

**CHARLES UNIVERSITY PRAGUE**

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**The examination of a link between the COVID-19  
pandemic and the size of the personal space**

Bachelor thesis

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## **Declaration**

I declare that I have written this bachelor thesis on my own. All used sources were properly cited in the text and are listed under 'references' at the end of the thesis. The thesis has been cited according to APA manual 7<sup>th</sup> edition. I declare that this thesis has not been used to obtain any other degree.

In Prague, 27<sup>th</sup> April 2021

Signature: *Kottánová*

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## **Abstract**

This bachelor thesis addresses the issue of the size of the personal space and its changes during the COVID-19 pandemic. It answers the research question of whether the subjective perception of the pandemic as threatful and participants' compliance with safety measures impact the interpersonal distance people prefer to maintain from each other. Furthermore, the thesis aims to establish which factors, such as participant's sex, nationality or age, impact the preferred interpersonal distance.

For the data collection, an online questionnaire was used. In total, 821 participants of 44 different nationalities completed the survey, 599 women, 219 men and 3 people of undefined sex. The results showed that participants who were feeling more health-threatened by the virus or by a close physical presence of other people preferred to maintain longer interpersonal distances from others. The same results were also determined for participants more compliant with the safety measures (social distancing and reducing social contacts). Difference between male and female participants was found, with, on average, longer distances kept by women. Research also examined the differences between the size of the personal space of participants from contact and non-contact cultures. Findings were contradicting to the previous research suggesting that members of contact cultures maintain shorter distances between each other. The preference for longer distances of participants from contact cultures can be explained by higher level of health-concerns in the context of the pandemic when compared to participants from non-contact cultures.

## **Keywords**

Personal space, interpersonal distance, proximity, social interaction, protective mechanism, the COVID-19 pandemic, a feeling of security, risk perception, social distancing

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# INTRODUCTION

This bachelor thesis examines the relationship between subjective perception of the COVID-19 pandemic and the interpersonal distance people prefer to keep as well as with compliance with the introduced safety measures. Moreover, it studies other determinants of the personal space such as age, sex or nationality of the participant, which might influence the maintained distance. The work aims to find whether there is a correlation between the participant's perception of the pandemic as threatening and the size of their personal space.

The concept of personal space, as one of our basic protective mechanisms, has been established by anthropologist E. T. Hall (1966) and firstly investigated by psychologists R. Sommer (1959) and K. B. Little (1968). It has been determined that it varies between sexes, among different cultures and with personal circumstances. One of the most important determinants is the context individual is placed in. Previous research showed that if the situation is perceived as threatening, the size of our personal space increases. Nevertheless, it is dependent on the subjective perception of the situation (Albas, D. C. & Albas, C. A, 1989).

Although the concept of the personal space and its determinants has been studied since the 1950s, its connection with the current situation of the COVID-19 pandemic makes it a relevant topic for research. The possibility of the SARS-CoV-2 infection makes the current situation health-threatening for us. Dosey & Meisels' (1969) theory allows us to predict that when individual perceive the COVID-19 pandemic as threatening, their personal space size will increase and therefore maintained interpersonal distances will extend.

The thesis is divided into two main parts: theoretical and empirical. In the first part, a theoretical framework of the study will be introduced, together with the findings of the previous research. The concept of the personal space, its perception and function will be explained, its determinants will be listed, and the connection with the COVID-19 pandemic will be drawn. In the empirical part, research questions and hypotheses will be established, and later on, the data collection process and statistical analysis will be described. This part will contain the results from the data analysis with their interpretation. Mean preferred distances when encountering a family member, a same- and an opposite-sex close friend, an acquaintance and a stranger in interior and exterior will be counted and later on compared between sexes, nationalities and age groups of the participants. The final part of the data analysis will be devoted to correlations between participants' attitudes about the COVID-19 pandemic, a close physical contact with other people and participants' compliance with the safety measures, and their mean preferred distances.

# THEORETICAL PART

## 1. Definition of the personal space

The personal space is a protective mechanism, sometimes referred to as a ‘bubble’ surrounding each individual (Von Uexküll, 1992). It is regulating the distance people maintain from objects or other people in their environment. E. T. Hall, a founder of *proxemic*, a field of study examining human spatial behaviour, determined its distance to 125 cm from the individual (Hall et al., 1968). This border separates interactions with familiar people from those with acquaintances and strangers. It serves as a buffer zone, protecting individuals from possible threats in their environment, in this case, represented by unknown people (Sommer, 1959). Only intimate interactions or contact with close friends and family members can occur beyond this border, closer to the individual (Hall, 1966).

Although personal space does not indicate only the distance, we maintain from other people but also the distances we keep from inanimate objects in our environment, it is mostly examined in the context of distance with other individuals (Graziano, 2017). Interpersonal distances differ due to many variables, such as the relationship with the other person, physical characteristics like sex, age, height or body scent, cultural background, body position, situational context and experiences (Evans & Howard, 1973).

## 2. Classification of the space around us

The research of the personal space is rooted in animal studies. Hediger (1950), one of the first scientists examining animals’ spatial behaviour, divided the area around the animal into two parts; *flight* and *social distance*, determined by the possibility of a safe escape in case of need. Space immediately surrounding the animal, into which animals let only their fellow group members, is called the *social distance*. The border dividing the *flight distance* from the *social distance* is called the *critical distance*. It serves the animal as a protective barrier from its environment, and it is located at a distance long enough to provide the animal with a safe escape. Nevertheless, its length is determined by the size of the animal and the context of the situation (e.g., when an animal is domesticated, its flight zone shrinks).

Hediger’s classification of animal’s space inspired the work of Edward T. Hall. He divided the area around every individual into four different zones based on the interactions which occur within them. He named the zones as intimate, personal, social and public. In



Hediger's conception, the intimate and the personal space would be located in the animal's *social distance* and the social and the public space would be placed beyond the *critical distance* (Graziano, 2017). The distribution of space is unconscious, and the number and size of the zones differ among individuals due to their culture, personality or situation (Hall, 1966). Therefore, Hall's distribution into the four different zones and their sizes is valid for Europeans and North Americans.

The closest zone, surrounding the individual in a distance of 15 to 45<sup>1</sup>cm, is called the intimate space. Since physical contact, such as sexual intercourse or fight, usually occurs in this area, unwanted violation of the intimate space by another individual might lead to physical discomfort, resulting in muscle stiffness. For that reason, the intimate space violation is considered inappropriate in public spaces. This zone is the most often violated in public transport or queues.

The second zone, the personal space, is placed between 45 and 125 cm around the individual, which is approximately the distance of an arm's length. In this distance, interactions with our closest friends or family members occur. Between 125 and 350 cm around the individual Hall determined the social space, where many various interactions occur, from interactions with our friends and acquaintances in the close social space to more formal interactions, such as with our colleagues, taking place at the end of this zone. Beyond this zone, which spans between 350 and 760 cm, is the public space. This distance provides us with the possibility of protection, such as escape from an enemy. People prefer to keep this distance while encountering strangers on the street (Hall, 1966).

### **3. The perception of the personal space**

The space around us is perceived by two types of receptors: receptors examining objects far away from us (eyes, nose and ears) and by our skin, which is exploring close objects. According to Hall, the amount of sensory input increases with decreasing distance because our sensors can pick up more cues. An increased amount of sensory input, especially in terms of smell or noise, can be very irritating for some individuals and can cause us discomfort. That is why we like to keep a longer distance from strangers or people we do

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<sup>1</sup> In the book '*The hidden dimension*' by E. T. Hall, the measures were listed in inches and feet. The distances were converted into centimetres to make the data more easily readable for a European reader. The original values were 6 – 18 inches for the intimate space, 1,5 to 4 feet for the personal space, 4 – 12 feet for the social space and 4 – 12 feet for the public space.

not have a close relationship with. Nevertheless, unlike auditory, olfactory and tactile stimuli, the number of visual stimuli increases with extending distance. That means that when we are too close to someone, we do not perceive a sufficient number of visual stimuli, and we can experience vision blur. Because the sight is the most critical sense for us, the inability to rely on it makes us feel anxious and uncomfortable (Hall, 1966).

In the perception of our personal space, we have to take into account two components: the subjectively perceived personal space and the objective personal space. Gifford's (1983) research has shown that the perceived size of our personal space differs from the objective personal space measured by the researchers. In general, people tend to perceive their distance from others as longer than it actually is. This aspect can significantly affect the results of this research because the participant's answers may suggest a larger personal space than if it would be measured.

### **3.1 The neuroscience of the personal space**

The personal space is one of our basic protective mechanisms. It is protecting us by maintaining a safe distance from other people and objects in our environment, and it is also responsible for respecting the personal space of other people. Cross-modal attentional mechanisms are needed to control the space around our body. These processes operate on both: the subcortical level, such as the startle reflex, and the cortical level. Compared to the subcortical level, processes of cortical level are slower. They include more conscious responses like taking a step back, escape, avoiding obstacles etc., which are protecting us from not getting hurt by running into something (Graziano & Cooke, 2006).

Findings from the research of Kennedy et al. (2009) suggested that the amygdala is influencing the distance we keep from other people and is crucial for two main processes: respecting the personal space of others and demanding others to maintain our personal space. Damaged or completely missing amygdala results in the absence of the personal space.

## **4. Determinants of the personal space**

### **4.1 The influence of age, sex, height and a relationship with the individual**

Various factors influence the size of our personal space. From previous research, we can conclude that one of the most crucial ones is sex. The study conducted by Hartnett, Bailey and Hartley (1974) showed that, on average, women kept a shorter distance from

other individuals of the same sex and a longer distance from the individuals of the opposite sex than men did. In men, the size of their personal space did not differ with the sex of the approaching individual (Dosey & Meisels, 1969). Although not all studies supported these conclusions, and some found a longer distance between two females than between individuals of the opposite sex, the measured distances between two male participants were always the longest. Nevertheless, these inconsistencies might be caused by different individuals' height as one of the critical determinants of interpersonal distance, which was not considered in some of the previous studies (Hayduk, 1978).

As mentioned above, the interpersonal distance we keep is influenced by the height and body position of the other individual. In their research, Hartnett, Bailey and Hartley (1974) concluded that both women and men keep a longer distance from tall individuals. The kept distance was longer in the condition when participants were standing than in the sitting condition, since it manifests one's height better. The longest distance kept was found in the condition with a standing tall man with longer distances kept by women than men. Their research also proved Hartnett's previous results (Hartnett, Bailey & Gibson, 1970), showing longer interpersonal distances maintained in a situation when another person approaches us compared to a situation when we are approaching someone.

Although many studies examined the personal space size in specific age group, such as children or elderly people, not much research focused on the link between personal space size and individual's age in general. Studies comparing the size of personal space between children and adults found significant difference in its size between the compared groups, showing on average smaller distances maintained by children (Heshka & Nelson, 1972). The results therefore suggested that the personal space is developed with individual's physical development (Guardo, 1969). However, Webb and Weber's (2003) study, examining the size of the personal space among elderly people (above 60 years old), showed that although the participant's age and the size of the personal space were positively correlated, it was dependent on participant's physical condition. The role of participant's mobility was shown to be the most significant, and therefore the size of one's personal space is more likely to be linked to their physical condition instead of their age.

Next to sex, height, body position and age, our personal space is also influenced by the relationship with the other individual. Studies have shown that we keep a smaller distance from our friends or family members and from people who share the same values with us, such as political orientation (Hall, 1966; Thayer & Alban, 1972). Hayduk (1978) confirmed that liking decreases the interpersonal distance we maintain. However, Melson's

(1976) research showed, that pre-schoolers were keeping the same distance, no matter their relationship with the individual. The ability to discriminate among affectionate states is developed with age, and it emerges earlier in girls. Moreover, it showed the same sex differences between interpersonal distances, as in adults; while for girls, the sex of the other individual was an important determinant of the distance, for boys, sex seemed irrelevant. Compared to boys, girls kept, on average, a smaller distance from other girls than from boys.

