increasing need for suitable spaces for outdoor sport and exercise facilities. For example, the German Federal Ministry for the Environment and Sport stated that within urban areas, “inner-city parks and green spaces are often insufficiently large, or are unsuitable, uninteresting or simply too urbanized” (2020, p.9). This statement emphasizes that, even though facilities can be available, the design of open public space can fail to encourage physical activity. In addition to open public space, and often placed in that public space, are outdoor sport facilities which are accessible to all needed. These facilities are described as “light sport facilities” (Borgers et al. 2013), sport facilities open to the public for which no club membership or organizational setting is needed.

## 1.2. Research Problem

Following, the aim of this research is to investigate how physical activity behavior of university students living in an urban environment and of different gender, is influenced by spatial design. Specifically, the central research question will be ‘How does, in Berlin, the spatial design of open public space and light sport facilities, contribute to physical activity of different gender groups?’.

Thus, the urban environment investigated will be Berlin, using two research areas as a case study: Berlin-Adlershof Science City and Campus Charlottenburg/ City West. The research population used will be university students residential in these research areas.

This central question will be answered by means of the answers of two sub questions.

1. *‘What is the influence of different public space characteristics on physical activity behavior?’.*
2. *‘What is the influence of gender on the perception of open public space and light sport facilities, in relation to physical activity behavior?’.*



### 1.3. *Structure of the Thesis*

The structure of this research will be as such, previous conducted research is discussed in the theoretical framework. Hereby are previous statements and findings about the factors that influence physical activity behavior presented. On the basis of these findings a conceptual model is made which consists of 2 main subjects that are of influence on the physical activity behavior. These are 'individual characteristics' and 'public space characteristics'. The hypotheses are based on this conceptual model and the theoretical framework. Consistently throughout the research, references will be made towards these. The methodology gives insight in how the research question will be answered and which data collection methods are used. Following this, the results will present the findings of the data collection. Lastly, the discussion and conclusion will provide a summary of the main points and findings of this study.

## 2. Theoretical Framework

### 2.1. Literature

Previous research has made clear that the spatial design of the built environment is influential on contemporary lifestyles. Rice (2019) notes that individual decisions are “pre-emptively and proactively nudged through the design of the built environment and other socio-technico-material factors” (2019). Physical activity behavior is formed by individual characteristics, the social context and the physical environment (Sumanksi et al. 2013). One method to measure the influence of spatial design of open public facilities in an urban environment is through big, generated data. Research by Van Renswouw et al. (2016) concludes that when big data on physical activity is put in heat maps, green and natural environments are favorable for running activity. Another example is research by Wicker et al. in the city of Munich, Germany (2013). Using geo-coded data in the city of Munich it becomes clear that the provision of “adequate sport infrastructure promotes sport participation” (2013). These examples provide insight on the importance of spatial design on physical activity with especially the factor of accessibility as a major influence. The importance of accessibility is explained by budgetary and time constraints and opportunity costs (Wicker et al. 2013). When sport facilities are located nearby, this opportunity cost is lower and physical activity is more encouraged. By using GIS, the availability of these facilities can be measured objectively. However, this measurement of big data does not give an insight in the specific reasons why people are motivated to start physical activity in certain environments.

Thus, the use of qualitative research methods is of importance to examine the reasons ‘why’ certain spatial designs of public space and sport facilities encourages or discourages physical activity behavior. Specifically, the perception of spatial design can hereby be investigated, such as the perceived accessibility (Macdonald, 2019). Previous research has concluded that, the more people present in an environment which are doing physical activity, the more normalized this becomes at this specific place and encourages others to do so (Macdonald, 2019). Therefore, it is of significant interest to research why certain public facilities are perceived as a suitable place to do physical activity and others are not. Ariane et al. uses the theory of ‘visual cues’ (2005) that give an impression to visitors of open public facilities on how to behave. One example is the visual cue of incivility in parks, such as, trash, graffiti and drinking. These cues can influence the perception of safety in a park and discourage physical activity behavior. On the other hand does Ariane et al. (2005) state that visual cues can also promote physical activity, like available light sport facilities, such as a sport field. However, Borgers et al. explains that there is a variance in individual use of light sport facilities by using the theory of ‘silent expectations’ (Tangen 2004 cited by Borgers et al. 2015, p. 2). Although it is not observable, the design of a light sport facility can create different expectations and perceptions to individuals due to the “social desirability that may be hidden in the design of sport” (Borgers et al. 2015, p. 6). The use of the available sport facility is therefore limited to the individual perception of the sport facility and feelings associated with the activity. Although a sport field is present, it can unintentionally exclude a particular group of individuals.

Another influential factor that is positively associated with physical activity is having a green scenery (Ariane et al. 2005). This factor is also explained by Groenewegen et al. (2006), who state that natural environments are perceived as more attractive and thus “may stimulate residents to undertake healthy physical activities such as walking or cycling or to choose these activities as a mode of transport, and to spend more time in them” (2006, p. 3). However, it is also stated by Groenewegen et al. that green environment can also influence peoples feeling of safety negatively because of the lack of social control (2006). Whether open space and public space encourages physical activity is therefore specific to individuals’ impressions of the ‘silent expectations’ (Tangen 2004 cited by Borgers et al. 2015, p. 2) and ‘visual cues’ (Ariane et al. 2005). This aligns with previous research that states that physical activity behavior is shaped by characteristics of the person and the environment (Rice 2019; Sumanski et al. 2013).

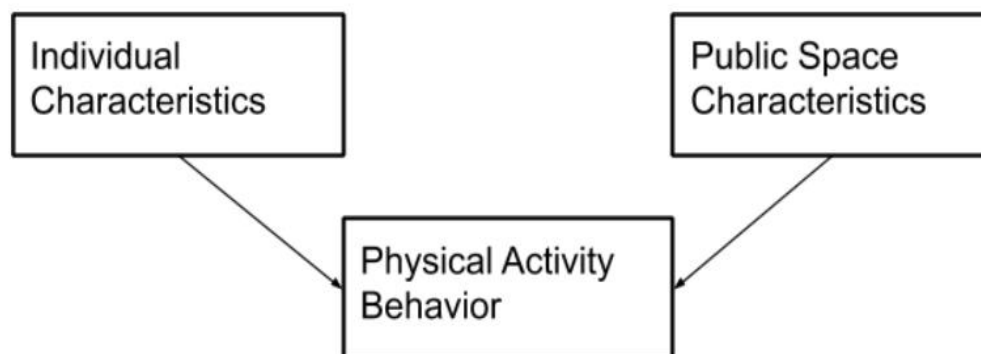


Conducted research also emphasizes the importance of socio-demographic differences in users of the facilities. Examples of this are, gender (Borgers et al. 2015; Radu et al. 2014), education and income (Wicker et al. 2013). Wicker et al. states that income has a positive effect on physical activity, along with education (2013). It is expected that “an individual’s educational level will have a positive impact on sport participation in general and in sport clubs” (Wicker et al. 2013, p. 56). However, there are findings that contradict the positive effect of education on physical activity. Research by Radu et al. (2014) states that “more than half of the University students is not active enough in Europe” (2014, p. 1763). Among university students, female students do not have a good enough level of physical activity (Radu et al. 2014). In addition to this, gender is also found to be an influential factor in physical activity preferences among university students by Burke et al. (2006). Ultimately, there seems to be a research gap that excludes the specific socio-demographic group of students in research on physical activity in public space and light sport facilities. This specific group needs more attention, to understand how change in the spatial design can encourage to physical activity. Additionally, is research on this group of significance since, university students especially derive physical and mental health benefits from “feelings of open space” and a “space to escape campus” (Ariane et al. 2005, p. 161).