#### **4.2. Personality and its effects on the personal space**

It is expected that the personal space is also affected by our personality. However, the results are not consistent enough to provide us with clear conclusions between the size of the personal space and personality traits. Nevertheless, it can be concluded that significant personality differences, such as personality disorders, have an evident impact on the size of the interpersonal distance (Hayduk, 1983).

The study conducted by Sewell and Heisler (1973) examined the effect of personality traits such as exhibition, autonomy, aggression, dominance or impulsivity. The researchers found that people who scored high in exhibition and impulsivity tend to have smaller personal space than those scoring low. These findings were supported by the results of Patterson and Sechrest's (1970) study, examining the effect of extroversion, with impulsivity as one of its core features (Rocklin & Revelle, 1981). They compared the size of the personal space between extroverts and introverts and established that, on average, introverts keep a longer distance from other people than extroverts do. Moreover, people scoring high in authoritarianism and low in self-esteem maintained longer interpersonal distance under stress conditions than people scoring low in authoritarianism and high on the self-esteem scale (Frankel & Barrett, 1971). Except for many other characteristics such as dependency, reliance or trust, also attachment style affects our proximity behaviour. The study by Kaitz et al. (2004) confirmed their hypothesis stating that individuals classified as securely attached maintained shorter interpersonal distance than adults with more-avoidant attachment style.

Except for our personality traits, also our beliefs and expectations influence the size of our personal space. Ickinger and Morris' (2001) study showed that people who believe that the world is uncertain or difficult are keeping a longer distance from other people. The same results were found in individuals who expected other people to be untrustworthy or vicious. With the interpersonal distance, we communicate our feelings toward the other individual, such as how comfortable and safe we feel around them. We set the tone and the

level of intimacy of the interaction. Closer interpersonal distance manifests trust and positive feelings to another person (Ozdemir, 2008).

Many studies also examined the relationship between the size of the personal space and our mental health. Whereas Sommer's (1959) results indicate that schizophrenic patients keep, on average, longer interpersonal distance, the results of replicating studies conducted on personal space of schizophrenic patients differ considerably. Inconsistent results were also found in studies conducted on people with an autistic spectrum disorder. While some participants with ASD preferred to maintain longer distances than healthy people, others kept shorter or no distance from the experimenter (Perry et al., 2015). Therefore, it is not yet successfully concluded whether there is a relationship between our mental condition and the size of our personal space or if different results are caused by an error or wrong measurement methods (Evans & Howard, 1973). Nevertheless, it has been established that the personal space of mentally healthy people during interaction with mentally or physically disabled individuals increases in its size. That means that physical or mental disability is distorting a spatial behaviour of a healthy person interacting with a disabled individual (Kleck, 1969).

### **4.3. The influence of the situation**

Our personal space serves as a protection for us from the environment. If the environment or the situation we are placed in is perceived as threatening, our personal space seems to increase in its size to ensure our safety (Graziano & Cooke, 2006). Nevertheless, personal evaluation of the situation, whether it is threatening for us or not, is the most crucial factor. If the situation is not perceived as harmful by us, the size of the distance we keep stays the same (Albas, D. C. & Albas, C. A., 1989). The activation of the protection mechanism can be caused by a threat perceived as both physically or mentally harmful, caused by either internal or external factors. Dosey and Meisels' (1969) experiment confirmed these predictions and showed that both males and females maintained longer interpersonal distances under stress conditions.

#### ***4.3.1. The personal space in crowding***

Crowded settings do not allow people to maintain a safe enough distance from others. Due to that, people's spatial behaviour in these situations has to change. In larger groups, interpersonal distances are, on average, smaller. McClelland and Auslander (1978) examined people's perception of crowded spaces. The results showed that if the maintained

distances between individuals are smaller than it is comfortable, people perceive the space around them as more crowded than it actually is. Moreover, people who prefer to maintain longer interpersonal distance in non-crowded settings experience more stress in crowds. It can be caused by the unavoidability of contact with other people and uncomfortable sensory perceptions (Aiello et al., 1977).

Some researchers claimed that unwanted contact and perceived sensory cues might lead to pathological changes in human behaviour. These predictions were based on Calhoun's (1962) studies of rats. He observed that rats started to show disrupted behaviours when the population density of rats in the cage increased. Although they did not suffer from a scarcity of resources, they showed signs of cannibalism, sexual deviations, motherhood insufficiency or general withdrawal. Calhoun named this phenomenon *behavioural sink*. After publishing the results, numerous studies were conducted to determine the same pathological behaviour in humans. Nevertheless, no supporting evidence for such behaviour in humans was found. That means that even if crowding is uncomfortable, humans can adapt to it (De Waal, Aureli & Judge, 2000).

#### **4.4. Cultural differences in the perception of space**

Because the perception of reality varies among cultures, also the size of the personal space differs. Whereas in the United States or Northern Europe might be socially appropriate to keep social distance longer than 125 cm, people in other cultures might tolerate closer interactions with each other. Although the perception of the space is culturally learnt, it might be altered during our life. Moreover, the culturally learnt scheme of the appropriate interpersonal distance is influenced by our personality and a context of the situation. According to Hall, the use of space can be divided into three types: *fixed feature*, which is culturally learnt and includes the layout of cities and buildings, *semifixed feature*, which stands for the movable parts of our culture such as furniture, and *informal space*, which contains the interpersonal distances (Baldassare & Feller, 1975).

Hall's (1966) comparison of proxemic behaviour of Arabs and North Americans was later on empirically tested by Watson and Graves (1966). They confirmed Hall's hypothesis stating that North Americans prefer to keep a longer distance from each other during interaction than Arabs do. A difference was also found in their way of communication. Arabs were approaching other individuals more directly; they were looking to each other straight into the eyes, talking more loudly, and, unlike the North Americans, they were often

touching each other. From comparison of the spatial behaviour of North Americans and Germans, Hall concluded that Germans prefer to keep a longer distance from others and are stricter about maintaining the distance than North Americans.

Studies examining the differences between contact (Mediterranean countries, Latin America, Arabic countries) and non-contact cultures (Northern Europe, North America) showed on average longer distances kept by non-contact cultures (Little, 1968; Baldassare & Feller, 1975). Moreover, individuals from contact cultures were using more eye contact and physical contact than individuals from non-contact cultures. Although mentioned studies confirmed these differences, Lomranz (1976) suggested that the concept of contact and non-contact cultures might be too general, and it is necessary to characterize cultures by a more measurable aspect in order to test the differences between them. Therefore, cultures were compared on Hofstede's dimension of individualism. Non-contact cultures were, on average, scoring higher on the individualism scale, which suggested that their members were more independent and autonomous (Hofstede, 2011). The comparison showed that members of the cultures scoring higher on individualism were, on average, maintaining longer interpersonal distances from each other than collectivistic cultures (Ozdemir, 2008), thus proving the previous conclusion from the comparison of contact and non-contact cultures.

More studies have been conducted sub-culturally, inside a country, which is caused by the better availability of the participants. In general, studies concluded that the individual's culture, residence, and ethnicity play an important role. One experiment showed that Whites preferred longer distance from Blacks than they did from other Whites (Baldassare & Feller, 1975). Another proved that the place where participants lived, such as East or West of the country, influenced their behaviour during interactions and the size of the interpersonal distance they keep (Watson & Graves, 1966).

The difference in size of the personal space might lead to socially inappropriate or uncomfortable situations when individuals from two different cultures encounter. Because of the foreign language and different social cues, it is very common to perceive someone's personal space wrong (Baldassare & Feller, 1975). According to Hall (1966), it is essential to learn the proxemic behaviour of other cultures to avoid misunderstandings.

## 5. Shape of the personal space

Hall (1966) proposed our zones to be four concentric circles and named them after the interactions, that usually occur within them: intimate, personal, social and public space. Since E. T. Hall's experiments, new studies examining whether the personal space is circular or noncircular have been conducted, and new representations of its shape have occurred.

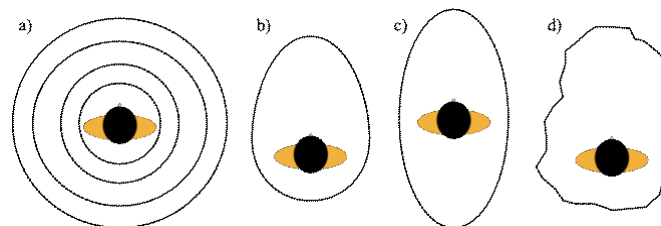
Hayduk's study suggested that instead of a circle, the personal space is egg-shaped with its largest part in the front of the individual. However, the shape is not fixed. It fluctuates with the direction of our head, with its biggest part always maintained in our field of vision. When participants in his experiment turned their heads, the largest part of their personal space moved with them (Hayduk, 1981).

The *Model of social forces* designed by Helbing and Molnar (1995) showed the personal space influenced by other pedestrians' personal space. Therefore, its most extensive parts are in the front and the back, and its sides are flattened. Their model is inspired by Lewin's theory of *social fields* and nowadays is widely used in pedestrians' simulations. It might also be used in town-planning. The elliptical shape was confirmed by the research of Petri et al. (1974). Nevertheless, their experiment showed that the shape is influenced by the sex of the approaching individual and the situation. While personal space of individuals, who were approaching a man, was confirmed to be circular-shaped, personal space of those who were approached by a man was elliptical, with larger distance kept in the front and back.

A more recent study by Rios-Martinez, Spalanzani & Laugier (2015) refuses the idea that other people's personal spaces model our personal space. Instead, he suggested that the personal space is influenced by each individual alone, and thus, it is asymmetrically shaped with its smallest part on the individual's dominant side. However, a study by Hecht et al. (2019) confirmed Hall's prediction of the circular personal space.

*Figure 1.*

*The shape of the personal space.*



*Note: a) Hall's concentric circles, b) Hayduk's egg-shaped model, c) Helbing's and Molnar's Model of social forces, d) Rios-Martinez, Spalanzani & Laugier's asymmetrical shaped personal zone.*



## **6. The COVID-19 pandemic**

The coronavirus disease, caused by the virus SARS-CoV-2, was first recognised in December 2019 in the Chinese Hubei Province. It is a respiratory disease transmitted via droplets in the air (Guan et al., 2020). The common symptoms are cough, dyspnoea, fever or fatigue. In some cases, mostly in older individuals or in people with reduced activity of the immune system and heart diseases, it can develop in acute pneumonia and result in the need of a lung ventilator (Velavan & Meyer, 2020).

Studies conducted on the transmission of the SARS-CoV-2 virus established the average reproduction number  $R$  to be 2.2. That means that one infected person, on average, infects 2.2 other people (Fauci, Lane & Redfield, 2020). For that reason, the COVID-19 is considered a highly infectious disease. Because no pharmaceutical intervention was known, it was necessary to induce protective behaviours such as keeping a minimum distance of 2 metres (social distancing), wearing face masks, and minimising social contact in general (Vieira et al., 2020). Since the COVID-19 disease is associated with possible health problems and the need for hospitalisation, it represents a physical threat. For that reason, the size of the interpersonal distance is predicted to increase.

### **6.1. Social distancing**

The SARS-CoV-2 virus is transmitted via respiratory droplets up to 10 metres in indoor places. Because of that, people should maintain interpersonal distance between 1.5 to 2 metres to stop the transmission. The research conducted by Setti et al. (2020) confirmed the sufficiency of the 2-metres long distance between two individuals if wearing a face mask. On the other hand, when people were without face masks, 2 metres distance was not safe enough, and the transmission could still occur.

The social distancing rule involves maintaining at least 1.5-metres long distance from other people, avoiding crowds and limit social contact to a minimum to stop the transmission of the virus. As mentioned above, because of the high infectivity of the SARS-CoV-2 virus and the absence of any pharmaceutical intervention known, many safety measures have been introduced, and *social distancing* is one of the most enforced ones (Lewnard & Lo, 2020).

### **6.2. Change in people's behaviour due to the COVID-19 pandemic**

The COVID-19 pandemic, as a world crisis, elicits many various responses from every government and each individual. Hale et al. (2020) showed that most countries

implemented similar measures, and individuals' compliance with them is truly high. It is undeniable that the world pandemic will have some impact on our behaviour and mental health. The risk of getting infected or infecting others, and the applied safety measures, may lead to fear, anxiety or depression. (Pedrosa et al., 2020).

Nevertheless, the research conducted by Prosser et al. (2020) showed a possible development after the measures will be released. The results divided people into two groups: those who will comply with the government measures even after they will be repealed and those who will return to their normal behaviour. This polarization of the society might, according to the authors, lead to disagreements and conflicts between both groups.

Nevertheless, it is not yet conclusively known if the safety measures applied by the government will have some long-term impact on our behaviour, thus if people will get used to less social contact, working online from home, wearing face masks or maintaining longer interpersonal distances. However, the research from *Imperial College London* (Jones, 2020) showed that, at the moment, most people altered their behaviour to the new safety measures. More than half of the respondents from the researched countries<sup>2</sup> were avoiding social gatherings, crowds and close interactions with other people. The same conclusions can be drawn from Abdelrahman's (2020) study, which showed that 83% of respondents preferred staying home to going out, and 60.3% kept the adequate interpersonal distance of 2 metres. He examined the correlation between compliance with the measures and personal and physical characteristics. People who scored high in neuroticism and on the scale of compliance with social norms were more likely to follow safety measures. Across all measured personality traits, women were complying with the rules better than men. Moreover, culture influenced the level of compliance with authority, which was shown to be higher in Asian countries than in the United States or Europe (Huynh, 2020).

### **6.3. Link between the size of the personal space and the COVID-19 pandemic**

From Hall's definition of personal space, as determined by people's feelings toward each other (Hall, 1966), we could predict that the size of personal space has increased since the close presence of other individuals represents a threat because of the possibility of the virus transmission. Furthermore, an extension of the interpersonal distance has been together

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<sup>2</sup> The research has been conducted in the following countries: Australia, Brazil, Canada, Denmark, Finland, France, Germany, Hong Kong, China, India, Indonesia, Italy, Japan, Malaysia, Mexico, Netherlands, Norway, Philippines, Saudi Arabia, Singapore, South Korea, Spain, Sweden, Taiwan, Thailand, UK, United Arab Emirates, USA, Vietnam.

with reduction of social contacts one of the protective strategies used against epidemics (Sorokowska et al., 2017). Mehta (2020), in his research, described two different types of social interactions which occur between strangers during the pandemic, both contradictory with the distances of spatial zones as measured by Hall (1966). Participants were either engaging in interactions within the distance between 1.5 and 2.5 metres, or they were keeping interpersonal distance longer than 6 metres. Therefore, the distance of public space, where usually these interactions would occur, has changed. In the first case, public interactions moved into the social space, which Mehta attributed to insufficiency of social contact in the social space. Therefore, it is substituted by social interactions with strangers, which can improve our mental health and well-being by reducing feelings of loneliness. The longer distance was attributed to the possible threat caused by a close contact.

Nevertheless, as shown in the previously mentioned studies (Abdelrahman, 2020; Prosser et al., 2020), individual compliance with the measures depends on many determinants such as culture, gender, age or personal characteristics. Together with personal experiences and the situation individual is placed in, all these variables impact the size of the personal space.

## **7. Conclusion of the research-relevant theoretical background**

The personal space is defined as the closest space around each individual, which serves as a buffer zone protecting an individual from possible danger in the environment (Sommer, 1959). This protective mechanism makes us maintain distance from other people and objects and respect other individuals' personal space (Graziano & Cooke, 2006).

Hall (1966) divided the area around an individual into four zones based on the interaction, which usually occurs within them – intimate, personal, social and public. The end of the personal space, which he set to be 125 cm, represents a border beyond which we allow to enter only our close friends or family. Nevertheless, the distance we keep from other people varies a lot, depending on many determinants. Our personal space is developed with age, and it differs with our sex; while girls keep a shorter distance from other girls and a longer distance from boys, boys maintain the same distance from both sexes (Guardo, 1969; Melson, 1976). Moreover, both sexes maintain a longer distance from tall individuals, especially while standing (Hartnett, Bailey & Hartley, 1974). Our personality and values also influence the size of our personal space; introverts and people with trust and self-

confidence issues or with insecure attachment style maintain, on average, longer interpersonal distance (Kaitz et al., 2004; Rocklin & Revelle, 1981; Sewell & Heisler, 1973). Although the distances between individuals during interactions differ among cultures, in general, people keep a longer distance from strangers and in unfamiliar or threatening situations than they do from their friends or family members and in a secure environment (Dosey & Meisels, 1969; Graziano & Cooke, 2006).

The world pandemic of the SARS-CoV-2 virus represents a threat in every respect, and the increased size of the personal space is one of our protective strategies (Sorokowska et al., 2017). Mehta's (2020) results supported the hypothesis about the change in the size of maintained interpersonal distances. He established that our public space has changed in two different ways; individuals either extended the border, behind which they interact with strangers, up to 6 metres, or allowed public interactions to occur within their social space between 1.5 and 2.5 metres, which is usually reserved for contact with people we know. Therefore, the distances kept from other people changed. This study aims to replicate the measures, using an online distributed questionnaire and determine whether the subjective perception of the COVID-19 pandemic as either threatening or not affects the distance people prefer to maintain from each other.

# EMPIRICAL PART

## 8. The aim of the study

This bachelor thesis addresses the issue of the size of the personal space during the COVID-19 pandemic. In situations perceived as dangerous, the maintained distance from others, in which we feel safe, increases (Graziano & Cooke, 2006). Mehta's (2020) research, examining the interpersonal distances during the coronavirus pandemic, confirmed the predicted changes in the distance between interacting individuals. While his research focused on the distance in which we interact with strangers and acquaintances on the street, this study examines maintained interpersonal distances with strangers or acquaintances as well as with close friends and family members. It aims to determine whether the size of our personal space has changed and whether the subjective perception of the COVID-19 affects the interpersonal distance we prefer.

As the SARS-CoV-2 virus, causing the coronavirus disease, is transmitted via respiratory droplets during human-to-human contact, physical closeness to another individual represents a significant risk for our health (Velavan & Meyer, 2020). Therefore, social distancing as a transmission-mitigating measure has been established. People are supposed to keep a minimum interpersonal distance of 1.5 or 2 metres and limit social contact in general (Vieira et al., 2020). Compliance with the social distancing measure, establishing safe distances between people to 1.5 metres, can contribute to the enlargement of our personal space from 125 cm to mentioned 1.5 metres (Abdelrahman, 2020).

### 8.1. Research questions and hypotheses

The research will examine the correlation between the size of the personal space; thus, between the distance we maintain from other people and the perception of the COVID-19 pandemic. Furthermore, it will consider the effects of other determinants, such as age, culture or sex of the participant. As the COVID-19 pandemic represents a threat to our health, personal space as our protective mechanism is predicted to increase in its size (Dosey & Meisels, 1969). Nevertheless, the situation only influences the size of the personal space if it is perceived as threatening (Albas, D. C. & Albas, C. A., 1989). Therefore, different perception of the pandemic, either as dangerous or harmless, will determine whether the size increased or not. The research question examining the prediction was formulated as follows: *Is the perception of the pandemic as either threatening or not correlated with the size of participant's personal space?* It is assumed that a greater threat level perceived will be an

indicator of a longer interpersonal distance (Dosey & Meisels, 1969). The second research question examines the relationship between the size of the personal space and participant's compliance: *Will a higher level of compliance with social distancing measure and the measure reducing social contact affect the size of the personal space?*. It was predicted that compliance with the social distancing measure will lead to longer interpersonal distances preferred (Abderahman, 2020; Prosser et al., 2020). And the third research question was comparing the results of the questionnaire to Hall's (1966) findings: *Does the size of the personal space differ from the 125 cm distance measured by Hall?* Therefore, answers with longer distances than 125 cm in questions about the preferred distance from a close friend or a family member would indicate that the size of a participant's personal space increased.

It is hypothesized that (a) participants who are more concerned about their health in the context of the COVID-19 pandemic will prefer maintaining a longer distance from others (Dosey & Meisels, 1969), (b) participants who perceive the close physical presence of others as more threatening will prefer to maintain longer distance from others (Dosey & Meisels, 1969). Relating other determinants of the personal space was hypothesized that (c) preferred interpersonal distance maintained from a familiar person (a family member, a close friend) will be shorter than distances maintained from strangers or acquaintances (Hall, 1966), (d) women will prefer longer interpersonal distance from an individual of the opposite sex than men (Dosey & Meisels, 1969), and (e) participants from collectivistic countries and contact cultures will prefer shorter interpersonal distance than from individualistic and non-contact countries (Baldassare & Feller, 1975). Due to an insufficient number of experiments examining the relationship between the size of the personal space and participant's age among adults, the outcome could not be predicted. Therefore, the relationship between participant's age and their preferred interpersonal distance was formulated as the fourth research question: *What is the effect of age on preferred interpersonal distance?*

## **9. Methods**

### **9.1 Research strategy**

The study aims to determine whether there is a correlation between the size of a participant's personal space and the level of threat by the coronavirus pandemic perceived. Therefore, the work will be using a quantitative strategy. Thanks to a great amount of collected data, it makes it possible to generalize the results (Bryman, 2016).

## **9.2. Data collection technique**

For the data collection, a questionnaire examining the participant's perception of the COVID-19 pandemic and their preferred interpersonal distances was chosen. The non-probability sampling snowball method was used (Bryman, 2016). The questionnaire consisted of 20 questions with 14 multiple-choice answers, four numeric rating scales and two open-ended questions asking about participant's nationality and age. It has been inspired by a survey examining the perception of the current situation of the COVID-19 pandemic, conducted by the Department of Epidemiology and Public Health, Faculty of Medicine, University of Ostrava (2020) and a questionnaire about a proxemic behaviour conducted by Trnková (2013). It was supposed to take a maximum of 15 minutes to complete. The questionnaire has been distributed in two versions, Czech and English, and its content can be found in Appendix B at the end of the thesis.

The questionnaire has been created on the Survio platform ([www.survio.com](http://www.survio.com)), allowing an online distribution of the survey. In the beginning, the aim of the study and its purpose, together with an e-mail address of the author, have been listed. Participants were notified that by filling in the survey, they agree with their participation in the study and following anonymous publication of the results. Higher numbers in questions about health and safety matters (6 – 9) indicated a higher level of health concerns and compliance throughout the pandemic. It was assumed that higher values in these questions would positively correlate with an increased size of the personal space.

Data collection took place at the time of the declared emergency state in the Czech Republic when restaurants, schools and most of the stores were closed, and the free movement of the inhabitants was restricted. On average, new COVID-19 cases increased by 9 803 infected people every day (Komenda, M. et al., 2020). 19% of the respondents from the study answered they were infected by the COVID-19 disease before, 57.2% of respondents were not, and 23.8% did not know whether they have been infected or not.

### **9.2.1. Instruments of the data collection**

The questionnaire has been divided into three smaller sections. The first section introduced demographic questions. Since many variables determine the size of personal space, participants were asked about their sex, age, nationality, whether they live in a big or small city and whether or not they had already been infected by the COVID-19 disease (Hartnett, Bailey & Hartley, 1974; Little, 1968). Questions about sex and nationality were



listed with open-ended answers. In the question asking about their sex, participants could choose from options “*male*”, “*female*”, or “*other*”. The question about the COVID-19 infection possible answers contained “*yes*”, “*no*”, or “*I don’t know*”. Question about the place of their residence offered seven possible options, ranging from a city with “*less than 1 000 inhabitants*” to an option of “*more than 100 000 inhabitants*”.

The second part was examining participant’s perception of the COVID-19 pandemic. Four questions with numeric rating scale answers have been listed, ranging from 1 (*not at all / never*) to 10 (*extremely / always*). Participants were asked to mark the most suitable answer about their health concerns related to the COVID-19 pandemic, the feeling of being threatened by the close physical presence of other people and their compliance with the measures about maintaining minimum distance and reducing social contact.