## 2.2. Conceptual model

As follows, the two main factors that influence physical activity behavior in public open space and the light sport facilities in this space, are individual characteristics such as gender and the public space characteristics such as a green scenery. The perception of space is known to differ between individuals and therefore of importance to understand physical activity behavior (Borgers et al. 2015). In addition to this has it been suggested by Burke et al. (2006) that physical activity interventions are “most beneficial when they are tailored to individual preferences and that a better understanding of these preferences could lead to increased adherence to exercise programs” (p. 4). It is therefore of importance for future policy intervention to understand what the influence is of certain individual characteristics in addition to visible public space characteristics. The conceptual framework (figure 2) visualizes these expected relationships.

Figure 2; Conceptual framework of the expected relationship between the factors ‘individual characteristics’ and ‘public space characteristics’ and physical activity behavior.



### 2.3. Hypotheses

Considering the central research question and research aim, a mixed method approach which combines qualitative and quantitative research with spatial analysis is chosen to answer the research questions (Rucks-Ahidiana & Bierbaum 2015). Therefore, a less nomothetic approach is used as the basis for the formed hypotheses for the two sub questions. The hypotheses are drafted based on experiences, perceptions and expectations between the factors individual and public space characteristics, and their relationship between physical activity behavior (Creswell 2013 cited by Punch 2014, p. 23).

*Sub question 1; ‘What is the influence of different public space characteristics on physical activity behavior?’*

Previous research stated that accessibility of sport facilities is an important spatial characteristic related to physical activity (Van Renshouw et al. 2016; Wicker et al. 2013). However, the theoretical framework also emphasizes the importance of quality and characteristics of public open space (Ariane et al. 2005; Groenewegen 2006). The hypothesis for the first sub question is therefore as follows:

“For university students living in Berlin-Adlershof Science City and Campus Charlottenburg/ City West, it is expected that accessibility, a green environment and availability of light sport facilities are perceived as important spatial characteristics that contribute towards physical activity behavior in open public space.”

*Sub question 2; ‘What is the influence of gender on the perception of open public space and light sport facilities, in relation to physical activity behavior?’*

Based on the theoretical framework and previous research it is expected that three factors are of importance for the perception of the suitability of public space for university students and their physical activity behavior. These factors are ‘gender’ (Radu et al. 2014), ‘silent expectations’ (Tangen 2004 cited by Borgers et al. 2015, p. 2) and ‘visual cues’ (Ariane et al. 2005). The hypotheses for the second sub question’, is as follows:

“Gender is expected to be an individual characteristic that influences the silent expectations and visual cues present in open public space and light sport facilities in this space, among university students living in the area of Berlin-Adlershof Science City and Campus Charlottenburg/ City West”.



### 3. Methodology

#### 3.1. Research method

##### Mixed method research

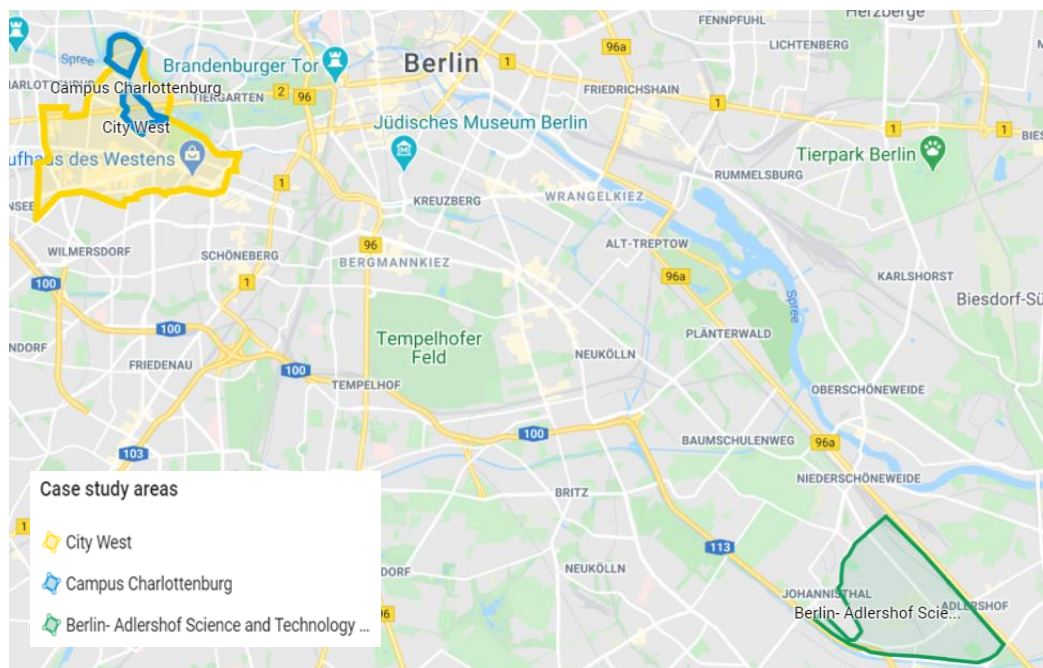
It has become apparent that the measurement of large quantitative data does not give insight in the specific reason why certain environments are used for physical activity (Van Renswouw et al. 2016; Wicker et al. 2013). In addition to this, it is even questionable in how far they do so at all. Only quantitative data is therefore not considered as suitable to answer the research question, ‘How does, in Berlin, the spatial design of open public space and light sport facilities, contribute to physical activity of different gender groups?’. The central research question and additional sub questions will therefore principally be answered through mixed method research approach consisting of quantitative and qualitative research and spatial analysis (Zaleckis et al. 2019).

##### Research areas: case studies

The central research question, “How does, in Berlin, the spatial design of open public space and light sport facilities, contribute to physical activity, for different gender groups?”, will be answered with the help of two case studies located in Berlin (figure 3). These two locations are chosen as an alternative to the whole urban environment of the city of Berlin. The reason for this is to empower statements about the spatial characteristics. A smaller area has as a result that the answers of respondents are more concentrated in one place which makes comparison possible.

The first case study chosen is, Berlin-Adlershof Science City which includes the campus of Humboldt University. The second case study is Campus Charlottenburg/ City West which contains the campus of Technical University of Berlin. The two locations have important similarities, such as the fact that both locations contain student housing and contain an university campus. However, it can be said that the locations differ in urbanity levels, the Charlottenburg Campus is located in the city center of Berlin, while Berlin-Adlershof Science City is unique in the way it is a relatively isolated entity in the South- East of Berlin. This difference should be taken into account when a comparison is made between locations.

Figure 3: The locations of Campus Charlottenburg/ City West and Berlin-Adlershof Science City.



Source; Google Maps, (2020).

### Ethical considerations

Considering the research is conducted by a Bachelor student of Human Geography and university students are the sample group, the positionality from which the researcher works is an insider. Power relations can therefore also be considered as equal. However, since this research is conducted by a researcher from the University of Groningen at the Humboldt University in Berlin it is important to be sensitive to local calendars and customs. The collecting of questionnaire data will therefore start in November, since that is the start date of the winter semester of Humboldt University.

### 3.2. *Data collection*

#### Spatial data

It is argued by Rucks-Ahidiana & Bierbaum (2015) that the integration of spatial analysis in addition to qualitative research analysis is of great relevance. This is because, “spatial context matters to our understanding of social phenomena” (2015, p. 93), in this case physical activity behavior of university students. Starting the research process with maps allows for identification of what is most striking about the area, without assuming spatial characteristics that might not be present. It is therefore of significance to map out ‘where’, ‘which’, and ‘how many’ open public space facilities and light sport facilities are present in the research areas. Additionally, this process can ‘reveal where spatial patterns influence the qualitative findings rather than assuming spatial patterns are inherently reflected in the qualitative data” (Rucks-Ahidiana & Bierbaum 2015, p.100).

In line with this research, the collection of spatial data was the first step in data collection. The data was gathered with the help of Google Maps and together with several fieldwork trips to the research areas an elaborate map was made in ArcMap. On this map the available open public space and light sport facilities were visualized before the qualitative and quantitative data collection. The spatial data obtained by observations followed the requirement that, the open space and sport facilities mapped are accessible to all e.g., they do not require a club membership, an entrance ticket or are limited to residents of one neighborhood only. Additionally, spatial data was gathered through an online questionnaire, in which respondents were asked to mark the specific public open space they most often use to do physical activity on a map of their residential area (Appendix A). Hereby a comparison between the available space and the used space can be made to research spatial design preferences and public space characteristics. This is of importance to answer the central research question and the first sub question.

#### Qualitative data

The qualitative data which is needed to answer the central research question, and second sub question, is obtained through an online questionnaire with the program Lime Survey (Appendix A). This program is provided through the Humboldt University. Lime survey is licensed by Humboldt University for data security and therefore suitable for online distribution. Hereby it was possible to distribute the questionnaire through email and several social media networks. Within the questionnaire open-ended questions are asked to gain insight in the reasons ‘why’ the open public space is used and ‘why not’. The measurement of physical activity is considered as complex, however by providing open-ended questions a self-reported and objective measurement can be given by the respondents itself (Van Hoye, Nicaise and Sarrazin 2014).

Additional to the online questionnaire, alternative methods to gather qualitative data were added during the data gathering process for the research area of Campus Charlottenburg/ City West (Appendix C). The alternative qualitative data was added after it became clear that the response rate, for especially Campus Charlottenburg/ City West, was relatively low. While distributing flyers on sight of the research area, short conversations were conducted with people that were passing by. These conversations provided valuable context and information which helped to answer the research

questions. The collection of qualitative data is of importance to gain insight in both ‘public space characteristics’ and ‘individual characteristics’. This is because respondents are able to provide an answer to an open-ended question which can consist out of factors that can relate to both.

### Quantitative data

Furthermore, quantitative data was also gathered with the online questionnaire. The questionnaire included questions focused on the individual characteristics of the respondents. For example, “what is your gender?” (Appendix A). Additional quantitative questions focus on the individual physical activity behavior of the respondents. Questions about age, what subject the respondents’ study and what degree the respondents aspire were also added.

### 3.3. *Data analysis*

#### Content analysis

The data obtained through the mixed method research methods is analyzed with “content analysis” (Zaleckis et al. 2019). Content analysis can be used for both qualitative data and geo-coded data. According to Zaleckis et al. (2019) it can “preserve the advantages of quantitative content analysis (objectivity, systematic approach, generalizability) and transfer and further develop them to qualitative-interpretative steps of analysis” (2019, p.1). The method of content analysis is ‘counting elements’ in a large set of comparable material and then provide a descriptive overview of the content (Clifford 2016, p. 122). In this case, these elements are ‘words’ in the open-ended questionnaires and ‘places’ given on the maps in the questionnaires. The combination of maps and word association in an interview script is a technique often used for the study of social representation of urban space (de Alba, 2012). It is stated that “bringing together these methods expands the knowledge about the qualitative data analysis” (de Alba, 2012).

#### Spatial data

The spatial data is coded and attributes are added in ArcMap. These attributes contain spatial characteristics, identified in the theoretical framework and content analysis of the qualitative data (Zaleckis et al. 2019). These spatial characteristics are ‘green environment’ and ‘light sport facilities’. These attributes are assigned to the spatial data which was gathered through fieldwork and the spatial data gathered through the online questionnaire. The spatial data from the questionnaire is linked to an answer ID and is combined with qualitative data from the questionnaire. Especially the answer to the question 9, ‘what open public space do you commonly use for physical activity?’ (Appendix A).

#### Qualitative data

The qualitative data conducted with the questionnaire was coded with the help of the program Atlas.ti. The qualitative data is coded using descriptive codes and in vivo codes. Following this, analytic codes are added to relate to the theoretical framework (Clifford 2016). Hereby codes related to the spatial design in open public space for physical activity behavior that kept reoccurring are exposed. These codes are counted and presented in a table with a quantitative overview

#### Quantitative data

The collected quantitative data is presented with a descriptive statistical overview. The most important factors to the central and sub research questions are identified. These are ‘gender’ and the relation of gender to ‘type of open public space’ and ‘fitness level’. To clarify these relations a clustered bar chart is provided for ‘type of open public space’ and a table presented with the percentages of assigned ‘fitness level’ per gender. To clarify the relation between fitness and gender, the frequency of usage of open public space for physical activity per gender is also added.



## 4. Results

### 4.1. Spatial analysis

A visualization of the spatial data per research area can be found in figure 4 and 6. From the total of 33 valid questionnaires, 3 respondents did not fill in question 9, “Which specific open public space do you most often use to do physical activity in [Berlin-Adlershof Science City/ Campus Charlottenburg or in City West]?”. This is since they answered “No” to question 7, “Do you ever visit public open [green] space in your residential area [Berlin-Adlershof Science City/ Campus Charlottenburg or in City West] to do physical activity?”. The maps below therefore present a total of 30 specific places chosen by respondents instead of 33.

Figure 4. A visualization of the spatial data in City West/ Campus Charlottenburg.