The third section contained nine questions about comfortable and safe interpersonal distances in various situations. Participants were asked to choose the most comfortable distance for interaction with a family member, a close friend, an acquaintance and with a stranger in interiors and exteriors. All distances, except with a family member, were measured in two situations, first interacting with a person of the same sex, and second of the opposite sex. For easier imagination, a picture symbolizing different interpersonal distances was enclosed in the questionnaire (figure can be found in Appendix C). Answers included distances of 1; 1.5; 2; 2.5; 3; 4.5; and 6 metres. Distances from 1 to 3 metres were based on Hall’s (1966) data, rounded up to half a metre to simplify the imagination of the distances for the participants. Options 4.5 metres and 6 metres were based on Mehta’s (2020) research.

In order to compare the size of the personal space before and during the pandemic, participants were asked to evaluate whether they think that the size of the interpersonal distance they maintain changed or not. The last question asked whether they consider their preferred size of the interpersonal distance smaller, bigger or the same as other members of their nation would keep.

### **9.3. Procedure**

Two questionnaires were published online, one in the Czech language and the other in English with identical questions. I sent a request for filling in a survey to my family and friends through social sites such as Facebook, WhatsApp and Instagram, and I asked them to send it to some other people they know. In total, I addressed 101 people. My friends shared it with their friends and their friend-groups on WhatsApp or Facebook, and my parents asked their co-workers and friends via e-mail. I also published the questionnaire link with a request



for participation on Facebook group pages such as student groups from the Faculty of Humanities Charles University, groups for residents of a student dorm in Prague and in Nijmegen, a group of my hometown Tábor and an international survey sharing group. The questionnaire sharing on Facebook groups also provided a room for discussion under the post, where I could respond to participant's comments.

To increase compliance with my request for filling in the survey, I used some persuasive strategies. Berkowitz and Daniels' research (1964) talks about the "helping norm" – an implicit rule, which exists in most world cultures and shows that humans are led to help another individual in need. Groves, Cialdini and Couper (1992) used the helping norm in participation request in their study, and their response rate increased significantly. Therefore, I formulated the request as ask for help. To each request sent, I added a sentence; *"It would be a great help for me!"*. That led to quite a high response rate at the beginning of the data collection.

Other studies proved that using personal information in a request was very effective (Brug et al., 1996). Therefore, I personalized the request for each person asking to fill in my study, and I always used the first name of the person requested. The personal relevance of the topic might have also influenced the response rate level. Because of its impacts, the COVID-19 pandemic is a highly relevant topic for most of us. That might have positively affected the response rate level (Groves, Cialdini & Couper, 1992).

After the first 3 hours of data collection, 118 participants completed the survey, 84 from the Czech questionnaire and 34 from the English one, thanks to above mentioned reasons. Although the response rate was decreasing with time, I received 228 responses after 24 hours, and therefore the limit of 100 responses for the Czech questionnaire was reached. The data collection started on the 5th of February 2020 and ended after 21 days, on the 26th of February. In total, 821 respondents participated in the survey, 647 in the Czech version and 174 in the English one. The response rate was 70.4% for the Czech version and 60.6% for the English version. The average time necessary for completing the questionnaire was between 3 and 5 minutes (for 70% of respondents).

### ***Access to the collected data***

The data collected for the purpose of this bachelor thesis are publicly accessible on the OSF website using this link: <https://osf.io/wugpm>.

## 9.4. Participants

The study aimed at people of all ages and all nationalities. The limit was set to 100 participants from the Czech questionnaire version and 100 from the English one, in order to get statistically relevant research results. This limit for both questionnaires was achieved after three days of data collecting. In total, 821 participants completed the study, 599 women (73.0%), 219 men (26.7%) and 3 people (0.4%) of undefined sex. The average age was 34.5, ranging from 15 to 85 years old. Forty-four various nations participated in the study, with the highest percentage of Czechs (77.8%), Italians (5.8%), Slovaks (1.8%) and Fins (1.7%). Most of the respondents (27.6%) lived in a city of a size between 25 000 and 50 000 inhabitants. The smallest percentage (7.3%) of respondents lived in the city of a size between 50 000 to 100 000 inhabitants. Because the non-probability sampling method was used, the sample cannot be considered representative of the population. Tables describing the sample (age, sex, nationality, place of residence) are listed in Appendix A.

## 9.5. Statistics and data analysis

At first, all demographic variables, such as sex, nationality or place of residence, were coded according to a created coding table. Missing values were coded as 999. The data was coded in the program Microsoft Excel.

For the data analysis, the statistical program *Jamovi* was used. At first, data distribution was tested by the Shapiro-Wilk test for normality, with set  $\alpha = 0.05$ . All p-values were smaller than 0.001, which, compared to  $\alpha$  suggested strong evidence for non-normality of the data distribution. The conclusion was also verified by histograms, which confirmed the Shapiro-Wilk test result (Ghasemi & Zahediasl, 2012; Peck, Olsen & Devore, 2015). Therefore, nonparametric tests had to be used.

At first, exploratory data analysis was performed to determine demographic characteristics of the sample, such as mean age, sex of the participants, place of residence, and nationality. Mean preferred distances in all options listed in the questionnaire were counted. Later on, the preferred distance with same-sex and opposite-sex individuals in the same situation was compared. Means were compared between male and female participants, nationalities and participants of different age. Correlation analysis was performed to determine whether there is a relationship between preferred interpersonal distance and participant's age and nationality.

The effect of participant's nationality was measured by two means; comparing preferred interpersonal distances between contact and non-contact cultures and performing

a correlation analysis between preferred distance and the country's level of individualism. First, cultures were divided into two groups (see table 1 below): contact and non-contact cultures, based on Hall's (1966) and Baldassare and Feller's (1975) previous research. Therefore, countries of Latin America and Southern Europe (Mediterranean area) were categorized as contact countries (N = 88), and Northern Europeans, North Americans, Indians and Asians were included in the non-contact cultures group (N = 56). According to Hall's (1966) data, Germans and Swiss prefer to keep a longer distance from other people; thus, they were classified as non-contact cultures. However, some of the nationalities, namely Central and Eastern European countries, Australia, New Zealand, Iran and Russia, was not possible to include in this categorization because they were not part of previous research ('unclassified cultures'). Therefore, these countries were excluded from this part of the analysis, and the sample size decreased to 144 participants.

In the next step, cultures were compared on the dimension of individualism. Countries were assigned a score from Hofstede's comparison, and a correlation between the size of the personal space and the individualism score of each country was observed. The level of individualism of each country roughly corresponds to contact and non-contact cultures categorization, with non-contact cultures being more individualistic (most countries scored above 50) and contact cultures scoring low on individualism (less than 50) (Hofstede Insights, 2018). Assigned individualism scores can be found in Appendix D.

*Table 1.*

*Categorization of respondent's nationalities.*

<b>Contact cultures</b>	Brazilian, Bulgarian, Chillan, Croatian, Filipino, Mexican, French, Greek, Italian, Portuguese, Romanian, Slovenian, Spanish, Turkish
<b>Non-contact cultures</b>	American, Canadian, British, Danish, Dutch, Finnish, German, Icelandic, Irish, Lithuanian, South-Korean, Swedish, Swiss
<b>Unclassified cultures</b>	Australian, Czech, Hungarian, Iranian, Moldavian, New Zealand, Polish, Russian, Slovakian

To determine a connection between the COVID-19 pandemic and the size of the personal space, correlation analysis between participant's preferred distance and their

attitudes about the threat caused by the COVID-19 disease, the close physical presence of others and participant's compliance with the safety measures, was performed. Because of the non-normal data distribution, Spearman's correlation test was used (Goss-Sampson, 2019; te Grotenhuis, 2009). Answers of higher numbers in the questionnaire indicated, that participant felt more concerned about their health, in the context of the COVID-19 pandemic, they were feeling more threatened by the close physical presence of other individuals, and were more compliant with the measures of social distancing and reducing social contacts to a minimum. Spearman's correlation test was also used to compare these four dimensions (health concerns, feeling threatened by the close presence of others and compliance with the measures) with age and nationality.

For reporting the results in the text, the following abbreviations were used; same-sex condition was labelled S and opposite-sex O.

### ***9.5.1 Questionnaire reliability***

The reliability of the questionnaire was determined by Cronbach's alpha. The indicators were divided into two groups, and Cronbach's alpha was counted for each of them. For indicators from the first part of test items, measuring respondents' subjective attitudes, Cronbach's alpha was calculated as 0.790. For the second part of the questionnaires, measuring the comfortable distance of participants, the Cronbach's alpha was 0.905 (Ferjenčik, 2010). Since Cronbach's alpha higher than 0.7 is considered a reliability indicator, the test can be evaluated as reliable with an acceptable score for the first part of test items ( $\alpha = 0.790$ ) and an excellent score ( $\alpha = 0.905$ ) gained for the second part of test items (Bryman, 2016).

## **10. Results**

### **10.1 Mean preferred interpersonal distances**

The mean preferred distances of all participants ( $N = 821$ ) for each situation (with a family member, a close friend, an acquaintance and a stranger) were calculated (see table 2 below, distances are calculated in metres). The preferred interpersonal distance was increasing with decreasing familiarity of the encountering person. Average preferred distances from a family member ( $M = 1.28$ ) or a close friend ( $M_S = 1.45$ ;  $M_O = 1.49$  m) were smaller than distances from acquaintances ( $M_S = 1.90$ ;  $M_O = 1.93$ ), strangers in interiors ( $M_S$

= 2.51;  $M_O = 2.54$ ) and strangers in exteriors ( $M_S = 2.30$ ;  $M_O = 2.32$ ). Average preferred distances from same-sex individuals or opposite-sex individuals differed among participants, with on average longer interpersonal distance from individuals of the opposite sex. In all options, the minimum distance chosen was 1.00 m, the maximum was 6.00 m.

*Table 2.*

*Mean preferred interpersonal distances with standard deviations.*

<b>Variable</b>	<b>N</b>	<b>Mean</b>	<b>SD</b>	<b>Median</b>
Family member	821	1.28	0.560	1.00
Same-sex close friend	821	1.45	0.547	1.50
Opposite-sex close friend	821	1.49	0.616	1.50
Same-sex acquaintance	821	1.90	0.668	2.00
Opposite-sex acquaintance	821	1.93	0.703	2.00
Same-sex stranger in interiors	821	2.51	1.11	2.00
Opposite-sex stranger in interiors	821	2.54	1.13	2.00
Same-sex close stranger in exteriors	821	2.30	1.03	2.00
Opposite-sex stranger in exteriors	821	2.32	1.04	2.00

By the Wilcoxon test, the significance between two groups, by comparing p-value to set level of significance  $\alpha = 0.05$ , was determined (Goss-Sampson, 2019). The test showed that the differences between distances from same-sex and opposite-sex individuals were statistically significant in all 4 different situations ( $p < 0.001$ ,  $p = 0.002$ ,  $p = 0.006$ ,  $p = 0.037$ ). The highest significant difference was found between same-sex and opposite-sex close friend ( $p < 0.001$ ). See table 3.

*Table 3.*

*Statistical significance of difference between mean interpersonal distances maintained from same- and opposite-sex individuals.*

		<b>Wilcoxon</b>	<b>p</b>
Same-sex close friend	Opposite-sex close friend	2612 <sup>a</sup> ***	<.001
Same-sex acquaintance	Opposite-sex acquaintance	721 <sup>b</sup> **	0.002
Same-sex stranger in interiors	Opposite-sex stranger in interiors	1352 <sup>d</sup> **	0.006
Same-sex stranger in exteriors	Opposite-sex stranger in exteriors	1075 <sup>e</sup> *	0.037

*Note:* <sup>a</sup> 687 pair(s) of values were tied, <sup>b</sup> 752 pair(s) were tied, <sup>d</sup> 732 pair(s) were tied, <sup>e</sup> 745 pair(s) were tied.