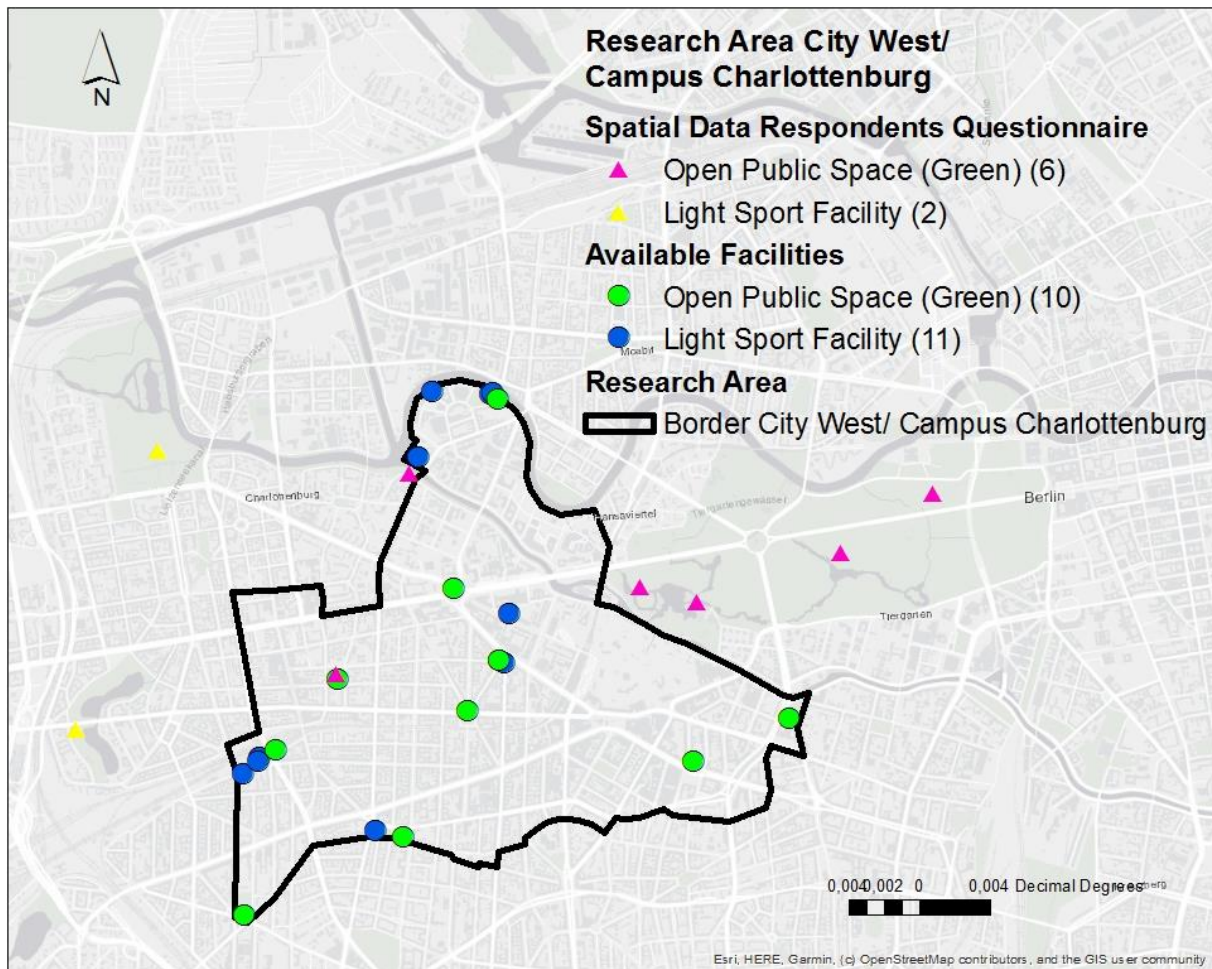


Figure 4 shows that there are 11 light sport facilities and 10 open public green spaces available within the borders of the research area of City West/ Campus Charlottenburg. The spatial data of the questionnaire shows that all markers of the respondents are marked outside the borders of the research area but one. This one marker is located on green space which surrounds a church, the other markers are also all located in an area which has a ‘green environment’. The importance of a “green scenery” (Ariane et al. 2005; Groenewegen et al. 2006) is in line with previous conducted research. Nevertheless, it seems that the size of the green space is considered important since the majority of the markers are located in a large park; Berlin- Tiergarten, Schloss Charlottenburg and Lietzenseepark. This factor has not been seen in previous research.

The fact that almost all markers are located outside the research border suggests that the space inside the research border is perceived as unsuitable for physical activity. Even though the GIS map

objectively shows the availability of light sport facilities and open public green space within the area, the respondents did not choose these. The public space characteristic of ‘accessibility’ hereby seems to be of no importance. This is contradictory to previous findings of Wicker et al. which state that providing sport facilities results in sport participation (2013). These findings are hereby more in line with research that focusses on the perceived accessibility of spatial design (Macdonald, 2019).

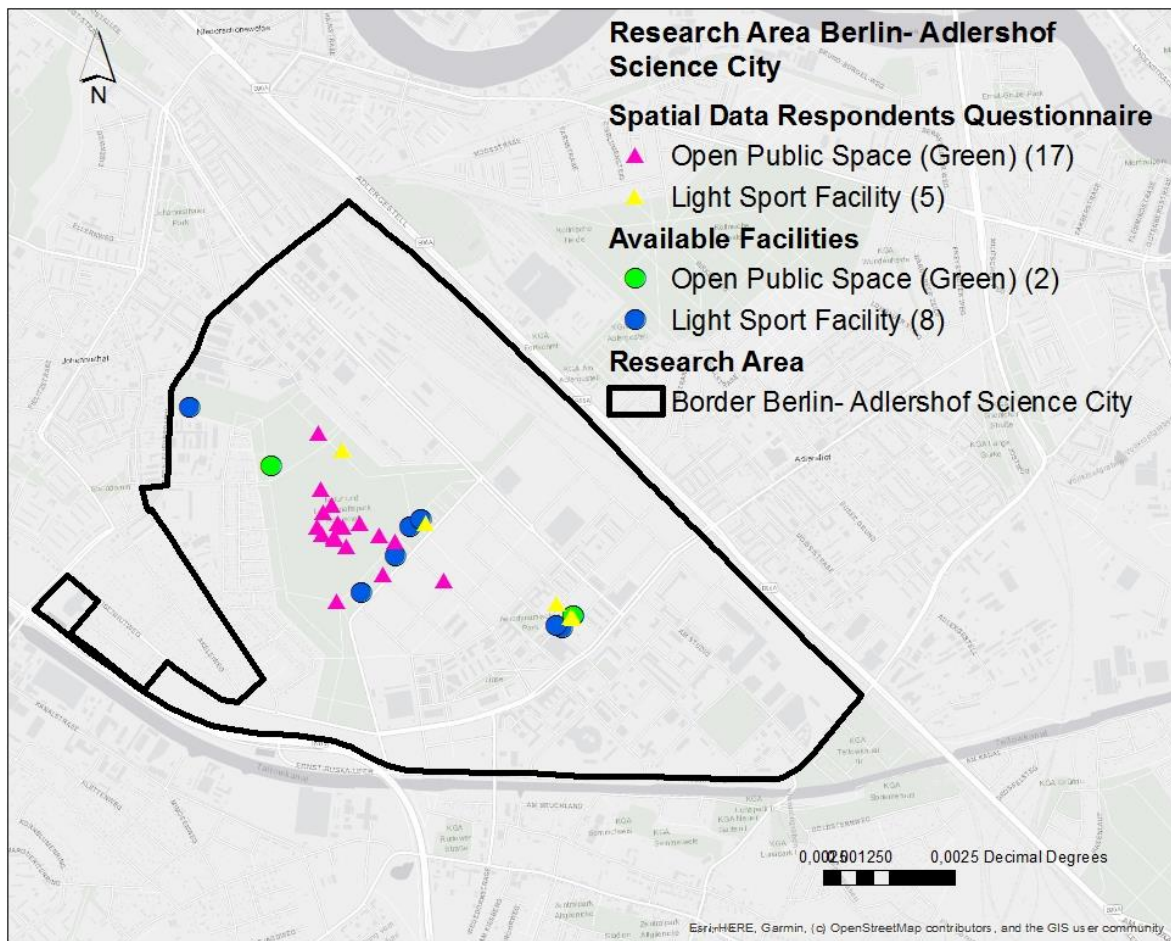
With the help of fieldwork and primary observations it becomes clear that spatial design is not solely of importance. Although the area City West contains available light sport facilities, these places contain ‘visual cues’ (Ariane et al. 2005) which can be considered discouraging for physical activity. One example is the green space near the train station (S Bahn) Charlottenburg. This green space contains light sport facilities such as a football field and a ping pong table (figure 5). However, in and around this green place many homeless people are sleeping and while conducting fieldwork here on December 8th, a municipal van was giving medical aid and advise about safe drug use during COVID-19. Hereby it can be said that although light sport facilities have visual cues that encourage physical activity, other visual cues of the environment that discourage physical activity can be perceived as stronger. The ambiguous perception of green space is also stated in previous research to be of a negative influence on peoples feeling of safety (Groenewegen et al. 2006).

*Figure 5. Light sport facilities located next to S Bahn station Charlottenburg.*





Figure 6. A visualization of the spatial data in the research area Berlin- Adlershof Science City.



In figure 6 it can be seen that the research area of Berlin- Adlershof Science City contains 2 green open public space facilities and 8 light sport facilities. The spatial data obtained through the questionnaire shows that the majority of 17 respondents mostly makes use of a green environment to do physical activity. This environment in particular is the nature reserve Park Johannisthal (figure 7).

Figure 7. Park Johannisthal, located in research area Berlin-Adlershof Science City.





Similar to the spatial data in City West a larger park and open area is chosen by the respondents which implies the size of the open public space is of importance. The remaining 5 respondents make use of light sport facilities located in the research area. What is striking in comparison to the research area of City West is that all markers are put within the borders of the research area. This implies that the space available in the research area is perceived as suitable for physical activity (Macdonald, 2019). Even though there are only 2 open green spaces available contrary to the 10 in City West. However, it is necessary to note that the research area of Berlin- Adlershof Science City does not have alternative large parks adjacent to the border of the research area such as Berlin- Tiergarten or Schloss- Charlottenburg.

Interestingly, the light sport facilities in both figure 4 and 6 are located in a green environment. Together with the other chosen open public space this results in all markers put in a green environment. This therefore also aligns with previous research which emphasizes on the importance of green space (Ariane et al. 2005; Groenewegen et al. 2006).

Other public space characteristics of Berlin- Adlershof differ from the research area of City West. The basketball field, volleyball field and ping pong tables are located next to the university campus and several residential buildings. There is few traffic and are few ‘visual cues’ (Ariane et al. 2005) of incivility such as littering, and the open public space is not known to have a lot of homeless people. The light sport facilities are placed in an open field surrounded by grass and are regularly occupied by students playing sports. The nature reserve park Johannisthal also contained many people physically active during fieldwork from September 2020 to January 2021. Activities were, walking, running, skating, playing frisbee, soccer and cycling. The popularity of these spaces aligns with previous research by MacDonald which stated that more people doing physical activity in an environment encourages others to do so as well (2019).

#### 4.2. Qualitative analysis

The amount of codes per factor in the tables below include both research areas. However, when there is an inequality between areas this is elaborated. The most important factors of why respondents like and use the open space chosen in figure 4 and 6 are, ‘green environment,’ followed by ‘open space’ and ‘accessibility’ (table 1).

*Table 1. What do you specifically like about the spatial design of this open public space in that makes you use it for physical activity?*

<b>Codes</b>	<b>Amount</b>
Green environment	19
Open space	13
Accessibility (distance)	8
Good for running	6
Available light sport facilities	3
Animals	3
Not crowded	3

Hereby, previous research about the importance of green scenery is again confirmed (Ariane et al. 2005; Groenewegen). Respondents describe the importance of a green environment as, “the open space, surrounded by greenery attracts me” (Answer ID 76), “Space, nature, quiet” (Answer ID 79) and “I like the openness and land patches with trees” (Answer ID 113). These quotes exemplify the importance of quality of open public space, a green environment and the characteristic of “spaciousness” (Answer ID 7).

In addition to this is the characteristic of accessibility only used by respondents of Berlin- Adlershof Science City as an explanation. This is striking because contrary to City West the area only has 2

available open public green spaces. The City West research area has considerably more facilities and respondents choose space outside the area. However, the available park in Berlin- Adlershof Science city is both open and has a green scenery. It is therefore credible to say the factors ‘green environment’ and ‘open space’ are most important and respondents travel to another area if the open public space nearby does not have these qualities. Nevertheless, it should be taken into account that there are no alternative places adjacent to the research area of Berlin- Adlershof in comparison to City West.

Other interesting findings are that the factor ‘running’ is often used to describe whether the space is suited for physical activity. This is for research location City West, “perfect distance for running” (Answer ID 77), “can run around in circles” (Answer ID 152) and for the research location Berlin- Adlershof, “running around the field” (Answer ID 114) and “Nice place for a run” (Answer ID 210). This again suggests the importance of the size of the space. Running is one of the most mentioned type of physical activity (Appendix B). Hereby, parks that are perceived as suitable for running could inherently be perceived as suitable for physical activity. The importance of available light sport facilities is however marginal. Contrary to other factors, gender for light sport facilities is solely male. All other factors are mentioned by both gender groups and have no remarkable difference in gender.

*Table 2. What can, in general, be improved about the public open space available? / Are their spatial design features that make you not use the open public space for physical activity at all, or less frequently?*

<b>Codes</b>	<b>Amount</b>
Trees/ vegetation	6
Light sport facilities	6
Lightning	6
Too small/ crowded	3
Visual cues	3
Traffic	3
No nature reserve	2
Public toilets and more bins	1

One of the most reoccurring spatial design factor that is disliked by respondents is the absence of trees, “more trees” (Answer ID 113). However, this reason was solely given by respondents of Berlin- Adlershof Science City. This seems to be contradictory to the previous considered ‘liked’ characteristic of open space in table 1. A clarification for this is the need for shadow, “Not enough shadows from trees in sunny summer” (Answer ID 63). The importance of trees for shade is also mentioned by a man playing badminton in City West on December 8, at Steinplatz. According to the man, the open green space is renovated and has little trees now, is it therefore not suitable to do any physical activity here in summer. However, he also mentions that in winter this characteristic is beneficial since there are very few spaces where there is sun in City West (Appendix C).

The importance of artificial light is also a reoccurring theme. This is given as a reason in Berlin- Adlershof, “one can place some lights close to basketball court” (Answer ID 220), “I don’t run in the park at night, it’s too dark” (Answer ID 189) and in City West “Some parks are without lights in the dark” (Answer ID 77). While talking to 3 architecture students on December 4 in City West, it became clear that people often bring their own light to play ping pong after dark. Especially in Berlin in winter, when it gets dark around 15:30. In addition to this they also mention that the best ping pong table in City West is located at Steinplatz (Appendix C). The table is often taken and there is a need for more suitable ping pong tables. This emphasizes again on the importance of the quality of the light sport facilities which results in ‘silent expectations’ (Tangen 2004 cited by Borgers et al. 2015, p. 2).

In addition to the factor traffic there are ‘visual cues’ (Ariane et al. 2005) that make both areas less attractive to practice physical activity. In City West this is the homeless people “the homeless people

under the bridge isn't so nice" (Answer ID 166). In Berlin- Adlershof this is lack of maintenance, "the area could be more maintained" (Answer ID 96).

Table 3. Why don't you make use of other public space in the research areas?

Codes	Amount
Accessibility	4
No time	3
Familiarity	3

Contrary to previous codes the answers to the question 'why don't you make use of other public space in the research area?' align with research of Wicker et al. that states that when the opportunity cost is low because sport facilities are located nearby, physical activity behavior is more encouraged (2013). Most respondents of both research areas state that the reason is "a lack of time" (Answer ID 113) or "long way from my apartment" (Answer ID 79). In addition to this respondents are familiar with the environment and therefore express preference for this place.

#### 4.3. Descriptive statistics

The respondent group consists out of 33 university students from which 24 from Berlin- Adlershof Science City and 9 from Campus Charlottenburg/ City West. The respondents are 48,5% female, 42,4% male and 9,1% other. The individual characteristic of gender is of importance to answer the second sub question. Previous research by Radu et al. stated that "among university students, female students do not have a good enough level of physical activity" (2014). Looking at the data it shows no evidence that there is a large difference between the self-assigned fitness level of female university students and the other gender groups (table 4).

Table 4. Percentage fitness level per gender.

Gender	Fitness level				
	Bad	Poor	Moderate	Good	Very Good
Female	6.25%	12.5%	37.5%	25%	18.75%
Male	0%	14.28%	21.43%	50%	14.28%
Other	0%	0%	66.66%	0%	33.33%

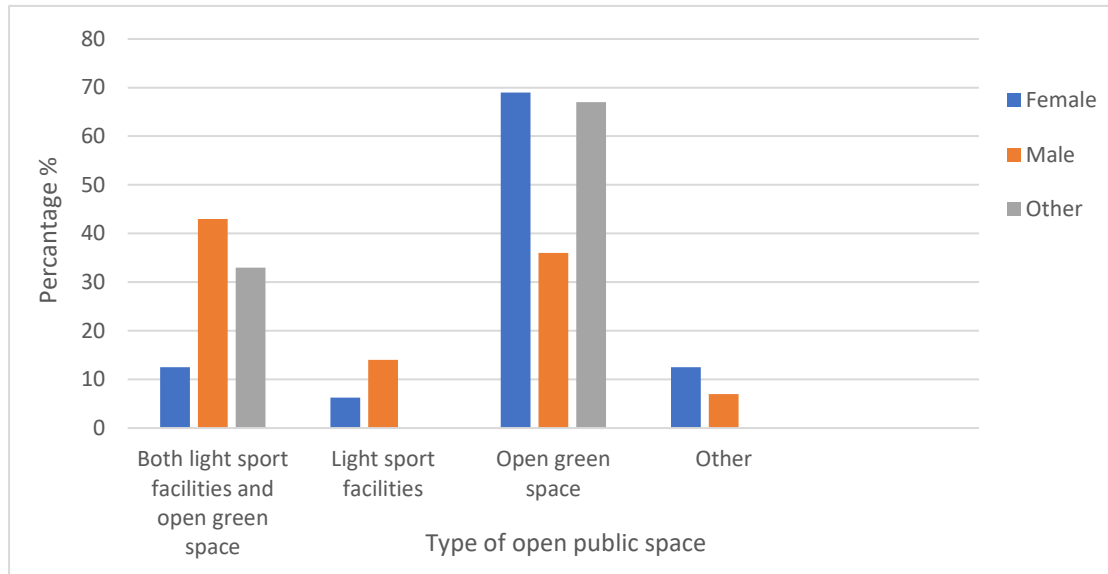
Furthermore does the data show that female respondents more frequently make use of the open public space than other gender groups (table 5). Contrary to previous research it can be assumed hereby that female university students do not have a worse physical activity level than other gender groups. In addition to this, do 90% of the respondents state to use open public space for physical activity which contradicts previous research which states that more than 50% of university students are not active enough in Europe (Radu et al., 2014).