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

### 10.1.1. Mean preferred interpersonal distance in the context of participant's sex

The distance kept from same- or opposite-sex individuals, was tested concerning the sex of the participant. Participants of undefined sex ( $N = 3$ ) were excluded from this part of the analysis; therefore, the sample size decreased to 818 participants. The preferred distance from family members, same-sex close friends and same-sex strangers in exteriors was shorter in women than in men. In the case of an opposite-sex close friend, acquaintances and strangers in interiors, women preferred to keep a longer distance than men. Compared to the preferred distances maintained in other mentioned situations, differences between women and men with both; same-sex and opposite-sex individuals in exteriors are not as dramatic. The exact distances are listed in table 4 below.

*Table 4.*

*Mean interpersonal distances preferred by men and women.*

Variable	Sex	N	Mean	Median	SD
Family member	Female	599	1.26	1.00	0.503
	Male	219	1.35	1.00	0.688
Same-sex close friend	Female	599	1.43	1.50	0.551
	Male	219	1.49	1.50	0.538
Opposite-sex close friend	Female	599	1.51	1.50	0.624
	Male	219	1.45	1.50	0.596
Same-sex acquaintance	Female	599	1.93	2.00	0.694
	Male	219	1.82	2.00	0.588
Opposite-sex acquaintance	Female	599	1.97	2.00	0.722
	Male	219	1.80	2.00	0.638
Same-sex stranger in interiors	Female	599	2.54	2.00	1.093
	Male	219	2.43	2.00	1.148
Opposite-sex stranger in interiors	Female	599	2.59	2.50	1.122
	Male	219	2.39	2.00	1.114
Same-sex stranger in exteriors	Female	599	2.29	2.00	0.970
	Male	219	2.33	2.00	1,172
Opposite-sex stranger in exteriors	Female	599	2.32	2.00	1.000
	Male	219	2.29	2.00	1.125

To determine whether the difference between distances preferred by men and women was statistically significant, a non-parametric Mann-Whitney U test was used. As shown in

table 5, the highest significance of the differences was found in opposite-sex acquaintance ( $p < 0.001$ ) and opposite-sex stranger in interiors ( $p < 0.001$ ). Differences between same- and opposite-sex strangers in exteriors and same- and opposite-sex close friends were not statistically significant ( $p > 0.05$ ).

*Table 5.*

*Statistical significance of sex differences in mean preferred interpersonal distance.*

<b>Variable</b>	<b>N</b>	<b>Mann-Whitney U</b>	<b>p</b>
Family member	818	59212*	0.011
Same-sex close friend	818	60403	0.064
Opposite-sex close friend	818	60537	0.073
Same-sex acquaintance	818	59963*	0.047
Opposite-sex acquaintance	818	55487***	< .001
Same-sex stranger in interiors	818	59318*	0.030
Opposite-sex stranger in interiors	818	55719***	< .001
Same-sex stranger in exteriors	818	63354	0.436
Opposite-sex stranger in exteriors	818	61379	0.144

*Note: \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ .*

### ***10.1.2. Mean preferred interpersonal distances in the context of participant's nationality***

As mentioned above, differences in the size of the personal space between participants with different cultural background were examined in two ways, between contact and non-contact cultures and in connection with culture scores on Hofstede's individualism scale (Hofstede Insight, 2018). First, the difference between members of contact and non-contact cultures was compared, showing that participants from contact cultures ( $N = 88$ ) preferred longer distance than members of non-contact cultures ( $N = 56$ ) (see table 6 below). Nevertheless, the Mann-Whitney U test for independent samples determined that the differences between means are not statistically significant (displayed in table 7). The comparison of p-value ( $p > 0.06$ ) to set the level of significance  $\alpha = 0.05$  allowed us to accept the null hypothesis, stating that differences are not statistically significant.

Table 6.

Mean interpersonal distances preferred by participants from contact and non-contact cultures.

Variable	Nationality	N	Mean	SD
Family member	Contact cultures	88	1.34	0.490
	Non-contact cultures	56	1.21	0.379
Same-sex close friend	Contact cultures	88	1.55	0.557
	Non-contact cultures	56	1.39	0.434
Opposite-sex close friend	Contact cultures	88	1.53	0.564
	Non-contact cultures	56	1.40	0.431
Same-sex acquaintance	Contact cultures	88	1.99	0.665
	Non-contact cultures	56	1.83	0.498
Opposite-sex acquaintance	Contact cultures	88	2.02	0.709
	Non-contact cultures	56	1.83	0.498
Same-sex stranger in interiors	Contact cultures	88	2.54	0.944
	Non-contact cultures	56	2.41	1.11
Opposite-sex stranger in interiors	Contact cultures	88	2.60	0.988
	Non-contact cultures	56	2.44	1.15
Same-sex stranger in exteriors	Contact cultures	88	2.23	0.823
	Non-contact cultures	56	2.23	1.00
Opposite-sex stranger in exteriors	Contact cultures	88	2.27	0.877
	Non-contact cultures	56	2.24	1.00

Table 7.

Statistical significance of different means of interpersonal distance between participants from contact and non-contact cultures.

Variable	N	Mann-Whitney U	p
Family member	144	2112	0.089
Same-sex close friend	144	2062	0.082
Opposite-sex close friend	144	2172	0.205
Same-sex acquaintance	144	2128	0.147
Opposite-sex acquaintance	144	2110	0.127
Same-sex stranger in interiors	144	2060	0.086
Opposite-sex stranger in interiors	144	2024	0.063
Same-sex stranger in exteriors	144	2314	0.524
Opposite-sex stranger in exteriors	144	2294	0.470



Secondly, countries were assigned a score on Hofstede's individualism/collectivism scale, and the mean preferred distances were compared (Hofstede Insight, 2018). Assigned individualism scores are listed in appendix D. Respondents with two listed nationalities (N = 7) and missing answers (N = 1) were excluded from the analysis. Therefore, the sample counted 813 participants. Correlation analysis was performed testing the hypothesis about a correlation between the level of individualism of the country and a preferred distance. Non-parametric Spearman's test was used because of non-normal data distribution.

All Spearman's rho were smaller than 0.1, ranging from  $r_s = -0.028$  to  $r_s = 0.012$ ; therefore, the correlations between variables can be considered trivial. Nevertheless, except for a family member and a close same-sex friend, a negative correlation was found for all other interactions. Therefore, the conclusion from contact and non-contact cultures analysis was confirmed: participants from countries scoring higher on the individualism scale preferred shorter distances from acquaintances and strangers. Nevertheless, p-values higher than the chosen level of significance  $\alpha = 0.05$  suggested that differences are not statistically significant. The results are listed in table 8 below.

Statistical non-significance of the results can be explained by the small sample size used in this part of the analysis. Although 44 different nationalities participated in the study, most countries (69.9%) are represented only by 1 or 2 respondents.

### ***10.1.3. Mean preferred interpersonal distances in the context of participant's age***

The relationship between mean preferred distances and participant's age was examined through correlation analysis using Spearman's test. The results were inconsistent, showing trivial ( $< 0.1$ ) or small ( $0.1 - 0.3$ ) correlations (see table 8 below). A statistically significant correlations ( $p < 0.001$ ) were found for same- and opposite-sex close friend and acquaintance, all with a small positive effect. A positive correlation between the mentioned variables indicates that with increasing age of the participants, preferred distance from a same- and an opposite-sex close friend and an acquaintance is increasing. For other variables, namely encountering a family member or a stranger both in interiors and exteriors, no statistically significant correlation with age was found.

Table 8.

Correlations between mean preferred distance and the level of individualism in each country and between participant's age and their mean preferred interpersonal distance.

Variable	Correlation with individualism level			Correlation with participant's age		
	N	Spearman's rho	<i>p</i>	N	Spearman's rho	<i>p</i>
Family member	813	0.003	0.940	821	-0.035	0.321
Same-sex close friend	813	0.012	0.724	821	0.133*	< 0.001
Opposite-sex close friend	813	-0.008	0.828	821	0.159*	< 0.001
Same-sex acquaintance	813	-0.000	0.989	821	0.116*	< 0.001
Opposite-sex acquaintance	813	-0.005	0.878	821	0.130*	< 0.001
Same-sex stranger in interiors	813	-0.007	0.841	821	0.010	0.765
Opposite-sex stranger in interiors	813	-0.028	0.423	821	-0.000	0.994
Same-sex stranger in exteriors	813	-0.014	0.697	821	-0.026	0.456
Opposite-sex stranger in exteriors	813	-0.021	0.553	821	-0.026	0.458

Note: \*  $p < 0.001$ .

## 10.2. Correlation between participant's attitudes about the COVID-19 pandemic and their compliance with the safety measures, as well as with their preferred interpersonal distance

To determine whether participant's attitudes about the COVID-19 pandemic and their compliance with the safety measures affect the preferred interpersonal distance, Spearman's correlation test was performed. Its results for all four variables (health concerns, the feeling of threat by the close presence of others, compliance with social distancing measure and reducing social contacts) showed statistically significant correlations ( $p < 0.001$ ). All observed correlations were positive, with a small ( $r_s = 0.1 - 0.3$ ) or a moderate ( $r_s = 0.3 - 0.5$ ) effect.

Table 9 below display the results of the correlation analysis between variables mentioned above and participant's mean preferred distances. Strongest effect was found in situations with a same- ( $r_s = 0.315$ ,  $r_s = 0.405$ ,  $r_s = 0.377$ ,  $r_s = 0.371$ ) and an opposite-sex acquaintance ( $r_s = 0.319$ ,  $r_s = 0.393$ ,  $r_s = 0.373$ ,  $r_s = 0.379$ ) and a same- ( $r_s = 0.300$ ,  $r_s = 0.389$ ,

$r_s = 0.371$ ,  $r_s = 0.292$ ) and an opposite-sex stranger in interiors ( $r_s = 0.290$ ,  $r_s = 0.383$ ,  $r_s = 0.378$ ,  $r_s = 0.284$ ). Smallest effect was observed in situations with a family member ( $r_s = 0.114$ ,  $r_s = 0.144$ ,  $r_s = 0.112$ ,  $r_s = 0.102$ ). Positive correlation between variables indicates that participants, who were more concerned about their health relative to the COVID-19 pandemic, were feeling more threatened by the close physical presence of others and were more compliant to the social distancing and social contact reducing measures, preferred, on average, to maintain longer interpersonal distance than participants scoring lower on these four dimensions.

*Table 9.*

*Correlations between participant's mean preferred interpersonal distance and their health concerns in the context of the COVID-19 pandemic, their feelings of being threatened by the close presence of others and their compliance with the social distancing and the reducing of social contact measures.*

Variable	N	Health concerns	Threatened by the close presence	Social distancing	Reducing social contact	<i>p</i>
		Spearman's rho	Spearman's rho	Spearman's rho	Spearman's rho	
Family member	821	0.114*	0.144*	0.112*	0.102*	< 0.001
Same-sex close friend	821	0.261*	0.319*	0.257*	0.294*	< 0.001
Opposite-sex close friend	821	0.252*	0.294*	0.266*	0.296*	< 0.001
Same-sex acquaintance	821	0.315*	0.405*	0.377*	0.371*	< 0.001
Opposite-sex acquaintance	821	0.319*	0.393*	0.373*	0.379*	< 0.001
Same-sex stranger in interiors	821	0.300*	0.389*	0.371*	0.292*	< 0.001
Opposite-sex stranger in interiors	821	0.290*	0.383*	0.378*	0.284*	< 0.001
Same-sex stranger in exteriors	821	0.227*	0.327*	0.303*	0.221*	< 0.001
Opposite-sex stranger in exteriors	821	0.219*	0.325*	0.304*	0.225*	< 0.001

*Note: \*  $p < 0.001$ .*

### ***10.2.1. Correlation between participant's nationality and their perception of the pandemic as well as with their compliance with the measures***

To explain the discrepancy between mean preferred distances of participants from contact and non-contact cultures gained from the previous research and the results of the

current study, an additional analysis was performed. The differences in attitude- and compliance-scores between contact and non-contact cultures were compared by means of exploratory analysis, showing on average higher scores for participants from contact cultures, except for their compliance with social distancing measure. Nevertheless, the Mann-Whitney U test showed a statistically significant difference between participants from contact and non-contact cultures only in health concerns in relation to the COVID-19 pandemic ( $p = 0.002$ ). The results were verified by histograms and box plots showing the same conclusion. Therefore, we can conclude that participants from contact cultures felt more concerned about their health in relation to the COVID-19 pandemic. For the results, see tables 10 and 11.