Table 5. Frequency of usage open public space for physical activity per gender.

Frequency	Gender		
	Female	Male	Other
Daily	7.14%	0%	0%
A few times a week	64.28%	53.38%	33.33%
One time per week	7.14%	15.38%	0%
Less than one time per week	21.43%	30.76%	66.66%

In addition to this Burke et al. provide findings that prove gender is an influential factor for physical activity preferences (2006). In figure 8 it can be seen that among women ‘open green space with a green scenery (e.g. park)’ is preferred above all other types of open public space. Male respondents choose ‘both of the options above’ more often and ‘sport facilities such as a basketball court, volleyball field or a calisthenic spot’. This suggests that female respondents generally do not use light sport facilities and aligns with Burke et al (2006). Possibly, this has to do with the perception of ‘silent expectations’ of light sport facilities that are perceived different per gender groups (Ariane et al 2005; Tangen 2004 cited by Borgers et al. 2015, p. 2).

Figure 8. A descriptive overview of preferred type of open space for physical activity per gender.



## 5. Conclusion

### 5.1. *Main findings*

- The open public space characteristic of ‘green environment’ is the most influential on the physical activity behavior of university students of different gender groups in both research areas. Preferred space is mainly located in a natural environment such as a public park, as previous research by Groenewegen et al. (2006) stated. Similarly, preferred light sport facilities are also located in a park or an environment with a green scenery which is in line with research by Ariane et al (2005). Next, public space characteristics are found to be of importance as well are, the size of the available park and ‘openness of the space’ which is not stated in previous research. This fact can be explained by the fact a majority of respondents practiced running as a type of physical activity and the current corona pandemic for which people are in need of open space to practice social distancing.
- The public space characteristic of ‘accessibility’ is not considered as an important factor for respondents of the research area Campus Charlottenburg/ City West. Within Berlin- Adlershof Science City ‘accessibility’ is frequently mentioned as an important factor. However, the availability of light sport facilities and green space are not as important as the quality of the available space such as ‘openness’ and ‘green environment’. Hence, if there are better alternatives adjacent to the research area, such as Berlin- Tiergarten, these are preferred. These findings contradict research by Wicker et al. (2013) which states that accessibility to the sport facility is of importance due to budgetary and time constraints and opportunity costs.
- Although Sumanski et al. (2013) explains individual characteristics as an important factor that influences physical activity behavior, there is no difference in the perception of ‘visual cues’ (Ariane et al. 2013) per gender. However, there is an exception for the visual cue of light sport facilities, this is in line with previous research about ‘silent expectations’ (Borgers et al). Male university students mainly state the availability of light sport facilities as a motivation for physical activity in open public space whereas female university student do not mention this.
- Although previous research by Radu et al. (2014) shows that “more than half of the University students is not active enough in Europe” (2014, p. 1763). Findings of the research contradict this statement since of the 33 respondents, 90% stated to use open public space for physical activity for health purposes. In addition to this do the findings show that female university students do not have a lower level of physical activity than other gender groups as stated by Radu et al. (2014). However, gender is found to be an influential factor in physical activity preferences. It is prominent that light sport facilities are mainly used by male university students. This is possibly the result of ‘silent expectations’ of light sport facilities which unintendedly excludes female university students.

### 5.2. *Policy implications*

For future policy implications it is important to focus on the preservation of large green open spaces to encourage physical activity. As seen in City West, small green places are often perceived as unsuitable and the size of the space is therefore of importance. There is an increasing housing shortage in Berlin which results in pressure to use open public space to build new housing. However, it is important to keep in mind that open space needs to be preserved for health reasons. Large open space is currently also beneficial to keep to social distance rules during the corona pandemic. Since the corona pandemic and containment measurements prohibit the use of private sport facilities there is an increasing need for more suitable space to prohibit the exploit of the nature in the available space.

### 5.3. *Future research*

Although the spatial and qualitative analysis show no large differences in gender, it is noticeable that male university students dominate in preference of light sport facilities. Additional research is needed to gain insight in the reasons why female university students generally do not prefer light sport facilities. This future research is needed because results of this can help to provide tailored policies to encourage physical activity with light sport facilities for all gender groups.

### 5.4. *Reflections on the data collection process*

Several issues arose during the data collection process. There was a delay in the distribution of the questionnaire, the original data collection method of distribution by email had no-response and there was an especially low response rate for the research area of City West. Additional difficulties are due to corona measurements such as online classes. Hereby, very few students could read posters and flyers that were put up in the university buildings on campus. During fieldwork it also became clear that the research area of City West does not reside many university students. Improvements could be made by choosing another research area which resides more university students.

The low response rate implies that the questionnaire was too long. However, the strength of this research lies in the diversity of the questions and the inclusion of qualitative, quantitative and spatial data. Hereby, the central research question is answered as elaborate as possible. However, additional research with a larger research group will increase statement strength.



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## Appendix

### A. Data collection instrument; questionnaire

*Link to the Lime Survey questionnaire ;*

<https://umfrage.hu-berlin.de/index.php/566787?lang=en>

*Start questionnaire;*

#### Welcome Text

First of all, I want to welcome and thank you for participating in this research. My name is Kiki Baetsen and I am a Human Geography and Planning student at the University of Groningen in The Netherlands. I am currently on ERASMUS in Berlin writing my Bachelor thesis at Humboldt University. The aim of this questionnaire is to find out the influence of spatial design and gender on the physical activity behavior of university students in open public space in Berlin.

As a result of the COVID-19 pandemic, indoor and outdoor sport facilities have been closed. This limits residents of Berlin to the available open public space and 'light sport facilities' (e.g. an open to the public basketball court or football field for which no club membership is necessary) to do physical activity. University students have been affected worldwide by the COVID-19 pandemic. Mental and physical health issues are known to predominate more with students living in an urban area and with a lack of physical activity. Therefore, this research aims to find out the influence of the spatial design within the city of Berlin on the physical activity behavior of university students. Additionally, it will be investigated if there is a difference in activity behavior between male and female university students, since it is found that female university students generally have a lower level of physical activity than male university students.

This questionnaire will take approximately 10 minutes. If you have any questions or remarks, please contact me at this email address; baetsen@cms.hu-berlin.de.

#### Data Protection Statement

Your data will be handled with confidentiality. The data will be processed and saved only as long as necessary. The data will not be published and only be used for academic purposes. After analysis the data will only be visible to the researcher of this project and those which are supervising.

Figure 1; Research area of Berlin-Adlershof Science City

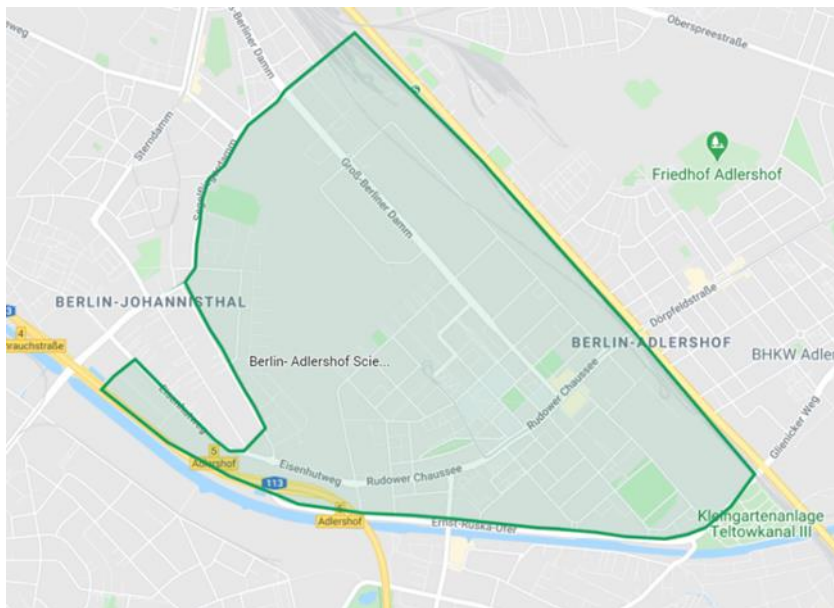
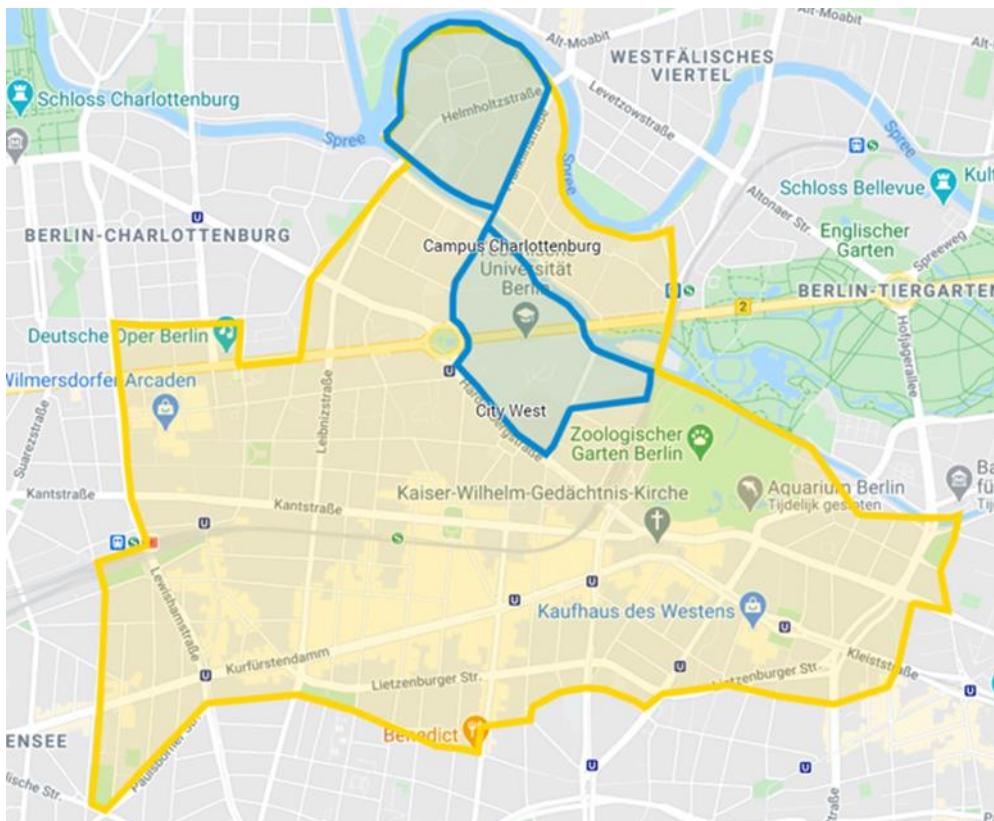


Figure 2; Research area of City West, including Campus Charlottenburg.





1. Do you live in one of the highlighted areas in the maps in figure 1 or 2?

- Yes, I live in;
- Berlin- Adlershof Science City
- Campus Charlottenburg/ City West
- No, I do not live in either of these regions  respondent is redirected to the end of this questionnaire.

2. Did you, in the last 6 months, visit public open [green] space to do physical activity? For example, to go for a run, engage in physical exercise, walk or play soccer or basketball?

- Yes
- No  respondent is redirected to the end of this questionnaire.

3. Are you currently enrolled as an university student?

- Yes
- No  respondent is redirected to the end of this questionnaire.

General questions about open public space and physical activity

4. You currently live in [Berlin-Adlershof Science City/ Campus Charlottenburg or in City West]. For how long since you moved into this area?

- Up to 3 months
- 3 to 6 months
- more than 6 months to 1 year
- More than 1 year

5. What type of open public space do you commonly use for physical activity?

- Open green space with a green scenery (e.g. park)
- Sport facilities such as a basketball court, volleyball field or a calisthenic spot
- Both of the options mentioned above
- Other, please specify;

6. What type of physical activity do you practice in open public space? More than 1 answer possible; please check all the boxes that apply;

- Running
- Walking
- Cycling
- Soccer
- Basketball
- A calisthenic facility (urban gym)



- o skating
- o other, please specify;

Area specific questions

7. Do you ever visit public open [green] space in your residential area [Berlin-Adlershof Science City/ Campus Charlottenburg or in City West] to do physical activity? For example, to go for a run, walk or play soccer or basketball?

- o Yes  respondent is redirected to question 8
- o No  respondent is redirected to question 13

8. How often do you generally make use of open public space in [Berlin-Adlershof Science City/ Campus Charlottenburg or in City West] for the purpose of physical activity for your health?

- o Daily
- o A few times per week
- o One time per week
- o Less than one time per week

9. Which specific open public space do you most often use to do physical activity in [Berlin-Adlershof Science City/ Campus Charlottenburg or in City West]?

Include map with the option to mark a place with the area chosen

10. What do you specifically like about the spatial design of this open public space in [Berlin-Adlershof Science City/ Campus Charlottenburg or in City West] that makes you use it for physical activity?

Open-ended question;

11: Do you visit other open public space in [Berlin-Adlershof Science City/ Campus Charlottenburg or in City West] for physical activity?

- o Yes
- o No  respondent is redirected to question 12.

12. Why don't you visit other open public space in [Berlin-Adlershof Science City/ Campus Charlottenburg or in City West] for physical activity?

Open-ended question;

13. Why do you not make any use of open public space in [Berlin-Adlershof Science City/ Campus Charlottenburg or in City West] for physical activity? (this question is skipped when answer 'yes' is given to question 7).

Open-ended question;

14. What can, in general, be improved about the public open space available in [Berlin-Adlershof Science City/ Campus Charlottenburg or in City West]? Do you have any recommendations?

Open ended question;

15. Are their spatial design features that make you not use the open public space for physical activity at all, or less frequently?





Open ended question;

General individual characteristic questions

16. What is your age?

[.]

17. What is your gender?

- Male
- Female
- Other

18. What subject do you study?

Open ended question;

19. What degree do you aspire?

- Bachelors
- Masters
- PhD

20. How would you describe your general fitness level:

- very good
- good
- moderate
- poor
- bad

## B. Questionnaire answers

### Closed-end questions

#### *Introductory questions*

Question 1. Do you live in one of the highlighted areas in the maps in figure 1 or 2?

Answer option	Yes, I live in Berlin-Adlershof Science City.	Yes, I live in Campus Charlottenburg/ City West.	No, I do not live in either of these regions.
Amount	35	33	128

Question 2. Did you, in the last 6 months, visit public open [green] space to do physical activity? For example, to go for a run, engage in physical exercise, walk or play soccer or basketball?

Answer option	Yes	No
Amount	46	9

Question 3. Are you currently enrolled as an university student?

Answer option	Yes	No
Amount	33	13

#### *General questions about open public space and physical activity*

4. You currently live in [Berlin-Adlershof Science City/ Campus Charlottenburg or in City West]. For how long since you moved into this area?

Answer option	Up to 3 months	3 to 6 months	More than 6 months	More than 1 year
Amount (Campus Charlottenburg/ City West).	2	0	1	6
Amount (Berlin-Adlershof Science City).	15	0	1	8

Question 5. What type of open public space do you commonly use for physical activity?