*Table 10.*

*Means of attitude- and compliance-scores of participants from contact and non-contact cultures.*

<b>Variable</b>	<b>Culture</b>	<b>N</b>	<b>Mean</b>	<b>Median</b>	<b>SD</b>
Health concerns in relation to COVID-19	Contact culture	88	6.44	7.00	2.07
	Non-contact cultures	56	5.09	5.00	2.55
Feeling threatened by the close presence of others	Contact culture	88	6.57	7.00	2.38
	Non-contact cultures	56	6.34	7.00	2.31
Complying to social distancing measure	Contact culture	88	6.94	7.00	2.15
	Non-contact cultures	56	6.66	7.00	2.53
Complying to reducing social contact measure	Contact culture	88	7.41	8.00	2.17
	Non-contact cultures	56	7.43	8.00	2.33

*Table 11.*

*Mann-Whitney U test examining the statistical significance between differences in attitudes and compliance with the measures of participants from contact and non-contact cultures.*

<b>Variable</b>	<b>Mann-Whitney U</b>	<b>p</b>
Health concerns in relation to COVID-19	1702*	0.002
Feeling threatened by the close presence of others	2328	0.574
Complying to social distancing measure	2361	0.670
Complying to measure about reduced social contact	2410	0.823

*Note: \*  $p < 0.05$ .*

Correlation analysis, using Spearman's test was completed on contact (for the analysis, the group was assigned number 1) and non-contact (assigned number 2) cultures in relation to their attitudes towards the COVID-19 pandemic and safety measures compliance. The analysis showed statistically significant ( $p = 0.001$ ) strong negative correlation ( $r_s = -0.263$ ) between the culture groups and their health concerns in relation to the pandemic. The correlation suggests that participants from contact cultures felt more threatened by the virus than participants from non-contact cultures. No statistically significant correlation was found with other three variables (close physical presence of others, compliance with social distancing measure and compliance with the measure reducing social contact to minimum).

Correlation between nationalities and their attitude- and compliance-scores was also tested in relation to the level of individualism in the country. A trivial positive correlation ( $r_s = 0.069$ ) with statistically significant effect ( $p = 0.049$ ) was found between the level of individualism and participant's feelings of being threatened by the close physical presence of other individuals. The other three tested variables showed no statistically significant correlation ( $p > 0.115$ ) between the compliance level or attitudes about the pandemic and the level of individualism. Therefore, with increasing level of individualism, the feelings of threat caused by someone's close physical presence increased as well. The results can be found in table 12 below.

### ***10.2.2. Correlation between participant's age and their perception of the pandemic as well as with their compliance with the safety measures***

To put the results of the correlation analysis between participant's age and their preferred distance in the context of the COVID-19 pandemic, a correlation analysis examining the relationship between participant's age and their personal attitudes about the COVID-19 pandemic and their compliance with the measures was performed. The results of Spearman's correlation test indicate a statistically significant ( $p < 0.001$ ) positive correlation with a small effect between age and health concerns related to the pandemic ( $r_s = 0.134$ ), compliance with the social distancing measure ( $r_s = 0.131$ ) and compliance with the measure of reducing social contact ( $r_s = 0.215$ ). We can conclude that with the increasing age of the participants, both: health concerns and their compliance increased as well. Nevertheless, the correlation between the participant's age and their feelings of threat caused by someone's close physical presence was not statistically significant ( $p = 0.058$ ). See table 12 below.

Table 12.

Correlations between attitude- and compliance-scores and contact and non-contact cultures, level of individualism in the country and the age of the participant.

Variable	Contact / non-contact cultures		Individualism score		Participant's age	
	Spearman's rho	<i>p</i>	Spearman's rho	<i>p</i>	Spearman's rho	<i>p</i>
Health concerns in relation to COVID-19	-0.263*	0.001	0.055	0.115	0.134***	< 0.001
Feeling threatened by the close presence of others	-0.047	0.574	0.069*	0.049	0.066	0.058
Complying to social distancing measure	-0.036	0.670	0.008	0.825	0.131***	< 0.001
Complying to reduced social contact measure	0.019	0.822	0.026	0.456	0.215***	< 0.001

Note: \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ .

As concluded above, a higher level of health concerns in relation to the COVID-19 pandemic and feelings of threat caused by someone's close physical presence was positively correlated with preferred longer interpersonal distance. The questionnaire also examined the participant's subjective perception of the size of their personal space during the COVID-19 pandemic. Participants were asked whether they noticed a change in the interpersonal distance they maintain compared to the distance they were keeping before the pandemic. Exploratory data analysis showed that 61.9% of participants (508 individuals) assume that their personal space increased in its size, 35.9% of people (295 individuals) think it didn't change during the pandemic, and for 2.2% of people (18 individuals), its size decreased.

### 10.3. Conclusion of the results

From the collected data, the mean preferred distances for each interaction were counted and compared between same- and opposite-sex individuals. The highest statistically significant mean difference ( $p < 0.001$ ) was found between same- and opposite-sex close friend. Mean preferred distances were also compared in the context of participant's sex. participants of undefined sex were excluded from the analysis. Therefore, the sample size decreased to 818 participants. Women in this sample were, on average, keeping a shorter distance from a same-sex close friend or a family member than men did and a longer distance with an opposite-sex close friend, acquaintances and strangers in interiors. The highest

significant difference in mean preferred distances of women and men was found in interaction with an opposite-sex acquaintance and an opposite-sex stranger in interiors ( $p < 0.001$ ).

Mean preferred distances were also compared in the context of the individualism level of each country. For the sample ( $N = 813$ ), only trivial correlations were shown, ranging from  $r_s = -0.028$  to  $r_s = 0.012$ . Except for interactions with a family member or a same-sex friend, negative correlations were found, suggesting that the preferred distance was shortening with the increasing individualism level of the country. Countries were also compared as contact ( $N = 88$ ) and non-contact ( $N = 56$ ) cultures. The comparison suggested that participants from contact cultures preferred, on average, a longer distance than non-contact cultures members. Nevertheless, the results from the analysis, comparing preferred distances in the context of participant's nationality, were not statistically significant.

The last mean comparison examined average preferred distances in the context of participant's age. Only trivial ( $r_s < 0.1$ ) or small ( $r_s < 0.3$ ) correlations were found. A statistically significant positive correlation ( $p < 0.001$ ) was found in the interactions with a close friend and an acquaintance, suggesting that with increasing age, participants preferred longer distance from a close friend or an acquaintance.

Preferred distances were also tested in relation to participant's feelings of security during the COVID-19 pandemic and their compliance with the safety measures of social distancing and reducing of social contacts. The analysis showed statistically significant ( $p < 0.001$ ) correlations with a small ( $0.1 < r_s < 0.3$ ) or a moderate ( $0.3 < r_s < 0.5$ ) effect. The strongest correlation was found when encountering same- and opposite-sex acquaintances and with opposite-sex strangers in interiors.

Participant's feelings of security and their compliance were also compared between contact and non-contact cultures. Analysis showed that participants from contact cultures were feeling, on average, more threatened by the virus ( $p = 0.001$ ,  $r_s = -0.263$ ) than participants from non-contact cultures. Differences between participants from contact and non-contact cultures in mean scores in the other three variables (threatened by the close physical presence, compliance with social distancing and with the norm of reducing social contact) were not statistically significant. The correlation analysis completed on the level of individualism in each country and participant's feelings of security and their compliance found a statistically significant ( $p = 0.001$ ) trivial positive correlation ( $r_s = 0.069$ ) between the level of individualism in participant's country and their level of being threatened by the close physical presence of others. These findings suggest that participants from countries

scoring higher on the individualism scale were feeling more threatened by the close physical presence of other individuals than participants from countries scoring low on individualism. Other findings were not statistically significant.

Correlation analysis examining the link between participants' age and their feelings of security and compliance with the safety measures showed a statistically significant ( $p < 0.001$ ) positive correlation between participant's age and the level of health concerns ( $r_s = 0.134$ ), participant's compliance with social distancing measure ( $r_s = 0.131$ ) and the measure about reducing social contact ( $r_s = 0.215$ ). The results, therefore, suggest that with increased age, participants were feeling more threatened by the COVID-19 pandemic and were more compliant with the safety measures.

## **11. Discussion**

Although many previous studies established that distances people prefer to maintain from each other differ depending on their relationship with the person, the context of the situation and personal determinants like sex or nationality, the current COVID-19 pandemic makes it a relevant topic for research. Dosey and Meisels' (1969) results suggested an increase in the size of the personal space in situations perceived as threatening. Therefore, it was predicted that the size of personal space has increased compared to original Hall's (1966) data when participants perceive the pandemic as health threatening.

The main research question focused on the link between participant's feelings of security, and their compliance with the safety measures and preferred interpersonal distance. In order to answer the research questions and verify the hypotheses, an online-published-questionnaire study was conducted. In total, 821 participants of 44 different nationalities completed the study. The results of the study will be elaborated in this section in the context of the research questions and hypotheses, and limitations of this thesis with a direction of future research will be stated.

### **11.1. Mean preferred interpersonal distances**

Comparison of mean interpersonal distances of the participants showed that the preferred distances from a family member or a close friend were shorter than distances maintained from an acquaintance or a stranger. Therefore, with the increasing level of familiarity of the encountering person, the interpersonal distances shortened. These findings



were in accordance with the hypothesis, stating that distances from a familiar person will be shorter compared to the distances maintained from a stranger or an acquaintance. However, the results of the study showed, on average, longer interpersonal distances maintained from a family member or a close friend compared to Hall's (1966) original data and shorter distances from strangers. Therefore, the results of the current study did not correspond with the Hall's distances and the spatial categorization into four different zones around each individual (Hall, 1966). According to Hall's categorization, contact with a family member or a close friend should occur within the personal space, which spans 45 and 125 cm around the individual. Respondents of this study preferred to keep, on average, 128 cm distance from a family member and 147 cm from a close friend. These results suggest that the size of the participant's personal space has increased compared to Hall's results.

Contact with acquaintances occurred within the distance of the social space (125 – 350 cm), which was consistent with Hall's categorization. Although contact with strangers was predicted to occur beyond the distance of 350 cm, this survey showed the average preferred distance from strangers within the distance of 230 – 254 cm, thus moving the contact with strangers from the participant's public space into their social space. Therefore, the results of this study were consistent with Mehta's (2020) research, which showed that public interactions were moved into the social space and took place between approximately 150 and 250 cm. Mehta attributed this transition to the insufficiency of social contact, which is substituted by contact with strangers. Yet, his research did not examine distances from family members or close friends; therefore, the results, concerning the change in the size of the participant's personal space, cannot be interpreted in the context of his study.

### ***Mean preferred interpersonal distances in the context of participant's sex***

The results of the survey suggested that the average interpersonal distance preferred by female participants from individuals of the opposite sex was longer than for male participants which was consistent with Dosey and Meisels' (1969) findings and the predicted hypothesis stating that women will prefer a longer distance from an individual of the opposite sex than men will. The exception was found in regard to a family member, with whom women preferred to maintain on average a shorter distance than men did. The data analysis showed that the mean average distance from same-sex individuals was shorter in women than in men, which can be explained with the fact that women can tolerate closer interpersonal contact from same-sex individuals than men (Fisher & Byrne, 1975).

### ***Mean preferred interpersonal distances in the context of participant's nationality***

The relationship between participant's culture and the interpersonal distances they preferred was measured in two ways: in relation to the level of individualism in the participant's country and as a group comparison between contact and non-contact cultures. Countries were categorized as contact or non-contact cultures based on Hall's (1966) and Baldassare and Feller's (1975) previous studies. It was hypothesized that interpersonal distances kept by the members of contact cultures and countries scoring low on the individualism scale will be smaller than distances maintained by members of non-contact cultures and countries scoring high on the scale. The results did not confirm the hypothesis, and the results indicated the opposite relationship.

Although the results were not statistically significant, correlation analysis completed on interpersonal distance in relation to individualism showed a preference for increased distances with decreasing level of individualism in the participant's country. The results were therefore in contrast with Ozdermir's (2008) research, which suggested longer interpersonal distances maintained in countries scoring higher on the individualism scale. Mean comparison of preferred distances of participants from contact and non-contact cultures showed bigger interpersonal distance preferred in case of individuals from contact cultures, which did not support Baldassare and Feller's (1975) results showing bigger interpersonal distance maintained in non-contact cultures.

These findings might be attributed to the level of parasite stress, which is more prevalent in the regions suffering from infection diseases. Parasite stress is manifested by increased interpersonal distance, which serves as a protective mechanism against the transmission. According to the authors of the study comparing preferred interpersonal distances among 42 different countries (Sorokowska et al., 2017), parasite stress is more prevalent in countries with a hotter climate, which were mostly categorized as contact cultures. That might indirectly affect the interpersonal distances, which might be larger due to the parasite stress.

The conclusion of Sorokowska et al. (2017) about increased parasite stress in contact cultures was supported by the additional findings from the current analysis comparing scores attitude- and compliance-scales of contact and non-contact cultures. The mean comparison suggested that participants from contact cultures scored higher on scales of health concerns, feelings of threat by the close presence of others and compliance with social distancing measure than non-contact cultures. Yet, a statistically significant difference was found only between mean attitude scores on the health concerns scale, suggesting that participants from

contact cultures felt more concerned about their health in the context of the pandemic than participants from non-contact cultures. These results, therefore, supported the theory of increased parasite stress in contact cultures, which can indirectly lead to the preference of longer interpersonal distances. However, findings were not supported by correlation analysis between individualism and scores of attitude- and compliance-scales of the participants. The analysis showed that participants from countries scoring higher on individualism felt more threatened by a close physical presence of others.

The results of the comparison of the scores from attitude- and compliance-scales corresponded also with Dosey and Meisels' (1969) hypothesis about increased size of an individual's personal space in situations perceived as threatening. The data showed that participants from contact cultures perceived the COVID-19 pandemic as more health-threatening compared to individuals from non-contact cultures. The contact-cultures participants also preferred to maintain longer interpersonal distances. Therefore, although the results disprove the given hypothesis about the effect of the culture, stating that participants from contact cultures will prefer shorter distance than participants from non-contact cultures, they can be explained by the individual perception of the situation and by the level of parasite stress. The results support the hypothesis that the personal space increases when the situation is perceived as threatful.

The different perception of the pandemic of participants from contact and non-contact cultures can be attributed to a different number of the confirmed COVID-19 cases and deaths in compared countries. Non-contact cultures, namely Iceland, Denmark, Sweden or Finland, confirmed, on average, fewer cases of the COVID-19 infection than contact cultures, such as Italy, Spain or France. The worse impact of the pandemic in terms of cases and deaths might result in the perception of the pandemic as more threatening, as seen in the answers of participants from contact cultures. However, not all contact cultures suffered from the worse impact of the pandemic and vice versa. For example, the number of COVID-19 cases in Germany and Great Britain, both countries categorized as non-contact cultures, are considerable and therefore do not support the conclusion of milder progress of the pandemic in non-contact cultures (Roser et al., 2020).

### ***Mean preferred interpersonal distances in the context of participant's age***

Previous studies examined the size of personal space only among specific age groups, such as children (Guardo, 1969; Melson, 1976) or among elderly people (Webb & Weber,

2003). The previous research suggested that the personal space is developed with age, since older children were maintaining longer distances from each other, and is increasing with age as one's mobility decreases.

To examine the link between preferred interpersonal distance and participant's age, a research question examining the effect of age on the preferred interpersonal distances was formulated. However, as seen from the data introduced in the chapter 10, no clear link between the size of the personal space and participant's age was found. Nevertheless, a significant positive relationship between participant's age and their preferred interpersonal distance when interacting with a close friend and an acquaintance suggests that with increasing age, the distance participants preferred to maintain from close friends or acquaintances, increased as well. The insufficient number of studies examining this topic does not allow to explain these results on a theoretical basis.

However, to explain the findings, a correlation analysis examining the relationship between participant's age and their personal attitudes about the COVID-19 pandemic, as well as with their compliance with the measures was performed. The analysis showed that with the increasing age of the participants, their health concerns and compliance increased as well, which lead to a preference for longer interpersonal distances maintained from close friends and acquaintances. The perception of the pandemic as more threatening can be attributed to a worse progress of the infection in elderly patients and higher mortality due to COVID-19 than in young- or middle-age participants (Liu et al., 2020). The findings of the analysis are in accordance with the hypotheses predicting an increase in size of the personal space in situations perceived as harmful (Dosey & Meisels, 1969). The results, however, do not explain negative correlations with strangers and family members, which suggested that with the increasing age of the participant, preferred interpersonal distance was shortening.

## **11.2. Correlation between participant's attitudes about the COVID-19 pandemic and their preferred interpersonal distance**

Data analysis showed that participants scoring higher on the scale of having health concerns related to the COVID-19 pandemic and the scale of feeling threatened by a close physical presence of other people preferred, on average, to maintain longer interpersonal distances. The results, therefore, supported both set hypotheses stating that people feeling more health-concerned in relation to the COVID-19 pandemic and being more threatened by the close physical presence of others would prefer larger personal space. Results can be

explained with Dosey and Meisels' theory (1969), stating that in situations perceived as threatening for us, the size of our personal space increases to ensure our safety.

### **11.3. Correlation between participant's compliance with the safety measures and their preferred interpersonal distance**

The results of participant's compliance with introduced safety measures suggested that participants who were more compliant with social distancing and reducing social contact measures preferred to maintain longer interpersonal distances. Presented results thus provide an answer to the research question asking whether a higher level of compliance has an effect on the size of our personal space. We can conclude that participants with higher compliance level preferred to maintain longer interpersonal distances than individuals scoring low on the compliance scale. The results can be partly explained with Prosser's findings of the study, examining the possible development of compliance with social distancing after loosening the measures. Prosser et al. predicted that participants, who are more compliant with the safety measures during the COVID-19 pandemic will prefer longer distances from other individuals even after measures will be released compare to less compliant individuals (Prosser et al., 2020).

### **11.4. Limitations**

This study has several limitations, which could have influenced the results. The first limitation concerns the sample selection, the sample cannot be considered representative, since the snowball method was used. Although the sample's representativeness is considerable due to the higher number of respondents, the results cannot be generalized to the whole population due to the unbalanced sample size from participating countries. Some countries, such as Sweden or Greece were represented only by one participant.

Another limitation area addresses the issue of the data collection. The data was collected via an online questionnaire, which aimed to measure the preferred interpersonal distances of the participants. Yet, this type of data collection risks a dishonesty of the participants (Novotná et al., 2020). Although the questionnaire included a figure representing different distances between two people, it might be difficult for the participants to imagine in which distance they would feel the safest. As mentioned in the chapter 3.1 about the neuroscience of personal space, maintaining personal space also employs unconscious processes (Graziano & Cooke, 2006), which were not activated by the used data

collection technique. The results might also suggest longer interpersonal distances preferred than they would be in reality as it can be seen from Gifford's (1983) research. His results suggested that subjective perception of participant's personal space often differs from the objective measurement of the distance. Nevertheless, a live experiment was not possible due to the coronavirus pandemic.

The reliability of the questionnaire was examined by Cronbach's alpha. An excellent score was established for the second part of the questionnaire, focusing on participant's compliance with safety measures and attitudes towards the COVID-19 pandemic. However, the Cronbach's alpha for the first part of the questionnaire was measured to be 0.790, which is considered acceptable. Lower scores of Cronbach's alpha may suggest issues with internal consistency or a lower level reliability of the instrument.

Personal space is influenced by many other factors which were not addressed by the questionnaire. In particular, as shown in Hartnett's research (Hartnett, Bailey & Gibson, 1970), the personal space differs between a situation when another person approaches us versus when we are approaching someone. The questionnaire did not address this issue. Moreover, the questionnaire also did not consider personality determinants and participant's experiences and beliefs, which have been proven to influence the size of our personal space (Frankel & Barrett, 1971; Ickinger & Morris, 2001; Rocklin & Revelle, 1981). To measure personality determinants, such as extraversion, the level of authoritarianism or self-esteem, a future questionnaire should include a standardized personality inventory. However, inclusion of an inventory would be time consuming which might lead to decrease in the response rate and ultimately the sample size (Novotná et al., 2020).

### **11.5. Future research**

This thesis examined the effect of subjective feelings of security during the COVID-19 pandemic and participant's compliance with the safety measures on the size of their personal space. Further research is necessary in order to verify some of the findings.

Firstly, in order to avoid possible dishonesty of the participants, future study should examine the interpersonal distances by means of experiment. Therefore, the risk of false or missing answers will be reduced and the issue of difference between subjective and objective interpersonal distance will be addressed.

Furthermore, the correlation analysis on preferred interpersonal distances with participant's age suggested that with increasing age, participants preferred to maintain a

longer distance from a close friend and an acquaintance. Nevertheless, further research is needed in order to explain the inconsistency of the results when encountering a family member or a stranger both in interiors and exteriors.

The study suggested that participants from contact cultures preferred to maintain, on average, longer interpersonal distance, which is contradictory to the findings of Baldassare and Feller (1975) and Little (1968). The results of this part of the research were not statistically significant, which was probably caused by the small sample size. As mentioned above, since many countries were represented only by one participant, the sample size was not balanced in all countries. The lower respondent's number was caused by insufficiency of social contacts in those countries, such as Mexico or South Korea. Future research should therefore aim on more balanced sample and more respondents from under-represented countries. The sample of the future studies should also be more equal in terms of participant's sex. In the current study, 26.7% of the participants were men. Therefore, future study should aim at a higher number of male respondents.

The last issue is the influence of personality on the size of the personal space. Previous studies showed that individual factors, such as extroversion level or individual's attachment style affect both; the size of the personal space (Frankel & Barrett, 1971; Rocklin & Revelle, 1981) and compliance with the safety measures (Huynh, 2020). Therefore, personal characteristics might have influenced the preferred interpersonal distance during the pandemic.

## CONCLUSION

This bachelor thesis addressed the issue of the size of the personal space during the COVID-19 pandemic. It examined the link between subjective perception of safety and the preferred interpersonal distances. Moreover, the effect of other determinants such as sex, age or nationality of the participants, was considered. The data was collected using an online questionnaire with 821 participants.

Personal space indicates a border, separating interactions with friends and family members from interactions with acquaintances and strangers. E. T. Hall (1966) established that this border is at a distance of 125 cm from an individual's body. Although this research supported shorter distances from familiar people than from strangers, distances determined by the questionnaire did not correspond with Hall's data. The results showed that preferred interpersonal distances in all four types of interactions (with a family member, a close friend, an acquaintance and a stranger) were longer than 125 cm, and therefore not corresponding with Hall's classification of the space around an individual.

The results showed that participants who felt more threatened in their health by the pandemic or by the close physical presence of other people preferred longer interpersonal distances. Similar conclusions were drawn concerning compliance. Participants scoring higher on the scale of compliance with social distancing measure and reducing social contact preferred to maintain longer interpersonal distance than participants scoring lower.

The following analysis established that sex, age and nationality impact the interpersonal distance participants preferred to maintain. Female participants were shown to prefer, on average, longer interpersonal distance from other people than men. The exception was found in a situation with a family member, where women maintained shorter distance. Correlation analyses between the preferred distances and participant's age yielded to inconclusive results. A statistically significant correlation was found only when interacting with a close friend or an acquaintance, where the preferred interpersonal distance was increasing with increasing age. Since not many studies addressed this issue, further research in this area is necessary.