Answer option	Open green space with green scenery (e.g. park).	Sport facilities such as a basketball court, volleyball field or a calisthenic spot	Both of the options above	Other, please specify;
Amount/ specific answer	18	3	9	<p>“The paths near the Spree. They have benches and enough open spaces near them.”</p> <p>“Concrete jungle”</p>

									“Just streets around”
--	--	--	--	--	--	--	--	--	-----------------------

Question 6. What type of physical activity do you practice in open public space? More than 1 answer possible; please check all the boxes that apply;

Answer option	Running	Walking	Cycling	Soccer	Basketball	Aerobic facility	Skating	Other
Amount / specific answer	22	23	16	8	6	4	3	“Volleyball” “Football” “Table tennis”

#### *Area specific questions*

Question 7. Do you ever visit public open [green] space in your residential area [Berlin-Adlershof Science City/ Campus Charlottenburg or in City West] to do physical activity? For example, to go for a run, walk or play soccer or basketball?

Answer option	Yes	No
Amount (Campus Charlottenburg/ City West)	8	1
Amount (Berlin- Adlershof Science City)	22	2

Question 8. How often do you generally make use of open public space in [Berlin-Adlershof Science City/ Campus Charlottenburg or in City West] for the purpose of physical activity for your health?

Answer option	Daily	A few times per week	One time per week	Less than one time per week
Amount (Campus Charlottenburg/ City West)	0	5	1	2
Amount (Berlin- Adlershof Science City)	1	12	2	7

Question 11: Do you visit other open public space in [Berlin-Adlershof Science City/ Campus Charlottenburg or in City West] for physical activity?

Answer option	Yes	No
Amount (Campus Charlottenburg/ City West)	4	4
Amount (Berlin- Adlershof Science City)	9	13

#### *General individual characteristic questions*



Question 16. What is your age?

Answer option	18	19	20	21	22	23	24	25	26	27	35	37
Amount	2	2	4	7	3	3	3	1	2	3	1	2

Question 17. What is your gender?

Answer option	Female	Male	Other
Amount	16	14	3

Question 19. What degree do you aspire?

Answer option	Bachelors	Masters	PhD
Amount	18	12	3

Question 20. How would you describe your general fitness level:

Answer option	Very good	Good	Moderate	Poor	Bad
Amount	6	11	11	4	1

*Open-ended questions*

Answers by respondents from Berlin- Adlershof Science City.

<b>Answer ID</b>	<b>What do you specifically like about the spatial design of this open public space in Berlin-Adlershof Science City that makes you use it for physical activity?</b>	<b>Why do you not make any use of open public space in Berlin-Adlershof Science City for physical activity?</b>	<b>Why don't you visit other open public space in Berlin-Adlershof Science City for physical activity?</b>	<b>What can, in general, be improved about the open public space in Berlin-Adlershof Science City? Do you have any recommendations?</b>	<b>Are their spatial design features (e.g. the facilities and the spatial environment) in Berlin-Adlershof Science City that make you not use the open public space for physical at all, or less frequently?</b>	<b>What is your gender?</b>
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7	Its spacious and not far away				No the Problem is my motivation	female
8	It's just cosy, green, open air, free space		Too far, and not as beautiful	Actually no it has everything it needs	No	male
18						
20	It is a good football pitch close to where i live			Additional football pitch		male
30						
63	It is near ~ has sheeps ~ not crowded at weekdays		Too far away Too crowded Too small	More trees Jogging lanes not made of concrete	Not enough shadows from trees in sunny summer	other
90						male
91						
95	I don't like anything specifically.		Too busy	Nope	No	female
96	It's near my dorm			The area could be more maintained	No	male
99	it's near my dorm there's a small area for pull up		Pandemic	more open places for sports	to crowded	other

103			It's enough :)			female
104	Close to my home			Maybe another free to use soccer field	Not really	male
109	The sheep		There aren't many	More lights	No	female
112	The park has mostly concrete or asphalt paths.			Should be lit better.	No	female
113	I like the openness and land patches with trees.		Lack of time, no bicycle	More trees	No, everything is great	female
114	running around the field some parts are elevated		I don't know of any	inadmissabi lity of central part of field is a pity	no	male
120	It is very open and not too busy.		I prefer the space I usually use because I know it	More bins and public toilets.	No, I like the spatial design of the park.	female
135	Huge protected vegetalized surface, animals		No place as calm and green as this one	More vegetation/ plant would be appreciated	Straight pattern of streets, car traffic	female
156	It's the only big park in Adlershof			No Naturschutz gebiet, it doesn't make sense		female
189	basketballC ourtNearby, NoHousesB lockSun,Bu tAnyIsOK			I am quite happy.	IDon'tRunI nTheParkAt Night- ItsTooDark, ButThatsGo od	male





210	Nice place for a run, has pull up bars and stuff		There are none	More places for real fitness	pull up & dip bars, theres not much else	other
211			I don't know so many places around here	No	No	female
214		There are only basketball/volleyball courts			No	female
220	It has a parallel way to the road			One can place some lights close to basketbal court	No	male
222		Unaware of options		Sorry no	Nah	female
229	the air is fresh;a lot of greens;prett y big field			more trees		female

Answers by respondents Campus Charlottenburg/ City West.

Answer ID	What do you specifically like about the spatial design of this open public space in Campus Charlottenburg and in City West that makes you use it for physical activity?	Why do you not make any use of open public space in Campus Charlottenburg and in City West for physical activity?	Why don't you visit other open public space in Campus Charlottenburg and in City West for physical activity?	What can, in general, be improved about the open public space in Campus Charlottenburg and in City West? Do you have any recommendations?	Are their spatial design features (e.g. the facilities and the spatial environment) in Campus Charlottenburg and in City West that make you not use the open public space for physical at all, or less frequently?	What is your gender?
51	foresty but also many fields, very natural feeling			i like it the way it is:)	Not really no	female
76	The open space, surrounded by greenery attracts me			The path I use to walk is very loud due to traffic	Sometimes the nearby traffic is bothersome	female
77	Very nice scenery and perfect distance for running		One is enough for running	More bicycle tracks	Some parks are without lights in the dark	male
79	Space, nature, quiet				Long way from my Apartment	female



101		There is no appropriate space		There are many small playgrounds, but no big space		male
152	can run around in circles, it is a different view		Better Alternatives elsewhere	More connected parks	Don't know what that means	
155	x					
166	I really enjoy running by the river (in the path)		Because I start my run at dovebrücke at the castle	Noup I really enjoy the view and the space	The homeless people under the bridge isn't so nice	male
217	Beautiful scenery		No time			male

### *C. Interviews during fieldwork*

*December 4, 2020. 2 male students eating at Studierenwerk Mensa.*

Steinplatz is too small to do physical activity. It is also too cold now to do physical activity outside. The courtyard at the TU Campus which contains a volleyball field, and a basketball hoop is “not good” for physical activity therefore they prefer going to Tiergarten, Schloss Charlottenburg or go running near the canal.

*December 4, 2020. 3 architecture students playing ping pong at Steinplatz, 2 male and 1 female student.*

The table tennis plate at Steinplatz is the best table in whole of Charlottenburg. The table is always taken you have to “fight for a spot”. Sometimes people bring their own light to play after it is getting dark, an improvement would therefore be to place lighting at the square. According to them is there a small amount of table tennis plates in Berlin and if new ones are places it is often busy and wanted spot. They say if you have a place where there is nothing happening, place a ping pong table and the place will be visited by many people.

*December 8, 2020. Two people playing badminton at Steinplatz, 1 male and 1 female.*

The man says “in Charlottenburg you have to really appropriate the space for yourself to do physical activity.” There was a spot closer to their home available, but that spot had no sunlight which led them to Steinplatz because there is very little sun in Berlin in winter. In summer this characteristic is seen as negative because the place is therefore too hot and the place provides no shade.

*December 8, 2020. Two man playing ping pong at the table located at a playground next to the canal in Charlottenburg.*

They use this spot because it is located near their home, but the additionally is the view also good. They would like to see more urban gyms in the area and suggest a “bark running track” as they used this when they lived in Hamburg. They prefer this table over the ones in Tiergarten because the tables are dirty and the people that hang around there are not pleasant.