Participant's culture was shown to be another crucial determinant of the interpersonal distance. Comparison between participants from contact and non-contact cultures found longer interpersonal distances preferred by members of contact cultures such as Italian, Spanish or French. Analysis conducted on the link between the preferred distance and the level of individualism shown the same conclusion: countries scoring lower on individualism,



which could be categorized as contact cultures, preferred to keep longer interpersonal distance. Participants from contact cultures were also shown to feel more threatened by the virus and by the close physical presence of other people, which provides an explanation for longer distances preferred. These findings support a theory of higher level of parasite stress prevalent in countries with warmer climate, such as most of the contact cultures. According to the authors, interpersonal distances preferred in these countries are longer in order to protect an individual from a disease transmission (Sorokowska et al., 2017). Nevertheless, the differences between mean preferred distances were not statistically significant, which can be explained by small sample size used for this part of the analysis. Most of the compared nationalities were represented by only few participants. Further examination of the results with a higher number of respondents from each country is therefore necessary. Furthermore, since this research did not consider possible personality determinants, future research should employ a personality inventory to examine the link between the size of the personal space and personality factors.

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# APPENDICES

## Appendix A. Sample description tables

*Table 13.*

*Age of participants.*

	Age
N	821
Missing	0
Mean	34.6
Median	28
Minimum	15
Maximum	85

*Table 14.*

*Sex of participants.*

Sex	Counts	% of Total
Female	599	73.0 %
Male	219	26.7 %
Others	3	0.4 %

*Table 15.*

*Participants' place of residents.*

Place of residence	Counts	% of Total
More than 100 000 inhabitants	221	26.9 %
50 000 to 100 000 inhabitants	60	7.3 %
25 000 to 50 000 inhabitants	227	27.6 %
10 000 to 25 000 inhabitants	62	7.6 %
5 000 to 10 000 inhabitants	70	8.5 %
1 000 to 5 000 inhabitants	92	11.2 %
Less than 1 000 inhabitants	89	10.8 %

*Table 16.**Participants' nationality.*

<b>Nationality</b>	<b>Counts</b>	<b>% of total</b>
American	5	0.6 %
American-South African	1	0.1 %
Australian	1	0.1 %
Brazilian	4	0.5 %
British	4	0.5 %
British-Luxembourg	1	0.1 %
Bulgarian	1	0.1 %
Canadian	1	0.1 %
Chilean	1	0.1 %
Croatian	2	0.2 %
Czech	639	77.9 %
Czech-American	1	0.1 %
Danish	3	0.4 %
Dutch	10	1.2 %
Filipino	1	0.1 %
Finnish	14	1.7 %
French	11	1.3 %
German	10	1.2 %
Greek	1	0.1 %
Hungarian	2	0.2 %
Hungarian-Romanian	1	0.1 %
Icelandic	1	0.1 %
Indian	1	0.1 %
Iranian	2	0.2 %
Irish	1	0.1 %
Italian	48	5.9 %
Lithuanian	2	0.2 %
Mexican	1	0.1 %
Moldavian	1	0.1 %
New Zealand	1	0.1 %
Polish	6	0.7 %
Portuguese	4	0.5 %
Romanian	5	0.6 %
Russian	2	0.2 %
Slovakian	15	1.8 %
Slovenian	6	0.7 %
South Korean	1	0.1 %
Spanish	2	0.2 %
Spanish-Argentinian	1	0.1 %
Spanish-Dutch	1	0.1 %
Swedish	1	0.1 %
Swiss	2	0.2 %
Swiss-Dutch	1	0.1 %
Turkish	1	0.1 %

## Appendix B. Questionnaire

### The effect of COVID-19 pandemic on the subjective feeling of security

This questionnaire examines the link between COVID-19 pandemic and the subjective feeling of security. It is part of a bachelor thesis by Tereza Kostlánová, Faculty of Humanities, Charles University, Prague, Czech Republic.

The survey takes place online. The research aims at all age groups, both men and women, regardless of their education or employment.

To fill in the questionnaire will not take more than 15 minutes of your time. Please answer truthfully.

The information you provide will be considered confidential. The results will be summarized, and answers will stay anonymous. By completing the survey, you agree with the processing of the data provided by you and with following publishing of the results. In case of any questions, please contact [tkostlanova@seznam.cz](mailto:tkostlanova@seznam.cz).

Table 17.

*Questionnaire content.*

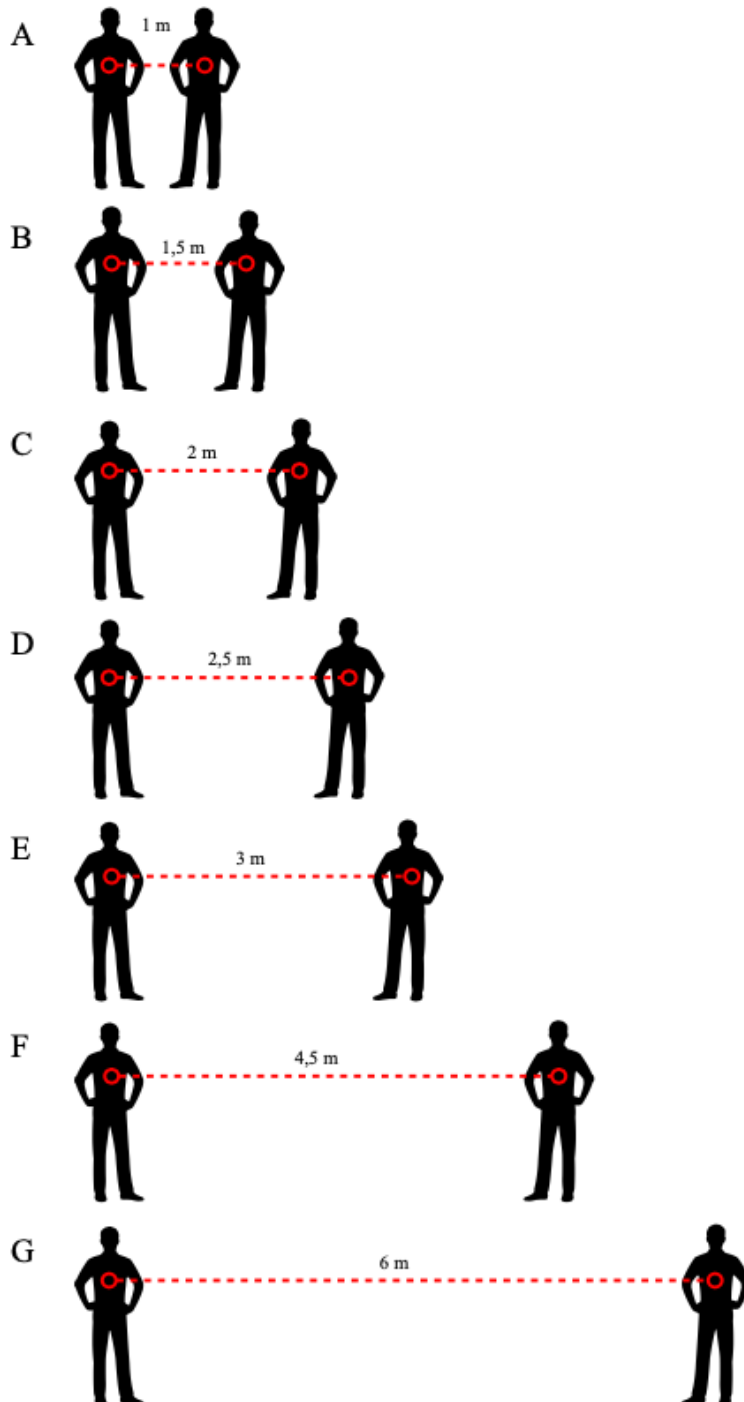
Question	Answer
1. How old are you?	Open-ended question
2. What is your sex?	Options: <i>Female / Male / Other</i>
3. What is your nationality?	Open-ended question
4. Were you infected by COVID-19 disease?	Options: <i>Yes / No / I don't know</i>
5. What is the size of the city you currently live in?	Options: <i>More than 100 000 inhabitants / 50 000 to 100 000 inhabitants / 25 000 to 50 000 inhabitants / 10 000 to 25 000 inhabitants / 5 000 to 10 000 inhabitants / 1 000 to 5 000 inhabitants / Less than 1 000 inhabitants</i>
6. To what extent are you concerned about your health in the context of the COVID-19 pandemic?	Numeric rating scale: <i>1 (not at all) – 10 (extremely)</i>
7. To what extent do you feel threatened by close physical presence of other people you don't know?	Numeric rating scale: <i>1 (not at all) – 10 (extremely)</i>
8. Do you maintain interpersonal distances of 2 metres from other people (social distancing)?	Numeric rating scale: <i>1 (never) – 10 (always)</i>
9. Do you comply with the measure of reducing social contact to a minimum, induced by the government?	Numeric rating scale: <i>1 (never) – 10 (always)</i>

10. In what distance would you feel the most comfortable and safe from your family member?	Options: 1 m (approximately the length of your arm) / 1,5 m / 2 m / 2,5 m / 3 m / 4,5 m / 6 m
11. In what distance would you feel the most comfortable and safe from a close friend of the same sex?	Options: 1 m (approximately the length of your arm) / 1,5 m / 2 m / 2,5 m / 3 m / 4,5 m / 6 m
12. In what distance would you feel the most comfortable and safe from a close friend of the opposite sex?	Options: 1 m (approximately the length of your arm) / 1,5 m / 2 m / 2,5 m / 3 m / 4,5 m / 6 m
13. In what distance would you feel the most comfortable and safe from an acquaintance of the same sex?	Options: 1 m (approximately the length of your arm) / 1,5 m / 2 m / 2,5 m / 3 m / 4,5 m / 6 m
14. In what distance would you feel the most comfortable and safe from an acquaintance of the opposite sex?	Options: 1 m (approximately the length of your arm) / 1,5 m / 2 m / 2,5 m / 3 m / 4,5 m / 6 m
15. In what distance would you feel the most comfortable and safe from a stranger of the same sex in interiors?	Options: 1 m (approximately the length of your arm) / 1,5 m / 2 m / 2,5 m / 3 m / 4,5 m / 6 m
16. In what distance would you feel the most comfortable and safe from a stranger of the opposite sex in interiors?	Options: 1 m (approximately the length of your arm) / 1,5 m / 2 m / 2,5 m / 3 m / 4,5 m / 6 m
17. In what distance would you feel the most comfortable and safe from a stranger of the same sex in exteriors?	Options: 1 m (approximately the length of your arm) / 1,5 m / 2 m / 2,5 m / 3 m / 4,5 m / 6 m
18. In what distance would you feel the most comfortable and safe from a stranger of the opposite sex in exteriors?	Options: 1 m (approximately the length of your arm) / 1,5 m / 2 m / 2,5 m / 3 m / 4,5 m / 6 m
19. Do you think that the distance you maintain from people you don't know has changed during COVID-19 pandemic?	Options: Yes, it increased (I prefer to maintain longer distance than before the pandemic) / Yes, it decreased (I prefer to maintain shorter distance than before the pandemic) / No, it stayed the same
20. Do you think that your preferred distance differs from other members of your nation?	Options: Yes, I prefer longer distance than other people / Yes, I prefer shorter distance than other people / No, it is the same

## Appendix C. Interpersonal distances from the questionnaire

Figure 2.

Visual representation of interpersonal distances enclosed to questions 10 – 18 in the questionnaire.



## Appendix D. Assigned individualism scores to each nationality

Scores were determined via Hofstede Insights webpage (Hofstede Insights, 2018).

*Table 18.*

*Individualism scores assigned to each country.*

<b>Nationality</b>	<b>Individualism score</b>
American	91
Australian	90
Brazilian	38
British	89
Bulgarian	30
Canadian	80
Chilean	23
Croatian	33
Czech	58
Danish	74
Dutch	80
Filipino	32
Finnish	63
French	71
German	67
Greek	35
Hungarian	80
Icelandic	60
Indian	48
Iranian	41
Irish	70
Italian	76
Lithuanian	60
Mexican	30
Moldavian	27
New Zealand	79
Polish	60
Portuguese	27
Romanian	30
Russian	39
Slovakian	52
Slovenian	27
South Korean	18
Spanish	51
Swedish	71
Swiss	68
Turkish	37